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WASWANIPI REALITIES AND ADAPTATIONS: RESOURCE MANAGEMENT AND COGNITIVE STRUCTURE

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<u>Errata Noted by Harvey Feit</u>

For Table 11-4 on pages 982-991

There are a few errors in the labels of Waswanipi hunting territories listed on this table on pages 985-86..

1) The hunting territory labelled XC should be listed as XB.

2) The hunting territory labelled XH should be labelled XC

3) Thus, hunting territory XH is omitted from the table. It should be listed along with the note that there are no data on its transfer.

WASWANIPI REALITIES AND ADAPTATIONS:

RESOURCE MANAGEMENT AND COGNITIVE STRUCTURE

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ABSTRACT

Each of the two "new" paradigms for ecological anthropology, ecosystems analysis and ethnoecology, explores only one pair of phenomena relevant to cultural ecology, environment and action, and environment and belief respectively. This study argues that ecological analysis is weakened by the exclusion of any one of those three orders of phenomena as objects of study. A detailed analysis of cognitive and behavioral data on the resource management of Waswanipi Cree hunters shows how religious beliefs incorporate both cultural logics and realistic models of environmental relationships; and, how action informed by those beliefs can effectively manage hunting, animal populations, human population distributions, and subsistence. Beliefs are formulated as recipes that apply to diverse situations so that actions informed by these are responsive to changing conditions. Decisions concerning alternative goals, situations and strategies are shown to be socially located with the men who are the "owners" of hunting territories.

EXTRAIT

L'anthropologie écologique traite de trois catégories de phénomènes: culture, environnement et comportement. Les deux "nouveaux" paradigmes explorent seulement deux des trois phénomènes relatifs à l'écologie culturelle, l'analyse des écosystèmes qui traite de l'environnement et du comportement et l'ethnoécologie qui traite de l'environnement et de la culture. La présente étude indique l'importance de l'interaction entre les trois catégories de phénomènes. Une analyse détaillée des données sur les croyances et le comportement concernant l'aménagement des ressources par les chasseurs cris Waswanipi démontre comment ces croyances religieuses reflètent à la fois la structure culturelle et les relations concrètes avec l'environnement; et comment le comportement de ces chasseurs en accord avec leurs croyances peut effectivement contrôler la chasse, les populations animales, la distribution géographique des populations humaines ainsi que leur subsistance. Les croyances se réalisent sous forme de recettes s'appliquant à des situations diverses et par la suite le comportement des chasseurs s'adapte aux conditions changeantes. Les décisions concernant les buts, les situations et les stratégies sont prises par les hommes qui sont reconnus socialement comme étant les "propriétaires" des territoires de chasse.

PREFACE

This thesis is based primarily upon approximately thirteen months of fieldwork spread out over a two-year period from October 1968 to October 1970 among the Waswanipi Cree Indian people living in northwestern Quebec; and upon approximately four years of analysis and writing spread out over an eight-year period from the fall of 1970 to the fall of 1978. Fieldwork was conducted at Matagami, Miquelon and Waswanipi River settlements.

Fieldwork began during the completion of my Masters Thesis and then continued intermittently as I fulfilled requirements for my doctoral program. After fieldwork the data were analyzed and initial drafts of this study were prepared but completion of the project was delayed by the commitments I chose to make during the intervening years.

When the James Bay Hydro-electric Project was announced the Cree people from the James Bay region of Quebec and the Inuit people from northern Quebec decided to fight the project in the courts, and then to negotiate a settlement with the Governments of Quebec and Canada. Because of the experience provided by the present research on Waswanipi use of the land and resources I was asked and agreed to participate first in the preparation of the court case, and then in the negotiation and implementation of the James Bay and Northern Quebec Agreement. It thus worked out that the ideas and implications of the present research were applied and used practically before the results of the research themselves were in a form appropriate for submission.

The intervening years have provided some opportunity to return to the field to check and collect additional data, both on short-term field research and as director of several research projects conducted by the Grand Council of the Crees (of Quebec). However, while the present thesis has been completely redrafted during 1977 and 1978, it continues to be based on the earlier data.

This study would not have been possible without the support, help and work of my wife Lise Feit, who worked with me sorting much of the raw data, and who then prepared and helped me revise literally several thousand pages of draft texts.

The study is also the result of a commitment by the Waswanipi people to share a part of their lives and their wisdom, and I use the word advisedly. My experiences at Waswanipi were an important period of my own life and for the opportunity and their help and friendship, I thank those Waswanipi people who gave so much. At the expense of leaving out many people who should be mentioned I would offer special thanks to Joseph and Eva Ottereyes, Emily Saganash, Richard and Sophie Otter, Ronnie and Maryann Otter, Peter and Emily Gull, John Gull, Katherine Gull, Harry Blacksmith, Nancy Otter, Abel Otter, Annie Saganash, Hattie Kitchen, Billy Ottereyes and Janie Capississit. If it were appropriate to dedicate a thesis this one would be dedicated to four men who have left this earth since I knew them: Andrew Ottereyes, Antoine Otter, William Saganash and Diom Blacksmith.

In the analysis of the data and the writing up of this study I have also had the good fortune to benefit from the intellectual and human insight of Professor Richard F. Salisbury, who as thesis advisor constantly helped me to clarify and make relevant what I was trying to say.

The breadth of issues raised in this study is an indication of the large number of people who have contributed to my understandings of the issues discussed over the course of the last years. Some specific contributions are noted in the text, only some of the general contributions can be noted here, those of: Philip Awashish, Professor Fikret Berkes, Richard Cuciurean, Professor William Kemp, Ignatius LaRusic, Professor Hugh Lawrence, Toby Morantz, Alan Penn, Professor Henry Rutz, Professor Philip C. Salzman, Professor Adrian Tanner, Professor Bruce Trigger and Martin Weinstein.

I would like to thank Douglas Dusseault and Rena Chouinard for helping Lise and myself to complete a very long job in a relatively short time under trying circumstances.

Finally, I would like to thank the various agencies whose funding programs made various parts of this research possible: a Doctoral Fellowship from the Canada Council; research contracts from the National Museum of Man; Steinberg Summer Research Fellowships from McGill University; Northern training grants from the Department of Indian and Northern Affairs to the Northern Research Committee of McGill University; and, research and publications grants from the Department of Sociology and Anthropology, Carleton University.

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Note on Orthography and Language Use

I have included Waswanipi words in the text in order to mark distinctions with western concepts, in order to build up a series of specific meanings for some key words, and in order to facilitate evaluation by the Waswanipi and other researchers working on related groups. The orthography used is sufficient to identify terms, but not to pronounce them. Furthermore, most of the terms cited in context were transcribed early in the fieldwork before I was accustomed to the sounds or the transcription system. Despite a habit of not distinguishing long and short vowels in transcription at the initial stage, I have presented the words as I recorded them, rather than try to "correct" them long after the event. A new orthography has been developed now for Cree that would considerably improve the one used here (Berkes and Mackenzie, in Press).

Consonants:	č, ts	= ch
	p	= p or b
	t	= t or d
	k	= k or g
	š	= sh
	s	= s
	m	= m
	n	= n
	h	= h
Vowels :	i	= beat
	I	= bit
	e	= bet, bat
	a	= father, water
	A	= sofa
	o	= dog, woe
	U	= put
	u	= rule
	oa	= w

My Cree language competence was not adequate to conduct detailed interviews in Cree, and I therefore interviewed in English. With monolingual Cree speakers I used interpreters. Because many bilingual Cree speakers also preferred formal interviews to be conducted in Cree, a majority of all interviews were conducted through interpreters. However with bilingual interviewees the interviewee himself/herself could revise the translation in subsequent responses, and sometimes did.

CHAPTER 1 - ENVIRONMENT, BELIEF AND ACTION IN ECOLOGICAL ANTHROPOLOGY

A - Introduction

What types of phenomena should be the objects of study in human ecology? What specific data need to be gathered for studies in ecological anthropology? What analytical tools are appropriate for use in such studies? What assumptions can be made about how the phenomena studied interact over time? What is to constitute an explanation?

The rapid growth of the research in the field of ecological anthropology has been accompanied by significant progress in the development of methodological tools and problem solving substantive accounts, but the literature has included only a limited number of theoretical or analytical statements. Those theoretical and analytical statements that have been offered have tended to be highly programmatic, and have led to few fully comprehensive studies consistent with the empirical standards required by the analytical program. This has resulted in the formulation of a large number of studies which consist of proposals or hypotheses about possible relationships between phenomena rather than significant tests of the theoretical assumptions. This in turn has enhanced rather than challenged the isolation of theoretical statements from substantive data.

Practitioners of the two most prominent "new schools"of ecological anthropology, functional systems analysis and ethnoecology, have each offered extensive statements defining the goals, assumptions, analytical tools, methods and explanatory models which they claim are appropriate to define the field. Comparing these formulations, one is struck by the extent to which each of these alternative formulations defines the phenomena which should be the objects of study in ecological anthropology so narrowly that there are serious gaps between an ecological anthropology so defined and the wider interests that typically define the anthropological field. This has resulted in a certain sectarianism which characterizes both the sub-discipline of ecological anthropology and the major schools within the field.

The present study is an exploration of the major dimension of the disagreement between functional systems analysts and ethnoecologists: the importance placed by the former on action as an area of study to the virtual exclusion of beliefs; and, the importance placed by the latter on belief to the virtual exclusion of action. Practitioners of each school, of course, acknowledge the existence of the phenomena on which they place relatively less importance, but as I will argue below, each in practice has excluded such alternative phenomena from the scope of their actual research programs. As a result, most studies may be easily criticized from the broader perspective of their adequacy for dealing with the general anthropological interests in human belief and action, and their interaction.

In the present study an account of both belief and action is provided with a view to demonstrating how the study of one informs the other, and how the exclusion of either leads to an inadequate account of the other. This introduction provides a brief review of paradigms of ecosystem analysis and ethnoecology and a brief outline of the present study.

B - Functional Systems Analysis

Functional systems analysis has been proposed by a number of scholars who call for a "unified science of ecology", identifying ecological anthropological analysis with the framework of functional systems analysis common in the biological sciences. Various names have been proposed for this "new ecology"; I will use the term "ecosystem analysis" interchangeably with "functional systems analysis".

Ecosystem analysts start with the unexceptionable claim that material exchanges between men and environments are necessary for the survival of human beings. They go on to claim that the study of culture should be approached by seeking to analyze the survival value that culturally learned human behavior has for human populations. They claim that if the focus of human ecology is on how human behavior maintains or improves the material relationships between men and environments, then human ecology can be readily integrated with the biological ecology focus on animal behavior and the basic concepts and the methodological and analytical tools of biological ecology can be applied equally to men.

Proponents of this paradigm have often cogently defended the need for careful study of man-environment relationships, against those who would ignore ecological analysis and explanation. They have done so by calling attention to the dependence of men on the biological and physical environments in which they live and to the impacts of men on those environments. By using functional systems analysis ecosystem analysts attempt to demonstrate that the material exchange relationships between men and environments are systemic and that such systems have self-regulating mechanisms. They have been more successful at demonstrating the former than the latter.

In order to implement this analysis, ecosystem analysts have assumed, and sometimes set out to demonstrate, that the variables of the self-regulating ecosystem can be observed in field situations and subjected to measurement so that the systemic relationships between variables could be verified and the structure and functioning of the system demonstrated. However, no case of self-regulation has in fact been fully documented.

Functional systems analysis has been promoted primarily by Andrew P. Vayda and Roy A. Rappaport, both jointly and independently (Vayda and Rappaport, 1968; Vayda, 1969a, 1969c, 1970, 1971, 1976; Rappaport, 1968, 1970, 1972; Vayda and McCay, 1975). The most intensive and quantitative use of the approach in the published literature is Rappaport's study of the pig ritual among a New Guinea people (Rappaport, 1968).

In addition, the application of functional systems analysis to anthropological topics has been proposed in a large number of "re-examinations" of, and "new perspectives" on, significant studies of human institutions in the anthropological literature, including among others: eastern Algonkian family hunting territory system (Knight, 1965); scapulimancy (Moore, 1957); Melanesian pig raising and feasting (Leeds, Vayda and Smith, 1961); Northwest Coast potlatching (Vayda, 1961, Suttles, 1961 1968, and Piddocke, 1965); the sacred cows of India (Harris, 1965, 1968, and Odend'hal, 1972), and warfare (Vayda, 1975). Functional systems analysts have attempted to demonstrate the value of the approach they propose by arguing that there are plausible, if difficult to test, ecological explanations for the functioning of many cultural practices previously explained by reference to social, psychological, ideational or historical factors. Almost all of these publications are, as Paul Collins noted (1965), "explanation sketches" which give an indication of the laws and conditions considered likely to be relevant, rather than quantitative verification of the functions identified.

In the process, the functional systems analysts have not ignored belief systems, but they have claimed that consideration of beliefs is not essential to the analysis; and, they have not undertaken any extended examination of the relationship of belief to the behavioral and environmental orders. Vayda and Rappaport claim that the culture of the human species can be studied and interpreted in the same way as the behavior of any species, i.e., for the ecologist, insofar as it is adaptive behavior formed by the process of natural selection (Vayda and Rappaport, 1968:492). The only sacrifice that would be entailed in such an approach is "of the notion of the autonomy of a science of culture". This program Vayda and Rappaport claim can be accomplished without abandonment of what they claim are the major goals of cultural anthropology. But they define those interests as behavioral rather than ideational: why particular traits or congeries of traits exist at particular times and in particular places; and, how the traits or congeries of traits function (1968:477; see also 494).

Anthropologists can formulate research based "upon human populations and upon ecosystems and biotic communities in which human populations are included" instead of upon relations among cultures and their environments, for cultures "unlike human populations, are not fed on by predators, limited by food supplies, or debilitated by disease" (Vayda and Rappaport, 1968:494; see also 479, and earlier statement in Rappaport, 1963:157-8). The degree to which human behavior is a result of learning as opposed to genetics creates problems in observation and description, but it

> "does not mean that the principles, concepts, or approaches employed by anthropologists studying behavior in interaction with environmental phenomena must be basically different from those employed by other scientists" (1968:494, italics in original; see also Rappaport, 1963:158).

The concept of a unified functional human ecology proposed by Vayda and Rappaport has therefore been associated with a relatively low valuation on the study of belief systems in human ecological research. The focus is on cultural behavior and specifically on standardized behavior patterns or traits, and not on ideation. Cultural behavior itself is not to be studied with reference to beliefs, but with reference to its environmental setting and consequences. Vayda and Rappaport have somewhat different stances on this issue, Vayda generally considering analysis of cultural beliefs as less important than Rappaport. Nevertheless, both effectively put any extended consideration of beliefs outside the scope of the immediate research programs they propose.

Vayda has written for example that:

> "Attention to cultural ideas, values or concepts cannot, however, be said to be a *sine qua non* of the analysis of ecosystems including man. One may choose rather to place emphasis upon the actual physical behavior or bodily movements through which man directly effects alterations in his environment..." (Vayda, 1965:4).

While Vayda does not preclude the analysis of beliefs in ecological anthropology, he in fact relegates them to a minor and dispensable role with respect to the explanation of behavior.

> "Our understanding is, in other words, enhanced when we are able to regard cultural practices such as divination, witchcraft accusations and ritual pig slaughters not as the exotic expressions of essentially inexplicable cultural values nor interests but rather as systemic components in the culture-carriers relations with the environment from which they draw the energy and materials upon which their lives and culture depend" (1969a:119).

While recognizing that the study of peoples' beliefs can be valuable as a means of giving a "fuller understanding of the mechanism producing the behavior" (Vayda and Rappaport, 1968:490), this is seen to have very limited relevance to most ecological studies.

Thus, Vayda has suggested that belief systems are only useful at early stages of culture trait development, and that in so far as later stages are of concern, or functional workings are of concern, beliefs may be overlooked:

> "With special reference to Iban warfare, we can say that at those points in its evolution when it was still something new to the Ibans themselves the thoughts and feelings of the Ibans about its desirability may have been significant determinants of whether or not it would then become established among them."
>
> "At the same time, it must be remembered that the ultimate establishment of a particular kind of warfare among the Ibans is likely to be, as we have seen, explicable to a large extent in terms of the adaptive effects of that warfare. This suggests that before deciding to concentrate our attention on either of the factors motivating the behavior of individuals or on the adaptive effects of behavior - or even on both at the same time - we have to decide whether it is with the beginning or with some other stage of a particular evolutionary development that we wish to deal. This is a conclusion that may well be applicable to the study of the causes of cultural phenomena in general as well as specifically to the study of the causes of war" (Vayda, 1969b:220).

Rappaport on the other hand has written on the need to consider belief as well as action in ecological anthropology:

> "We must consider the ideological aspect of culture... Nature is seen by man through a screen composed of beliefs, knowledge, and purposes and it is in terms of their cultural images of nature, rather than in terms of the actual structure of nature, that men act. Therefore, some anthropologists (...) have called our attention to the necessity, if we are to understand the environmental relations of men, to take into account their knowledge and beliefs concerning the world around them, and their culturally defined motives for acting as they do" (Rappaport, 1972:246).

There inevitably will be discrepancies between men's images of nature and the actual structure of ecosystems, because their images are always simplifications of the ecological systems whose subtlety and complexity eludes full human comprehension. This discrepancy Rappaport sees as "one of the central problems of ecological anthropology" (1972:247).

To deal with this problem Rappaport proposes that the ecological ethnographer prepare two models for analysis. One, he calls it the "cognized model", a description of the knowledge and beliefs concerning the environment entertained by a people, which is the model in terms of which people act. The second, he calls the "operational model", a description of the same ecological system in accordance with the assumptions and methods of the science of ecology (Rappaport, 1972:247). The operational model is composed of the elements which ecological theory suggests to the analyst may affect the biological well-being of the human populations under study. These may include elements which are not part of the conceptual system of the people under study (e.g., micronutrients) and therefore not part of the cognized model. On the other hand, the cognized model may include elements that are not part of the operational model (e.g., supernatural beings) because they are not empirically demonstrable by the criteria of the observers' culture, but those elements nevertheless have real effects on the people's behavior.

Rappaport stresses that although men act in terms of their conceptions and wishes, they act upon nature and it is nature that acts upon men enhancing or reducing their chances for survival. The cognized model therefore is to be studied from the perspective of its functions. Thus, he claims that the important question concerning cognized model is not the extent to which it coincides with what the analyst takes to be reality, but the extent to which it elicits behavior which is appropriate to the biological well-being of the actors and to the ecosystems in which they participate. "The criterion of adequacy for a cognized model is not its accuracy, but its functional and adaptive effectiveness" (Rappaport, 1972:247).

Rappaport therefore argues for an integration of the two models in order that the adaptive features of cognized models can be studied:

> "Accordingly, the analysis of the ecological ethnographer consists of an integration of the cognized and operational models, an integration which permits him to describe the effects of behavior undertaken with respect to the cognized model on the ecosystem as it is represented in the operational model. In this way it becomes possible to assess the adaptiveness not only of overt human behavior, but even of the ideology which informs that behavior" (Rappaport, 1972: 247-248).

Thus, although Rappaport recognizes cognized models, he does not study the relationship between cognition and behavior, but rather assumes a congruity of the two, and then integrates the cognized model with the natural order. This leads Rappaport into reductionism. He argues that functional systems analysis should precede studies directed at the peculiar human features of human existence and asserts, as a general principle, that study of the similarities of a class of phenomena "must precede any adequate understanding of whatever may distinguish the members of that class from one another" (Rappaport, 1972:244). Other things being equal he claims that explanations of greater generality should be preferred to those of narrower range, i.e., generalizations of ecology and biology which apply to all life, as opposed to anthropological generalizations which are limited to a single species, because explanations of greater generality "allow us to introduce more order into our comprehension of the universe" (Rappaport, 1972:244-245). This approach:

> "... leads us to ask whether behavior undertaken with respect to social, economic, political, or religious conventions contributes to or threatens the survival and well-being of the actors, and whether this behavior maintains or degrades the ecological systems in which it occurs. While the questions are asked about cultural phenomena, they are answered in terms of the effects of culturally informed behavior on biological systems: organisms, populations and ecosystem" (Rappaport, 1972:243).

Thus, several recent critics have noted that Rappaport by assuming that the cultural order is a subsystem of a larger ecosystemic order ends up reducing the cultural logic to a natural logic (Murphy, 1970; Friedman, 1974; Sahlins, 1976). As Murphy notes functional systems analysts are reductionist not because they seek the causes of cultural phenomena at the ecological level, but because they attempt to attribute the order and integration of culture and of the social system to ecological conditions (Murphy, 1970:169). The integration of the social system lies in the ideas and social activities that are adjusted to produce an ordered way of live, and at this level of analysis the social system is distinctive and autonomous although related to environmental conditions. Ecological facts, processes of natural selection, adaptation do not order or integrate culture (Murphy, 1970:169).

The two fundamental claims of Rappaport, that men are dependent on environments for their biological survival and that men are uniquely dependent on symbolic systems, are clearly basic to any ecological studies of human beings. Similarly, Rappaport's claim that ecological anthropologists must distinguish and study both informants' and scientific analysts' models of environment, and that they should look to the ecological functions of cultural behavior are important and potentially productive research strategies.

Rappaport's argument that ecological anthropology should begin with those aspects of human existence which are common to all living things and only secondarily consider other features of human existence is, in my view, a very limiting proscription for research. For example, Rappaport's own description of Maring beliefs, interesting as it is in its own right, is linked only in the most general way to his own functional explanations of the Maring ecosystem (1972). By this exclusion, Rappaport, like Vayda, fails to systematically study the relation of belief to both behavior and environment.

The omission of questions about the relationship of the cultural order to the behavioral and environmental orders is fundamental and far-reaching. Rappaport and Vayda's arguments both acknowledge the need to study beliefs, while foregoing or delaying those studies, presumably because such analysis could not be statisfactorily handled by a functional systems analysis. Indeed, Rappaport's claims, given his emphasis on the special dependence of men on symbols and the difficulty of studying human ecology, should lead to the conclusion that functional analysis is not the sole tool needed.

The need to study behavioral <u>and</u> symbolic dimensions of the interaction of men and environments seems basic to me because there is no adequate universal or even general evidence for the priority of one over the other. Indeed, what evidence there is indicates a complex and dialectical set of relationships. It is not fruitful in my view to decide <u>a priori</u> if the explanation of human behavior patterns depends more on biological needs or on symbolic values; the interesting and potentially productive question lies in the interaction of the two. I would argue for an approach that would make the interaction and relative importance of the biological and symbolic dimensions of human behavior a topic for analysis rather than an <u>a priori</u> assumption.

<u>C - Ethno-ecological Analysis</u>

Like functional systems analysis, ethno-ecological analysis also begins with an unexceptionable claim, namely that human action is only possible because men live in a world that is ordered and made meaningful by men, so that such order and meaning as exist are in part a result of the human process of experiencing and thinking in the world. Without a culturally constructed world systematic human action could not occur and human survival would be impossible. Ethno-ecologists have called special attention to the need to study human cognition and human knowledge in addition to the study of behavior as such.

Ethno-ecologists take as the first problem the description of the culturally systematized world, the everyday things of the environment in which men live. They define culture as an idea system and the task of the ethno-ecological analyst is to discover the significant features of objects and events used to define the concepts and formulate the propositions that natives use to make decisions.

The analysis has drawn largely on linguistic models of sets of contrasting terms as the basis for a logically formal representation of the significant, or distinctive features.

Ethno-ecology has been associated most closely with the work of Harold C. Conklin (1955, 1962), Charles O. Frake (1962), Ward H. Goodenough (1964, 1969) and Brent Berlin (1972, 1973, 1976).

Conklin's Ph.D. thesis, written in 1954, hypothesized that the botanical knowledge of the Hanunoo of the Philippines reflects a structural set of inter-relationships of culturally defined concepts including both plants and associated cultural patterns (Conklin, 1954a:7). He saw his goal in this study to be distinct from the majority of earlier ethnobotanical studies in that the "primary concern is not with the taxonomic botanical data, but with Hanunoo folk botanical knowledge and its organization" (1954a:11). The specific hypothesis was that the analysis of folk botanical knowledge was related to the actual cultural practices of the Hanunoo. Specifically, he studied the production and consumption of food, the manufacture of artifacts, and "superordinary relations" - magic, religion and medicine.

Conklin's second study of the relation of folk knowledge to decision-making and horticultural practice among the Hanunoo (1975 /1957/) is still, to my knowledge, the only intensive published ethno-ecological study giving a sustained account of human ecology as both knowledge and practice. A briefer account of the data analyzed was published in 1954 in which Conklin undertook to revise scientific and popular misconceptions of slash-and-burn horticulture on the basis of his results. This article was seminal in that it simultaneously stressed, among other points: the extent to which shifting cultivation was not "haphazard" and uniform, but rather "locally-determined, well-defined" and responsive to changing conditions; and, the extent to which it was not a simple but rather a complex procedure involving multiple crops, intercropping, and a well-defined cycle of processes of land use. As such the article made clear the extensive knowledge on which shifting cultivation was based and the extent of control exercised in the process over environmental conditions by farmers as a result of their use of that knowledge (Conklin, 1954b).

Taking his lead from Conklin's work Frake has made the most widely quoted programmatic statement on the value of gathering extensive data on systems of knowledge in the course of ecological studies. Consistent with the "new ethnography", he defined the primary tasks as the construction of taxonomies of native terms for environmental phenomena, and determining the semantically critical attributes of the categories. He claims that by discovering the principles for classifying plants, animals and other ecological components as do the people under study, one also learns the features which they take note of when deciding among alternative courses of action (Frake, 1962a:55). From the taxonomic rules for what natives regard as appropriate in classification, their rules for action in relation to environmental phenomena can be formulated:

> "From a presentation of the rules by which people decide upon the category membership of objects in their experience, an ethnographic ecology can proceed to rules for more complex kinds of behavior: killing game, clearing fields, building houses, etc. Determining the requisite knowledge for such behavior shows the

> ethnographer the extent to which ecological considerations, in contrast, say, to sociological ones, enter into a person's decision of what to do. The ethnographer learns, in a rather meaningful and precise sense, what role the environment in fact plays in the cultural behavior of the members of a particular society" (Frake, 1962a:55).

However, despite these initial claims and demonstrations of the relevance of the analysis of belief systems for the analysis of action these examples have not, in general, been followed up.

One partial exception is Mary Black's study of Ojibway world view, which gives an account of cognitive categories set within a broad cultural domain, which while itself not directly concerned with action, has clear implications for motivation and therefore action. Black compared Hallowell's classification of Ojibway ontology and world view with a description analyzed from data she gathered using formal eliciting techniques and analysis. She focussed in particular on the inventory of lexical terms bounded by the term 'living things' and in particular on Hallowell's claim that a 'persons' category existed that was a sub-set of the former category. Black following the lead of her "informant's classifying preferences" (1967:127) found that a ranking classification effectively ordered the domain and that all items in the taxonomic domain appeared rankable. She found that a conception of the distribution of 'power' was used to explain the rankings, and that such a concept was laden with emotive and evaluative connotations for informants. In her conclusion the examination of the domain cover term 'those who are living' she indicated a possible re-definition of the domain as 'those who have power' (Black, 1967: 207).

Black's use of ethnoscientific methodology to disover concepts that are used to organize larger domains that are of broad cultural significance and that are used in many other domains, provides at least a significant possibility of finding linkages between such folk categories and the structure and organization of action, as the wide range and emotive connotations of the categories she studied suggests.

However, despite these suggestive and programmatic leads ethnoecologists have not, in general, followed these up. Instead there has been a resurgence of highly formalized studies of restricted domains, one of the most productive areas being in the ecologically related domains of ethnobotany and ethnozoology. Many folk taxonomies relevant to the scientific domain of ecology have been studied: Conklin, 1962; Frake, 1961, 1962b, 1964a, 1964b; Berlin, Breedlove and Raven, 1966, 1974; J. Diamond, 1966; D. Metzger and G.E. Williams, 1963, 1966; Black, 1967, 1969a, 1977; Bulmer, 1967, 1968b, 1970; Bulmer and Tyler, 1968; Bulmer and Menzies, 1972-73; Berlin and Kay, 1973; Berlin, 1970, 1972, 1973, 1976; Hunn, 1976; Hays, 1976; Gardner, 1976; Dywer, 1976; Brown *et al.*, 1976; and Bouchard and Mailhot, 1973. A review of some of the issues raised by these studies appears in Chapter 3 of the present study.

Despite the extensive cognitive analysis however, there have been virtually no attempts to move from taxonomic analysis of plants, animals and other ecologically relevant domains, to rules for more complex kinds of behavior. Thus, while Berlin has claimed that it is especially in their ecological studies that cognitively oriented anthropologists should find a common ground with those anthropologists who study man "in terms of the influences of the material world" (Berlin, 1970:16), his major study of the Tzeltal plant taxonomy only includes traditional ethnographic descriptive statements on the procurement and use of the plants (Berlin, Breedlove and Raven, 1974). This general concentration of ethnoecologists on folk systematics has generally led the development of ethnoecology away from linkages between belief systems and action.

From the present perspective, it appears that just as with the claim by ecosystems analysts that the analysis of behavior must precede the analysis of belief, so the claim that the analysis of cognition must precede the analysis of action has led not to a linking of the two phenomena for study, but to their separation. And, as in the former case, the development of one phenomenon at the expense of the other appears to be linked to the inadequacies of the theoretical framework adopted, in this case ethnosystematics.

Thus, Vayda and Rappaport have rightly questioned whether detailed studies in ethnosystematics have any necessary link with an ethnoecological study of activities. Vayda and Rappaport criticized Frake's proposals to the extent that they "may be construed to mean that there are adequate a priori grounds for inferring ethnoecology from ethno-systematics" (1968:491). In detail, they say:

> "even if we grant the validity of Frake's method for disclosing the 'rules by which people decide upon the category membership of objects in their experience', we are still a long way from knowing just what the people know about their environment and about procedures for dealing with it. To discover a people's classificatory terms and concepts is to discover what might be designated their 'ethno-systematics' or 'ethno-taxonomy', and this must be distinguished from ethno-ecology... Taxonomy may of course be based on behavioral characteristics, but they need not be... Clearly, then, there are no universally applicable procedures for inferring either ethno-ecology or the actual relations within an ecological system from ethno-systematics" (Vayda and Rappaport, 1968:490-1).

This critique is well taken, and it indicates again the simple relationships that appear to have been assumed to exist between belief and action and between environment and belief. Thus, ethnoscientists have generally treated the study of the cognitive order as if it could be isolated from the study of the behavioral order on the assumption that behavior follows from cognitive structure. The analysis focusses on the relationship of cognition and environment, but it excludes extensive consideration of the relations of belief to behavior and behavior to environment.

This is a particularly limiting assumption because it fails to ask questions of why and how it is that people do act, and how it is that action is related to their experience and their thought. People are motivated to act in situations which are not just cognitively structured but emotively powerful as well and without an analysis of values it is difficult to explain action. In addition, cognitive structures respond to goals formulated in the process of acting, and to the experiences of acting and of its consequences. Thought must therefore be studied in relation to action and not in isolation.

D - The Present study

Both schools of ecological anthropology agree then that the relationship between men and the environments in which they live must be central to their concerns. But, whereas one school studies the relationship between human action and the environment, the other studies the relationship between human thought and the environment. Practitioners of both of the "schools" of ecological anthropology, have demonstrated the significance of their own contributions to the field of ecological anthropology, but neither group has provided a fully adequate model for the analysis of the multi-dimensional interaction of human beings and the environments in which they live.

While the need to include both human action, and the actors' beliefs in analyses in ecological anthropology has been recognized by some proponents of both paradigms discussed here, nevertheless there exists considerable disagreement on how to adequately fulfill this need.

In my view, ecological anthropology has to have a broader and more diverse field of study than practitioners of either of the two major "schools" have assumed, it has to become a field that incorporates, but is not limited to, the subject matter studied by each of the major schools.

This thesis is an attempt to explore the significance of including both action and belief in an ecological analysis of a human population. The aim is to consider the environmental, behavioral and cognitive orders of ecological analysis in order to describe, rather than assume, how the cognitive order is related to the environmental and behavioral orders, and how the behavioral order is related to the cognitive and environmental.

No full model of ecological anthropology is developed as an alternative to existing paradigms. Rather, elements of the existing paradigms are synthesized with elements from other areas of anthropological inquiry in an effort to develop an analysis that is consistent with both the rapidly growing knowledge of the complex and pragmatic consequences of man's functional relationship to the environment in which he lives, and with the growing subtlety of the knowledge of the interpretive and motivational framework that informs human experience and human action.

The relationships between culture and ecosystem and action are the descriptive problem, not the first assumption in the study of human ecology. The starting assumption is that human action is organized on multiple levels, and that human beings act in ways that "make sense" to an observer at different levels of analysis, simultaneously.

Analytically I distinguish three orders of phenomena as definitive of the study of the relationships between men and the environments with which they interact, that is, as definitive of ecological anthropology: environment, behavior and belief. And, if ecological anthropologists need to study three orders, the environmental, the behavioral and the symbolic, then it is necessary to find appropriate means to describe each of the orders, or more particularly to describe the relationships between these orders. In the thesis, I propose that the means to study the environment - action relationship is functional systems analysis, the means to study the belief - environment relationship is ethnoscience and symbolic analysis, and the means to study the belief-action relationship is decision theory.

I propose that the means to study the interaction of these relations is to study them over time. The time scale may vary from events occurring on a single day or several days in sequence, to seasonal or annual events, to a history of relationships covering decades. Whatever the time frame, the aim of the analysis is to describe the interactions of belief with behavior and environment, and of action with environment and belief and to account for their interaction overtime.

To this end the present thesis is divided into separate parts for the initial analyses of beliefs and behavior. The first part includes the present chapter and Chapter 2 which provides a basic introduction to the Waswanipi people and the recent historical events which led up to the conditions under which field research was undertaken.

Part II of the study includes the basic analysis of Waswanipi belief systems. Chapter 3 begins with an extensive review and critique of recent work in ethnosystematics, and provides an alternative formulation of the methods and analyses appropriate for a truly ethnoecological analysis, namely an analysis that shows how beliefs can inform action because beliefs include models for decisions. Chapter 4 outlines the basic categories of 'living things' that comprise the culturally defined world of the Waswanipi. These categories are shown to be related to "real" distinctions in the world, but also to be organized by a set of cultural and experiential criteria. In Chapter 5, the basic symbols and meanings of the Waswanipi world are considered by analyzing the several basic concepts, those of hunting, spirit beings, god, life, and power. The conclusion of this analysis is not a structure of symbols but rather a hypothesis about the Waswanipi's culturally defined goal for living. In Chapter 6, the ethnomodels for action, the recipes for hunting are described and are shown to be consistent with the cultural symbols and "project" described in Chapter 5. Brief resumes and reviews of Part II appear at the end of Chapters 3 and 6.

Part III of this study provides an analysis of the behavior of Waswanipi hunters with respect to both the environment and resources towards which their action is directed, and with respect to the recipes and experiences of consequences of acting that link belief to action and action back to belief. Chapter 7 briefly provides a preview of the chapters and a background analysis of the priority of subsistence production in Waswanipi hunting. Chapter 8 analyzes hunting production in relation to nutritional needs. Chapter 9 analyzes hunting in relation to recipes, labor-time inputs, efficiencies and reliability. Chapter 10 analyzes hunting in relation to the reproductive capacities of the resources. In Chapter 11, belief and action are again brought together in an analysis of the decision models for hunting. Major decisions are shown to be socially located with the men who are "stewards" of the traditionally inherited hunting territories. There I identify the strategies and tactics by which cultural goals and management principles are translated into informed action that effectively regulates resources, human population distributions and subsistence in the context of meaningful action. This interaction is then examined in a longer time depth to reveal its capacity for meaningful innovation and successful management.

The concluding chapter summarizes the findings and relates them back to the issues raised in this chapter.

The literature relevant to aspects of the present study is reviewed at appropriate places in the following chapters. It should be noted however that no full review of ecological anthropology is provided because over the last two decades a series of reviews of ecological anthropology have been published. I have rather limited my reviews to discussions of the material most relevant to the issues raised. For reviews and programmatic statements, see: Steward, 1955, 1968; Helm, 1962; Freilich, 1963; Geertz, 1963; Brookfield, 1964; Sahlins, 1964, 1968, 1976; Netting, 1965, 1972, 1977; Vayda, 1965, 1969a, 1969c, 1976; Stoddard, 1967; Harris, 1968; Vayda and Rappaport, 1968; Rappaport, 1969b, 1972; Damas, 1969; Bennett, 1969, 1976a, 1976b; Berlin, 1970, 1973; Berlin, Breedlove and Raven, 1973; Anderson, 1973; Vayda and McCay, 1975; Bulmer, 1974; Little and Morren, 1976; Hardesty, 1977; and Richerson, 1977.

CHAPTER 2 - THE WASWANIPI PEOPLE AND WASWANIPI ECONOMIC ACTIVITY

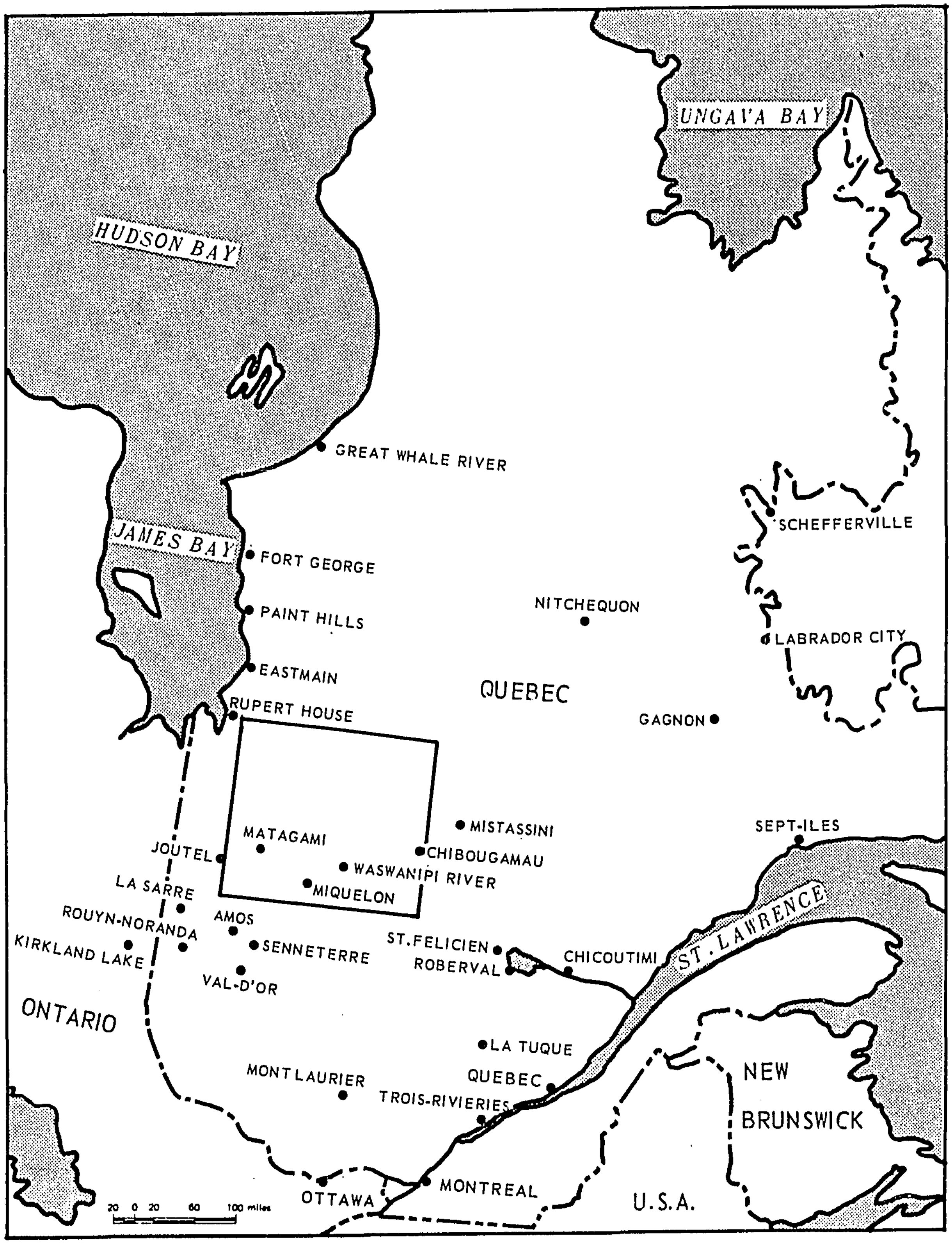
In the period from 1968 to 1970 the Waswanipi were a band of approximately 575 Indian people residing and working in five major settlements and numerous smaller camps in northern-western Quebec, and utilizing an area of some 14,000 square miles for hunting, fishing and trapping. In the summers the largest settlements were located on the outskirts of the town of Matagami, in the small roadside village of Miquelon, and an all-Indian village where the Senneterre-Chibougamau highway crossed the Waswanipi River (Maps 2-1 and 2-2). Two other smaller groups were at the towns of Chapais and Senneterre, where some people lived in individual houses within the towns, and in a settlement on the outskirts of Chapais (Table 2-1).

The region encompassed by these settlements is between 300 and 400 miles north and northwest of Montreal by air, and between 400 and 500 miles from Montreal by road. From the perspective of southern Canada at the time of this research these settlements were the northernmost towns in northwestern Quebec, and the roads and railways linking them were the last major ground transportation links to the north in the western half of the province.

From the perspective of the Waswanipi people these settlements were in the southern portion of the territory which they hunted, fished and trapped. The Waswanipi territory extended from Matagami on the west, south to near Lebel-sur-Quévillon, east past Chapais, and north past Evans Lake and the Broadback River (Map 2-3). The area extended up to 160 miles in a north to south direction and 100 miles in an east to west direction, some 100 miles being to the north of the road and rail network as it existed at that time. In short, the frontier of intensive Canadian resource exploitation had reached the southern portions of the Waswanipi territory.

Prior to about 1955 the Waswanipi all resided in summer at Waswanipi Post, an Indian reserve on an island at the northern end of Lake Waswanipi served by a Hudson's Bay Company fur trade store. When the Hudson's Bay Company store at

Map 2-1 The Location of the Waswanipi Region



MAP 2-2 The Waswanipi Region

Key:

═══════ Main Highway

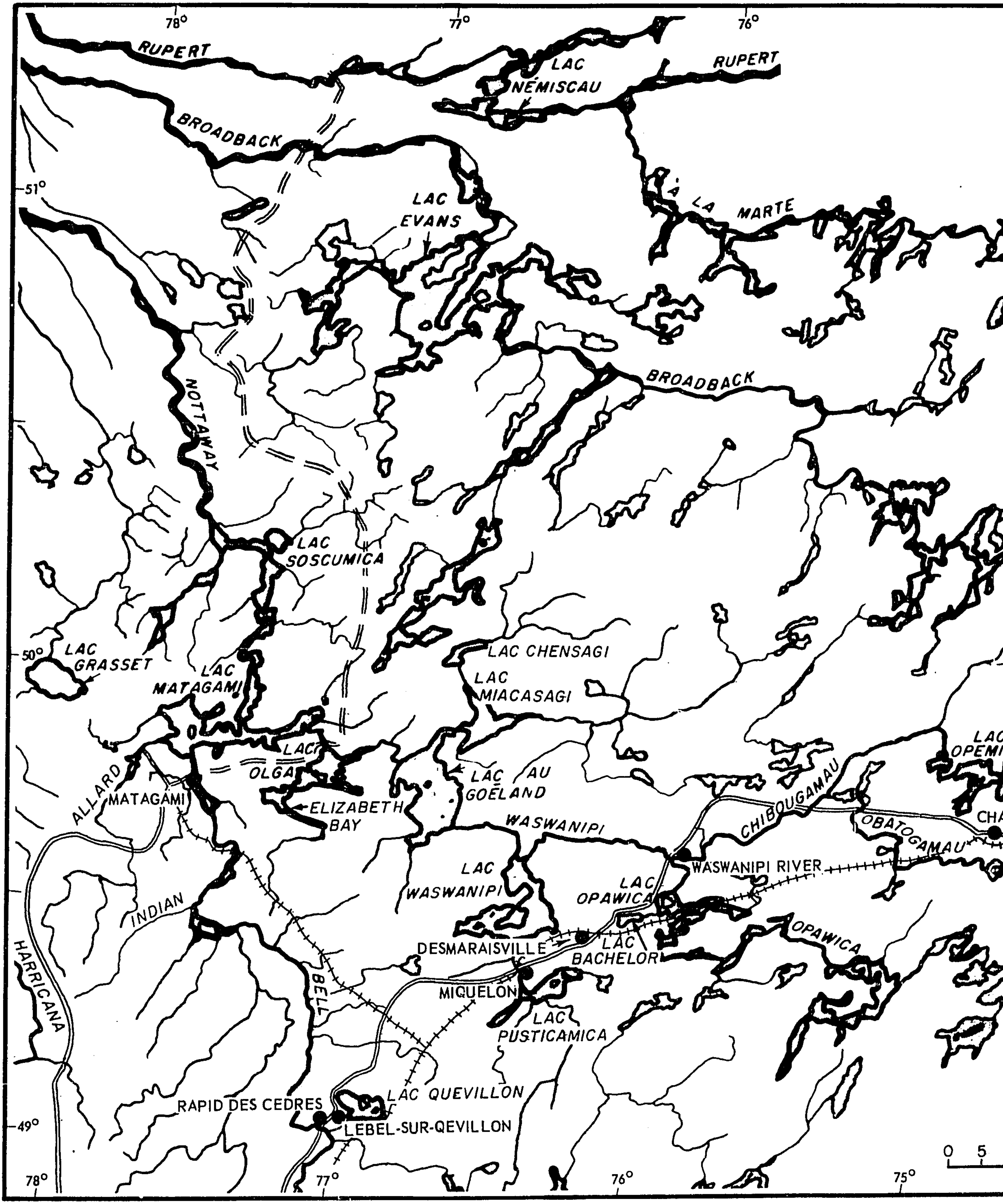
══ ══ ══ Main Highway Constructed After 1970

+-+-+-+-+ Railway Line

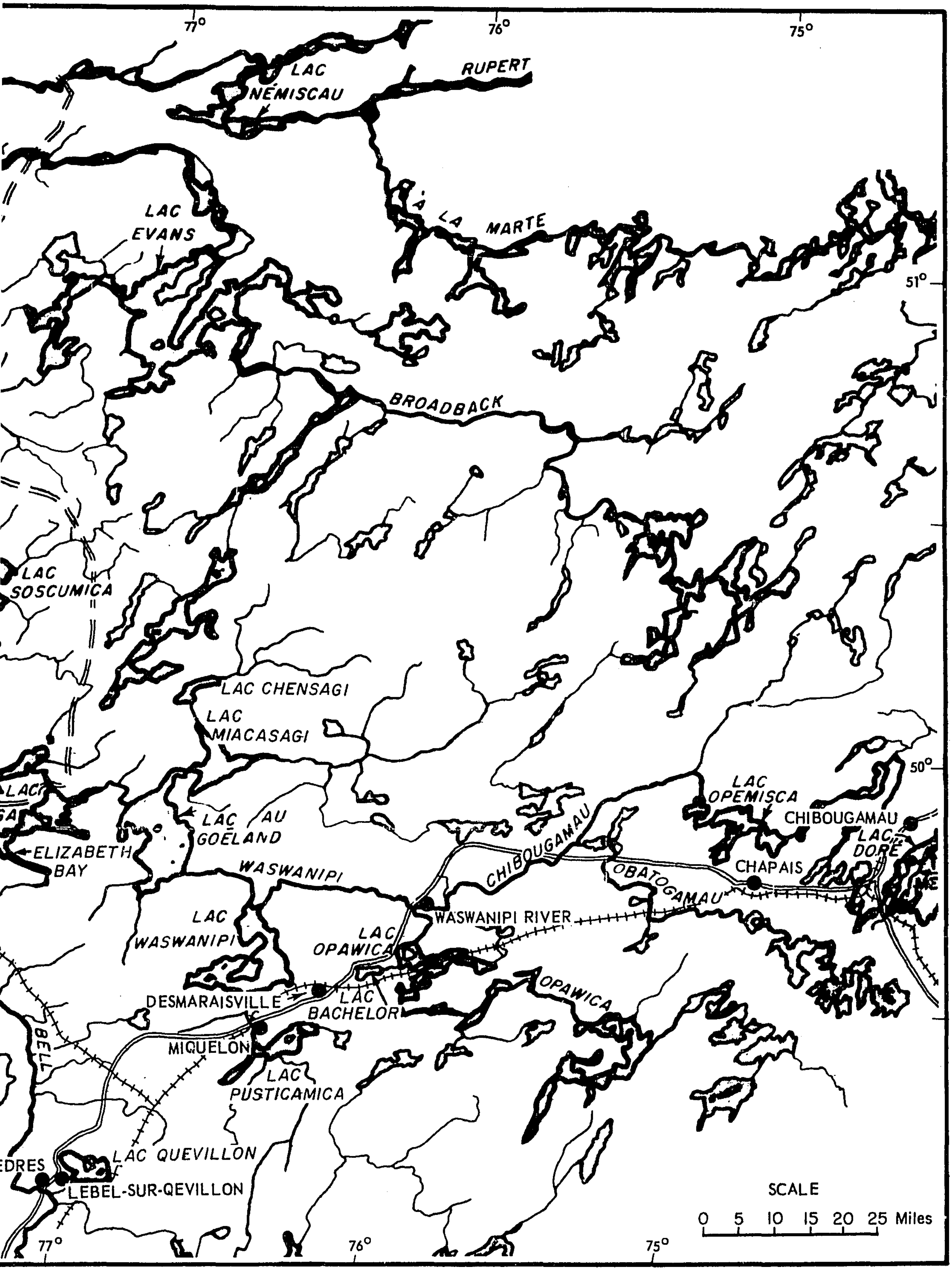
Block Letters = Permanent Settlements

Italics Letters = Main Water Bodies

The Waswanipi Region



The Wàswanipi Region



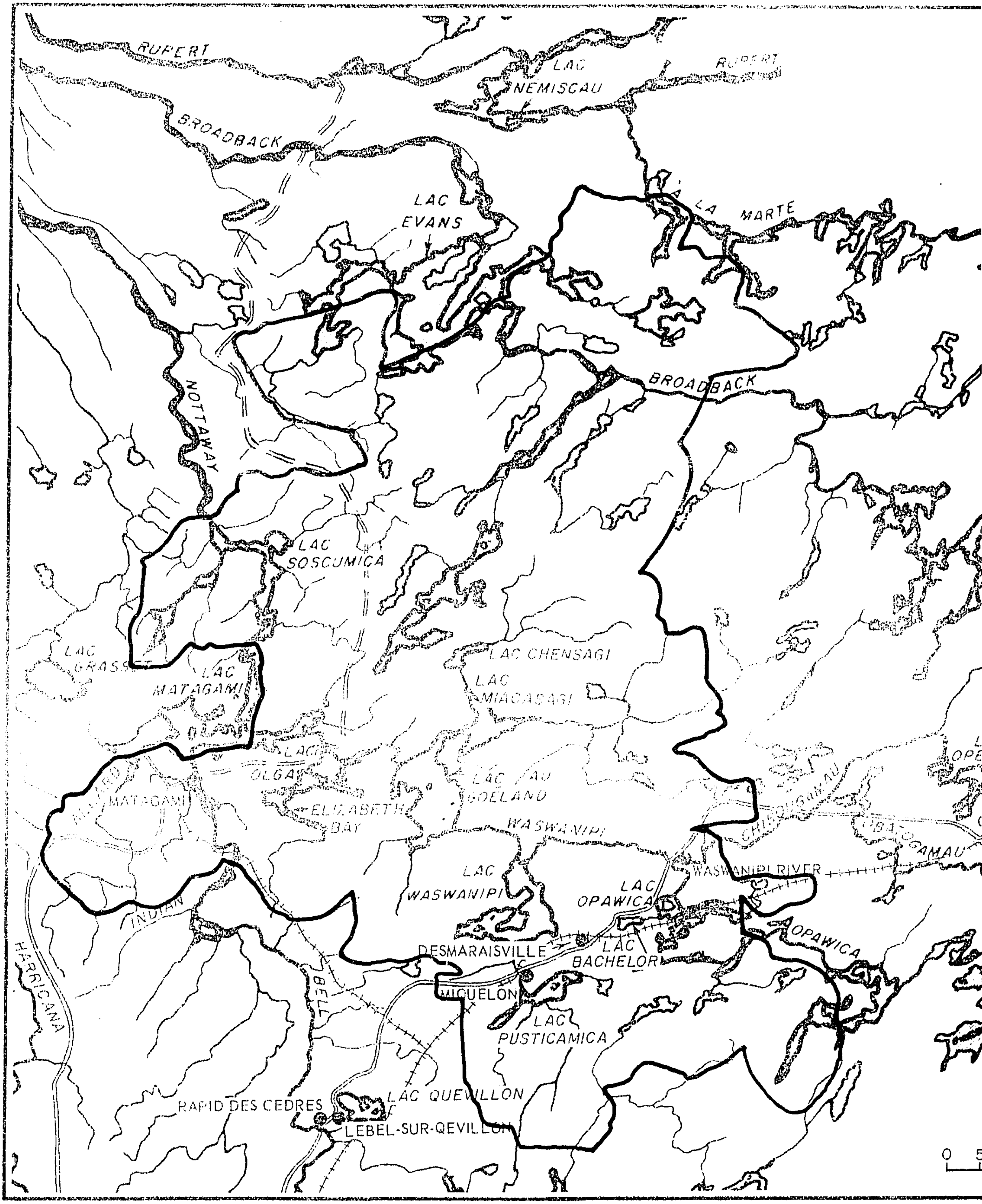
MAP 2-3 The Area Included Within the Hunting Territories of Waswanipi Tallymen Living in Matagami, Miquelon and Waswanipi River, 1969-70

The area indicated is the approximate outer boundary of the hunting territories owned by the population which was studied in the present research. This includes all the Waswanipi people resident in the towns of Matagami, Miquelon and Waswanipi River in 1969-70, including 20 people at Matagami who although closely associated with the Waswanipi band were not official members of the band.

The area indicated on the map therefore differs from the area bounded by the official Waswanipi hunting territories because it: A. includes the areas of several hunting territories along the west side, Bell and Nottaway Rivers area, that are owned by those people living at Matagami who are not Waswanipi band members; B. excludes a continuous series of areas of hunting territories along the eastern boundary that are owned by Waswanipi men living in Chapais and Senneterre.

Almost all hunting activities reported in this study occurred within the area indicated on this map. However, some use was also made of areas below the southern limit of the hunting territories indicated here. These activities are included in the analysis in the text except on some occasions when the geographical distributions of the activities are being analyzed; and, in the latter case specific indications are given of the areas included in the analysis.

The Area Included Within the Hunting Territories of Waswanipi Tallymen Living in Matagami, Miquelon and Waswanipi River, 1969-1970



Area Included Within the Hunting Territories of Waswanipi Tallymen Living in Matagami, Miquelon and Waswanipi River, 1969-1970

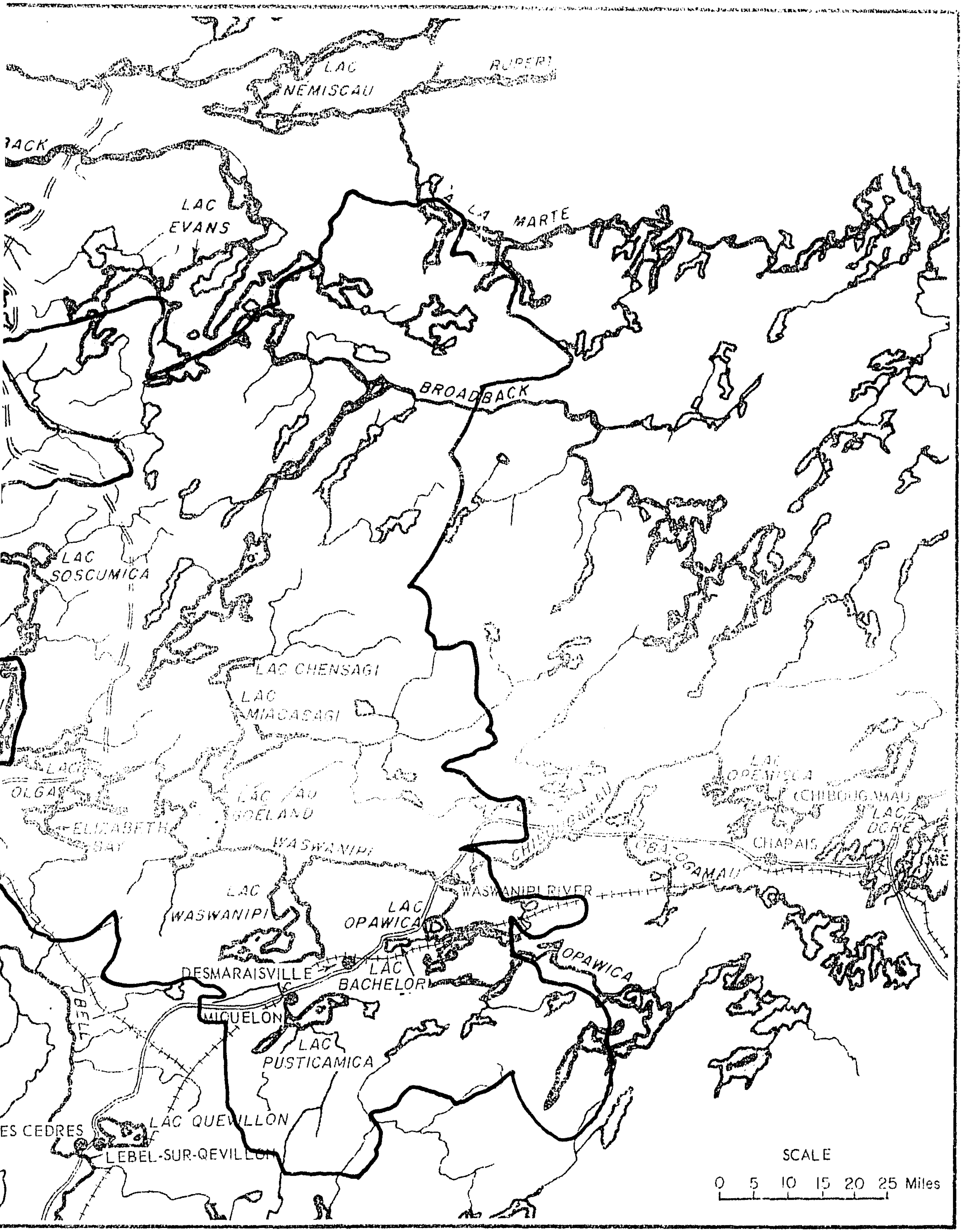


Table 2-1 Distribution of the Waswanipi Population Among Settlements, Summer, 1969

Settlement	Population	Percentage of Total Population
Matagami Village	170[1]	29
Miquelon	126	21
Waswanipi River Village	128	22
Chapais	93	16
Senneterre	55	9
Other or Unaccounted	22	4
Total	594[1]	101

Footnote:

1. Includes 22 people officially registered as members of the Abitibi-Dominion Band, see text.

Waswanipi Post closed in 1965 the last of the Waswanipi left the reserve for the settlements near the towns and roads.

The transformations that occurred in the Waswanipi region during the period between 1950 and 1970 had significant impacts on the geographical distribution of the Waswanipi people, the social conditions of their lives, and on their economic activities, impacts to which the Waswanipi are still in the process of developing satisfying responses in 1968 to 1970.

To a real extent the Waswanipi today, in 1978, have embarked on fulfilling the vision they developed of their future in the 1960's, but many of these developments, particularly those requiring political reorganization, are beyond the time focus and scope of the present study. This study is concerned with the reorganization of economic activities which occurred throughout the 1960's and which has continued in the 1970's.

From the perspective of this study which is based on fieldwork undertaken between 1968 and 1970, it is critical that the reader be familiar with the outline of Waswanipi history, and with the specific events of the years immediately preceeding fieldwork so that the situation described and analyzed may be seen in perspective. The analysis of the Waswanipi environment and of Waswanipi beliefs and activities during 1968 and 1970 is presented in the main sections of this study.

The present chapter is intended to serve as an orientation, a "setting", and also a warning against overly simple or deterministic assumptions about the ultimate end point of recent historical changes, the nature of the processes of change, and the forces ultimately responsible for social and economic change.

Culturally, the Waswanipi refer to themselves in English as "Waswanipi" or as "Cree Indians", and consider that they are closely related socially and culturally with six other bands of Indian people living in northern Quebec, and known as the Eastern Cree or James Bay Cree.[1]

The Waswanipi speak a "y" dialect of Montagnais-Naskapi, an Algonquian language spoken by most of the Indian peoples of northern Quebec, and a dialect that is also spoken by the other bands of James Bay Cree (Michelson, 1913; 1935; 1939; Cooper, 1928a; and Ellis, 1973). The Cree who occupy most of the James Bay drainage basin of Quebec, and the soutern part of the Hudson Bay drainage basin, distinguish themselves culturally and linguistically from the Montagnais people who occupy most of the St.Lawrence drainage basin east from Lake St.John, and also from the Naskapi people who occupy part of the Ungava Bay drainage basin. The Montagnais and Naskapi peoples speak "l" or "n" dialects of Montagnais-Naskapi. There were in 1970, approximately 5,500 James Bay Cree, 5,900 Montagnais, and 350 Naskapi in Quebec (Siggner and Brulotte, 1975).

At the time fieldwork began, at the end of 1968, there were 572 registered members of the Waswanipi band. The population was predominantly a young one, the median age being 14.9 years with 52 percent being under 16 years of age (Tables 2-2, 2-3). The old people on the other hand were long lived and the bulge in the population occurred among the 14 year old and younger cohorts (Table 2-2). The sex ratio was 102. The annual growth rate of the population varied considerably from year to year, because of the small size of the group, and the five year average for 1965 to 1970 was 4.9 percent per year. It appears as if the rate was somewhat lower after 1970 (Snigger and Brulotte, 1975).

The Waswanipi people have been a distinctive group for at least 150 years, since the late 18th century, that is since the probable date of establishment of the first fur trading post in the territory they occupy. Prior to the establishment of a fur trading post at Waswanipi the fur trade had been established on the St.Lawrence river for over two centuries, and on James Bay at Rupert's House for over a century. The ancestors of the Waswanipi must

Table 2-2 Age and Sex Structure of the Waswanipi Band Population, December, 1968[1]

Age	Female	Male	Total
0-4	57	65	122
5-9	39	54	93
10-14	39	34	73
15-19	22	20	42
20-24	20	16	36
25-29	17	16	33
30-34	20	18	38
35-39	16	14	30
40-44	13	10	23
45-49	8	11	19
50-54	7	7	14
55-59	6	6	12
60-64	6	7	13
65-69	3	6	9
70-74	2	3	5
75-79	5	1	6
80-84	2	0	2
85-89	1	1	2
Total	283	289	572

Footnote:

1. Source: Canada, Department of Indian Affairs and Northern Development.

Table 2-3 Age and Sex Distribution of the Waswanipi Band by Groups,[1] December, 1968

Age Group (Years)	Male		Female		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Standard Grouping:						
under 16	158	55	138	49	296	52
16 to 65	120	42	132	47	252	44
over 65	11	4	13	5	24	4
	289	100	283	100	572	100
Educational Grouping:[2]						
under 20	173	60	157	55	330	58
20 to 35	50	17	57	20	107	19
over 35	66	23	69	24	135	24
	289	100	283	100	572	100

Footnotes:

1. Source: Canada, Department of Indian Affairs and Northern Development.
2. Age classification based on the first Waswanipi going to full-time schools in 1932-35 and the first mass education for Waswanipi children in 1949-54. (See Salisbury, Filion, Rawji and Stewart, 1972:22-23; and this text.)

have been involved in this trade in the first half of the seventeenth century. By 1603 it was reported that the Indians trading at Tadoussac, on the St.Lawrence River, and then travelling to exchange goods with other Indians at the headwaters of the Saguenay River, in the Lac St.Jean region, were already trading with Indians who ranged as far as Hudson's Bay (Trigger, 1962:248). There are records of Iroquois raids and of Algonquin and Huron parties using what are now the Bell-Nottaway and Waswanipi river systems (Voorhis, 1930:7). The Algonquins used the upper St.Maurice, Bell and Nottaway Rivers to reach James Bay to trade. The Hurons used the area to pass around the Iroquois controlled lower Ottawa Valley on their way to trade at Quebec (Trigger, 1969a). The Iroquois came to the region to disrupt the fur trade by-passing their area of control. The Waswanipi region, however, must have been regularly used for only a matter of several decades, because there were rapid changes in economic and political alignments during the early fur trade period, and because there were alternative routes, more suited to the transport of freight (Morse, 1969:71) which could be used once peace was established in the St.Lawrence drainage and James Bay.

Stories of the Iroquois raids persist in local traditions and in some place names associated with the events of that period. But, while the Waswanipi have an oral record of this period, no written record of the Waswanipi or their predecessors seems to have survived. Many groups are reported to have variously traded at Rupert House northwest of the Waswanipi region, at Mistassini to the northeast, at posts around Lake St.Jean to the east, and at Abitibi Lake to the southwest; but none of the groups named in the Jesuit Relations (Thwaites, 1896-1901) or in the Hudson's Bay records from the earlier dates (Morantz, pers. comm.) is identifiable as the Waswanipi. The Waswanipi are presumably the descendants of the peoples who have inhabited this region since after the last glaciation, but their present organization and identification may date to the establishment of permanent fur trading posts in the region.

The name "Waswanipi" means 'light on the water'[2] and refers to the practice of fishing by torch-light, which was formerly done at several locations in the region, including at one location near Waswanipi Post. Near the post there is a small rapid where sturgeon could be attracted by torch-light and then speared. The name itself, therefore, probably came to refer to the people only after the Northwest Company, and then the Hudson's Bay Company, fur trade posts were established at the north end of Lake Waswanipi and a number of hunters and their dependents became regular users of the posts with summer camps nearby. Waswanipi traditions indicate that the community was made up of people coming together from the north and the south of Waswanipi Lake, and it is likely that the post did have the effect of amalgamating several distinctive small groups into a single community.

The exact date of the establishment of the Northwest Company post is unclear, but it appears that it was in operation intermittently after 1793, and it was definitely established by 1799 (see post histories in Davies, 1963). The HBC had established a post at Gull Lake in 1820 and later moved to Waswanipi Lake after 1821 when the Northwest Company merged with the Hudson's Bay Company. There was a HBC post continually in operation on this lake from its founding until 1965, and during this entire period there were regular groups of trappers associated with the post, the core of Waswanipi band.

The Waswanipi Hudson's Bay Company post was one of the most productive and valuable fur trade posts in northern Quebec (O'Sullivan, 1901:50), and throughout the 19th and early 20th centuries various sub-posts and depots were operated in the Waswanipi region. As a result the actual composition of the band, and the limits of territories used by the hunters associated with the band have probably varied. Nevertheless, the record of a distinctive band and occupation of the region are continuous for over 150 years.

The region itself, however, was very little known to outsiders other than the fur-traders up to the beginning of the twentieth century. On the early maps of eastern Canada, up to the 19th century, the Waswanipi region barely exists. These maps generally show the upper St.Maurice and Ottawa River drainage systems as being immediately south of Rupert River, leaving no place for Bell-Waswanipi River systems. The mouth of the Nottaway River at Rupert Bay was known, but not its sources. This is probably attributable to the fact that after the early years of the fur trade wars the Waswanipi region was off the two major overland communications routes between the St.Lawrence and James Bay. One route extended from Rupert House up the Rupert River to Lake Mistassini and over the height of land to Lake St.John, and thence to Quebec. The Rupert River has an exceptionally high and steady flow during the summer because Lake Mistassini, at its head, acts as a large reservoir. The other route extended from Moose Factory up the Moose and/or Abitibi Rivers to Lake Abitibi and thence to the Ottawa by way of Lake Timiskaming or Grand Lake Victoria.

The secondary route to and through the Waswanipi region was up the Ottawa or St.Maurice Rivers, across the low height of land and down the Bell River, Lakes Matagami and Waswanipi and thence to the Nottaway or Rupert Rivers. It was used in the seventeenth century mainly by native peoples, and was used only occasionally during the nineteenth century. Roman Catholic missionaries who were visiting the upper St.Maurice region would continue on to Waswanipi and sometimes beyond, via this route.

The first visit by a missionary was in 1848. Some three or four decades later Anglican Missionaries started to visit Waswanipi coming up from Rupert's House to Nemiscau and thence south along the canoe routes that the Hudson's Bay Company used to supply and communicate with Waswanipi. Because the supply canoe brigades from Waswanipi would go each summer to Rupert House, the Waswanipi also came in contact with Anglican missionaries regularly after 1875 because a series of Anglican missionaries were intermittently in residence at Rupert House after that date (Petersen, 1974:18). Waswanipi was always a difficult post for the Hudson's Bay Company to supply from James Bay being an inland post near the southern edge of the James Bay drainage. The rivers were broken by many rapids and portages, and the supply route past Nemiscau was away from the main Rupert River route which led successively from Nemiscau, to Mistassini, Neoskweskau and Nichicun.

The heights of land in this region are not difficult to traverse with light load, but the many portages make waterborne transportation of heavy goods difficult and slow. Mobility of natives was not thereby seriously affected, at least up until the last two decades, but access to the region by fur traders and by clergymen, government officers and other non-Natives who follow the fur trade was limited. The region therefore has a long history of contact with European trade but a short history of intensive contact and settlement by non-Natives, especially considering it is only 500 miles from Montreal.

By the time the region was first visited by government geologists, extensive regions to the north had been surveyed. Robert Bell who made the first extensive mapping in 1895 and 1896 reported that the region was the most southerly unexplored district in Canada at the time (1897b:16). Henry O'Sullivan who had preceeded Bell by a year on a short survey, and who returned four years later to extend Bell's work, commented on the fact "that such an extent of country should remain unexplored and unknown at the end of this 19th century appears hardly credible..." (1895:113).

The first major change in the accessibility of the Waswanipi region was brought about by the construction of the Canadian National Transcontinental Railway between 1912 and 1915 from LaTuque to Oskelaneo and Senneterre and the Canadian West. Prior to construction, considerable thought had been given to building the transcontinental to the foot of James Bay, where it was hoped a port could be developed. One of the most likely routes for such a line would have brought the railway right across the Waswanipi region. Indeed it was to report on the potential for such a rail line that O'Sullivan made his surveys of the region. A more southerly route for the Transcontinental line, through Senneterre, was finally chosen approximately 100 miles south of Waswanipi Post, although the idea of a railway to James Bay was not immediately abandoned. In 1914, two survey teams worked to lay out a survey for a spur line north from the Transcontinental up to James Bay. One team worked towards the Bay, the other from the Bay south, intending to meet.

The team from the Bay had a series of accidents, several lives were lost, and the team never carried out its assignment. The plan for a railway to James Bay apparently faltered with this effort, and the major effect of the transcontinental line was to give easy access to the doorstep of the Waswanipi region.[3]

The railway through Senneterre led to a rapid settlement of that region from Oskelaneo west along the rail line. At various points along the railway line extensive programs of land clearing and colonization for farming were begun with organized support from the Government of Quebec and Catholic action movements. Mining exploration and development was accelerated, reservoirs were constructed for hydro-electric production, forestry industries were established, and increased numbers of non-Native trappers entered those districts along the rail line that were not too settled.

Waswanipi, however, remained isolated from the agricultural developments, and for the time being from the major industrial developments, although the railway line did bring important changes to Waswanipi.

With the railway the supply route for the Hudson's Bay Company post was shifted, first partially and then completely, from the Rupert-Nemiscau-Waswanipi route to the Bell River-Lake Matagami-Waswanipi route that was significantly shorter and easier. The railway also brought new access for missionaries and a young Anglican missionary was able to visit the post for long summer residences starting in 1915. In 1919 he became a permanent missionary in residence, using Waswanipi as a base from which to minister to the inland Cree communities, and giving summer school instruction to the people. The Waswanipi who had been Christianized earlier and who were nominally Roman Catholic, became Anglican, with the exception of two families.

The presence of the railway also had an almost immediate impact on the intensity of non-Native use of the resources of the region. In 1915, a commercial fishing operation was begun on Matagami, Gull and Olga Lakes by non-Indians who transported the catch to the railway at Senneterre up the Bell River. Substantial inboard motor boats were used for the hauling on the lakes and river and carts on small gauge rails were installed at the various portages. Only one or two Indian people were employed. This fishery was apparently in operation until the 1930's when it was abandoned during the depression.

It is not known exactly which fishery resources were used by the commercial fishery, but sturgeon was the major harvest according to Waswanipi informants who remember it. The commercial use of so remote a resource, with heavy capital investment needed for transportation to the railway, was probably possible only for a valuable resource such as sturgeon. Sturgeon fishing in northern Quebec appears to have been a response to the rapid decline of sturgeon populations in southern Canada beginning around the turn of the century. Prior to 1860, sturgeon was only an accidental catch in southern Canadian commercial fisheries and it was burned or used as animal feed or fertilizer. After 1860, a recognition developed of the value of the flesh, fresh or smoked, and of the value of the eggs for caviar, of the swim bladder for isinglass, and even the skins for leather (Scott and Crossman, 1973:88). The result was intense harvesting and, between 1885 and 1895, a depletion of the sturgeon populations in some of the Great Lakes, a depletion from which they have never recovered. Records of the Canadian commercial catch indicate that the low points immediately prior to and following the First World War were reached in 1913 to 1916 and 1920 to 1923 (Minville, et al., 1946:503).

The railway also provided access for some non-Indian trappers and mineral prospectors. During the 1920's and 1930's considerable mineral exploration was undertaken in the southern portion of the Waswanipi region from Matagami to Chibougamau. Exploratory drillings were made near Matagami during the 1920's (Lang, 1933) and some preliminary mining development was done at Chibougamau (Wilson, 1952), where the mineral resource potential had been known since the turn of the century. One mine was apparently put into production to the southwest of Lake Waswanipi during the mid-1930's. The ore was hauled out on sleds over a bush road toward Senneterre, the railhead some 100 miles away. A 150 mile long winter road from St.Felicien to Chibougamau was built in the 1920's, but the depression and the war slowed development (Wilson, 1952:4). After the war, a mine and a sawmill were operated on Bachelor Lake starting about 1949, serviced by the winter road towards Senneterre. Some Waswanipi worked in summer for this sawmill.

Wage employment prior to 1950 was limited in the Waswanipi region, one or two men are reported to have worked summers for the commercial fisheries in the 1920's or 1930's, and occasional work with prospectors was available during the same period and during the 1940's.

At the turn of the century all available Waswanipi men had been regularly engaged during the summer as canoe-men in the "brigade" of canoes that travelled to Rupert House, and later to Senneterre, for the Hudson's Bay Company, taking out the annual fur purchases, and returning with the annual supply of trade goods. This activity was interrupted during the 1920's and terminated around 1940 when transportation by airplane came into use (LaRusic: 1968). After that time the only regular employment available was for one man who worked regularly for the Hudson's Bay Company. However, even in this instance, the man was not steadily employed, and he hunted and trapped the territory immediately around the Hudson's Bay Post, combining his work with a fairly active trapping career.

During the first half of this century all the Waswanipi were full-time hunters and trappers who would harvest the wildlife resources of the region to provide the food to sustain themselves and their families and to provide products for sale. Their products for market, primarily furs, were sold through the trade post, to obtain credit to buy the equipment they used for hunting and trapping, the clothing they needed, and to buy food to supplement their food production.

The hunting year began in the fall when hunters would prepare to leave the Post for their isolated bush camps. They would receive a credit at the Hudson's Bay Company store based on the manager's assessment of their ability to harvest furs sufficient to repay the advance. With the credit the hunter and his family would outfit themselves, first with hunting and trapping equipment and supplies, then with food and clothing and some "luxury" goods such as tobacco. The food never amounted to a large portion of the total diet, but it was increasingly important as a hedge against an unsuccessful subsistence harvest and a shortage of wild foods.

Most families would leave during September to remain in the bush until May, except for a visit to the Post at Christmas to sell furs, which was traditional among the Waswanipi since at least the beginning of this century.

Travel was by canoe, in the early years powered by paddlers, and in later years by outboard motors. In either case travel involved a slow process of unloading the canoes and portaging at impassable rapids and between water bodies. It could take several weeks for some families to reach more distant areas. During fall, winter and spring, the families would live in lodges built in bush with locally available materials, and in tents of canvas at camps used for shorter durations.

Families did not generally live alone, but in hunting groups of two or three families under the leadership of a single man. His leadership was exercised by consensus rather than coercion. The hunting group would go to specific hunting territories which were under the stewardship of one man.[4] Hunting territories were handed down from generation to generation, and the steward of the hunting territory was often the leader of the hunting group using the ground. In any case, the steward would have given permission for its use.

The Waswanipi territory was entirely divided up into hunting territories which were relatively enduring units of stewardship. Nevertheless, neither the composition of the hunting groups nor the territory used by a particular hunter were necessarily the same from one year to the next. The steward would have continuing responsibilities for a territory, but the territories themselves could be used one year but not another, the number of people using the territory could be varied, and the definition of the territory itself could be altered over time, as I will show in a later chapter.

In fall, emphasis was placed on harvesting fish, waterfowl and small game, to build up a store for the more difficult and uncertain winter period. After freeze-up trapping would be more important as well as the hunting of big game which would begin during the mid-winter. Some fishing would be done during the winter under the ice with hooks or nets. The men of the families living together usually worked together in pairs. Harvests of meat and pelts were individually "owned", and people readily shared their subsistence produce. This was generally not the case with the furs for trade. The fall furs were brought into the Post at Christmas time, but hunting continued all winter and trapping in the spring. With break up of the ice cover there would be an intensive fishery, muskrat hunts, and waterfowl hunts. Most families would return to the Post in May to trade the furs caught after the New Year and pay off their debts.

When the canoe brigades were in operation the men would be away for one or more months during the summer, and women and children would stay in the area around the Post, living off fish, small game and rations issued by the Hudson's Bay Company store as part of the remuneration of the men on the brigade. With the exception of the brigades, summer was generally a time of relaxation and socializing, with some fishing and some hunting for waterfowl and big game in the areas near the Post.

This was the typical cycle of activities at Waswanipi, as at many other fur trade posts in the Canadian North. At Waswanipi, and among the James Bay Cree in general, the pattern lasted with few modifications longer than it did in most other regions of Canada, and even today many elements of this annual cycle are still practiced at Waswanipi. Nevertheless, the 1940's were a period of increasing non-Native presence in the Waswanipi region, which brought new economic and especially administrative activities.

Government services were supplied to the Waswanipi starting about 1938 to 1940. Official lists of band members were made during the first visits to Waswanipi Post of an Indian Affairs Branch bureaucrat, the Abitibi District Indian Agent. During his first visits he also provided systematic social welfare for the first time. The initial relief was war-surplus clothing and blankets. Later, in the period from 1946 to 1949, a standard food ration was established for Native peoples living off the land and the fur trade, as part of the family allowance program established in 1945 for all Canadians. Welfare became an important alternative source of cash incomes, in addition to sales of fur pelts, and it was critical at a time when fur prices were declining and the fur brigades had ceased to operate.

Beaver, a main source of food and of cash incomes, was trapped out during the 1930's, for reasons which we will discuss later in this study. As a result, the Governments of Quebec and Canada established a beaver reserve system, registering the traditional hunting territories as traplines, and the stewards as tallymen. Beaver trapping was forbidden for a number of years, and the tallymen had to report each year the number of active beaver lodges on their trapline. After it was decided that the beaver population had grown to sufficient levels to sustain a regular harvest, then trapping of beaver was permitted under a system of annual quotas. The annual quota came to be based on the number of active lodges the tallyman annually reported were on his trapline. This project was the first major government activity in the territory and it will be discussed in more detail later in this study.

With government presence, formal education was also intensified. The first resident Anglican missionary at Waswanipi had run a summer school starting before 1920 and lasting about 10 years. Then starting in the mid-1930's, the Anglican Church arranged for a limited number of school age children to leave Waswanipi and go to Church-run Indian residential schools; about seven children went in the first five years. Students stayed away at schools for several years at a time before they would return to Waswanipi. In the 1940's, the Indian Affairs Branch took over selection for and administration of education. Children were still sent to residential schools outside the Waswanipi region after 1950 but in slowly increasing numbers, and in addition a summer school was run at the Post. Those going to residential schools were sent mainly to Brantford, Chapleau and Moose Factory, Ontario for grades up to the 6th, and for grades 6 to 12 mainly to Sault Ste.Marie, Ontario. Above grade 9, the students at Sault Ste.Marie went to the regular school and boarded with local town families. The schools were very far away, the costs were high, and the number of children attending these schools was limited. In 1963, a residential school for the children of the northwestern Quebec Indian bands was opened in LaTuque, Quebec and enrollment was substantially increased over the next two or three years such that all school age children that parents were willing to send to school, or have taken, could be accommodated. Only since the opening of this school have the majority of the children attended school on a full-time basis. During 1968 to 1970, roughly three-quarters of school age children would in fact be attending school in a given year.

An indication of the extent of schooling available up to the mid-1940's, and of the impact it had on Waswanipi individuals is indicated in the language skills of the Waswanipi band members. In 1965, 125 Waswanipi adults were interviewed by the McGill-Cree Project. Asked to rate their ability to speak English, 9 adults said they could speak it fluently, 40 could speak fairly well, 56 could speak a few words, and 17 said they could speak none (LaRusic, 1968:Table IV, page 33). Of those who spoke English fluently, none were over 50 years of age, i.e., born before 1915, and most were less than 34 years old, i.e., born after 1930 (McGill-Cree Culture Change Questionnaire Marginals). English language skills were therefore closely related to the introduction of summer schools between 1915 and 1920 and to the beginning of formal schooling in the 1930's.[5]

Regular medical services provided to the Waswanipi band were also intensified in the 1940's, and a summer nursing station was established during the same decade.

The way of life established in the early decades of this century, which began to be modified in the 1940's, was significantly altered in the following decades, initially by the accelerated expansion of the railway and road network north from the Senneterre region in the 1950's and early 1960's. The expansion was made to facilitate the commercial utilization of the mineral resources of the southern portions of the Waswanipi region. The town of Chibougamau was given a charter in 1952, Chapais in 1954, Matagami in 1964, each based on one or more substantial underground mines. In addition smaller mines were operated at Desmaraisville. Around the three main mining areas, towns of several thousand non-Native workers and their families were rapidly established and have remained. These developments had an impact on the immediately surrounding lands and wildlife, but the total area and the total amount of wildlife affected were a very small part of the area and resources important to the Waswanipi.

Nevertheless, the road and rail network needed to open mining operations in the territory had a considerable impact on the Waswanipi. The decade of the 1950's was one in which extensive summer work was periodically available for Waswanipi men, first to help survey and then to provide labor for the construction of roads or railways. The road from St.Felicien to Chibougamau was upgraded to an all-weather road between 1945 and 1949. An all-season road north from Senneterre to Chapais and Chibougamau was constructed from 1950 to about 1959, and upgraded throughout the 1960's. A railway line was completed from north of Senneterre to Chibougamau by 1957. A road from Amos and spur railway line from north of Quévillon were built to Matagami in the early 1960's and completed by 1963.

The new access provided by the road, and especially the railway network, not only supported mineral resource development; it made possible a more extensive use of the forest resources of the region. Small sawmill operations had operated since 1949, and now new operations opened at several locations along the roads, moving every few years as new opportunities developed or as equipment or funds ran out. By 1970, these small operations were in the process of being replaced by approximately five larger scale and more stable sawmills, each requiring a significant forest concession for its operations.

In the 1960's, however, the main impact on the forests was the result of the construction of a large paper pulp mill by Domtar at Quévillon Lake. The construction of the mill from 1965 to 1967 implied an assured forestry resource. The entire area south of 50°N was allotted in forestry concessions, mainly to Domtar, but also to two other pulp and paper companies and, increasingly, to some of the larger and more stable sawmill operations. The Domtar pulp mill was located in the southern sector of its concessions at the new company town of Lebel-sur-Quévillon. About 70 percent of Domtar's forestry concessions were within the Waswanipi territory. By 1968 to 1970, the total area of land affected by forest cutting within the Waswanipi hunting territories was still less than 100 square miles, but by the late 1970's the impact of forest cutting on the land and wildlife of the Waswanipi region would become a serious and widespread problem for the Waswanipi hunters.

For several years the supply for the mill was provided by a number of small pulp-cutting contractors who hired men to cut trees with chainsaws, providing significant employment opportunities for Waswanipi and Mistassini men. These operations, however, were replaced after a few years by highly automated, capital intensive, heavy machinery and cutting practices, and jobs related to pulp-wood cutting were in decline by 1968 to 1970.

These changes in settlement, transportation and resource use had important consequences for the Waswanipi leading to changes in the settlement patterns and economic activities of the Indian community. In 1961, the resident non-Native population of the region was over 7,000 and it continued to rise, reaching over 20,000 by 1971 (Table 2-4). Despite the fact that most Waswanipi undoubtedly wanted to maintain the basic fabric of their community and the broad features of their economic activities, as they existed in the 1950's, this proved impossible without a significant reorganization given the changes that were occurring in the region.

When the roads and railway were built, the Hudson's Bay Company had looked upon them as a boon to the trade at Waswanipi Post. The Moccasin Telegraph, the Hudson's Bay Company house organ for the northern trade, reported in December 1953 the post Manager at Waswanipi was checking the condition of the highway from Waswanipi Lake to Senneterre as it was hoped to move freight to the lake along the road the following summer (13(3):20). The next summer, the Moccasin Telegraph reported that:

> "Waswanipi has always been an inaccessible post to which it was difficult and expensive to deliver freight. In the not too distant future we may have the choice of having our freight delivered either by truck or railroad to within a few miles of the post" (14(2):13).

In 1957, winter freighting of supplies from the road to Waswanipi Post was begun by snowmobile (Moccasin Telegraph 16(2):20 and 19(1):25), and a new store was built at Waswanipi Post by the Hudson's Bay Company in the summer of 1959 (Moccasin Telegraph, 19(2):30) in anticipation of the improved trade.

During the same period the Hudson's Bay Company opened merchandising department stores, but without trading post services, in the towns, at Chibougamau in 1955, Chapais in 1956 and Matagami in 1963 (Moccasin Telegraph, 15(2):15 and 23(3):20), as well as rebuilding its store at Senneterre. The expected stability of the Hudson's Bay Company store at Waswanipi Post was in fact undermined by these and subsequent developments.

What happened was that during the latter part of the 1950's and especially in the early 1960's an increasing number of Waswanipi began to use the sites

Table 2-4 Increases in the Non-Native Populations of the Waswanipi Region, 1961 to 1971

Settlement	Population		
	1961[1]	1966[1]	1971[2]
Chibougamau	4,765	8,902	9,701
Matagami	2	2,244	4,000
Lebel-Sur-Quévillon	0	392	3,600
Chapais	2,363	2,459	2,914
Unincorporated (including Miquelon, Desmaraisville, Waswanipi River)	100	300	500
Total	7,230	14,297	20,715

Footnotes:

1. Source: 1961 and 1966 figures are from Census of Canada, quoted in Salisbury, Filion, Rawji and Stewart, 1972:Table 2, p.26.
2. Source: SDBJ-SEBJ, 1974:Table 1, page 24 except that for unincorporated settlements which is from Salisbury, et al. (Footnote 1).

of the new towns and settlements in the region as summer residences, and also to an increasing extent as all-year residences.

At first, the Waswanipi moved to the towns in order to take advantage of the cheaper prices for food and general supplies and in order to seek employment. The price difference with Hudson's Bay Company Waswanipi store was a function of the fact that the store was located on Waswanipi Post at the north end of Lake Waswanipi. Although the road and railway cut costs of delivering goods to Waswanipi Post, the store at the Post still had to transport goods some 15 miles across Waswanipi Lake by snowmobile or canoe, a cost not incurred by stores directly on the road and rail system. The move of residence from Waswanipi Post to the various new settlements along the roads and railway lines was also encouraged in the early 1960's by Indian Affairs personnel in order that wage incomes available at these sites reduce dependence on government welfare. The setting up of a commercial fishery for the Indians in 1958 appears to have been part of this project.

It is clear that at that time the majority of Waswanipi men were actively interested in employment that was compatible with their subsistence activities. Most of those seeking employment wanted summer work which would integrate seasonally with winter hunting and trapping, and which would provide a more adequate total cash income with which to cover the increasing costs of subsistence production. The increasing needs for new sources of cash to carry on harvesting was described as the major reason the Waswanipi began taking wage employment when it became available (LaRusic, 1970:B-16). The Waswanipi attempted by a number of means to structure their involvement in wage labor, so that it was compatible with subsistence activities. The means they used included preference for generalized patrons to mediate Indian - non-Native interaction, and preferences for jobs with "bush" work styles, where people could live in the "bush", families could work together, rigid work schedules were not necessary, and wage employment could be combined with subsistence production during the summer (LaRusic, 1968; 1970; Tanner, 1968). LaRusic reports that prior to 1964, less than a dozen of the approximately 90 adult Waswanipi males opted for full-time wage employment (1966:6), mainly young men.

The actual choices among alternative types of summer jobs that were made in the years from 1964 to 1967 fit these goals well and have been described by LaRusic, Tanner and Samson (1966). The most important types of employment in the summers of 1965 and 1967 were forest cutting and commercial fishing, with mineral exploration, guiding and fish plant operations being of secondary importance (Table 2-5). As LaRusic indicates in his assessment of the attributes that affected choices among the different job types, the features that forest cutting and commercial fishing have in common are that they are done at "bush" sites, they do not require languages other than Cree, they require low or no interactions with non-Natives, they are stable jobs, and they require few new skills. They also provide low incomes relative to the other types of employment in which some of the Waswanipi participated (LaRusic 1970:Table VIII, page B-40).

The consequences of this shift to summer wage employment were not however foreseen by the Waswanipi nor anticipated by non-Natives. Rather than summer wage incomes strengtening the economic conditions for hunting and trapping activities, the course of events led first to a disruption of the economic conditions of hunting and then to a reorganization of hunting activities. These changes were the result of several factors, which will be discussed below.

As a result of many Waswanipi men taking summer employment, the Hudson's Bay Company first lost the domestic business of those Waswanipi who initially moved to live at the settlements along the roads and in towns. After about 1963, it also lost the grocery supply business to those men employed in summer at bush sites in commercial fishing and in forest cutting operations.

When the Department of Indian Affairs and Northern Development commercial

Table 2-5 Types of Employment of Waswanipi Active Males,[1] Summers 1965, 1967 and 1970

Type of Employment	Summer 1965[2]		Summer 1967[3]		Summer 1970	
	Number	Percentage	Number	Percentage	Number	Percentage
Forest Cutting	35	51	16	19	23	21
Sawmill	0	0	2	2	3	3
Commercial Fishing } Fish Plant	13	19	19	23	7	7
Fish Plant			7	8	6	6
Mineral Exploration	9	13	5	6	24	22
Guiding	4	6	4	5	5	5
Mining	0	0	2	2	3	3
Other, Odd Jobs	2	3	12	14	6	6
No Employment	5	7	16	19	30	28
Totals	68[4]	99	83	98	107	101

Footnotes:

1. Excluding residents of Chapais and Senneterre.
2. From Samson, 1966:Table II, p. 16, and page 3. Active males only.
3. From LaRusic, 1970:Tables II and III, pp. B22-B23.
4. Sample from 90 active males.

fisheries operations were first begun the base camp was at Quévillon Lake where there were no major commercial establishments at the time. Most purchases for consumable goods were still made at Waswanipi Post which was relatively accessible by canoe from all of the fishing camps on lakes between Waswanipi and Matagami. Some time after movement of the fisheries plant to the Matagami area in 1963, however, local grocers in the town became the suppliers to the men out on the lakes. The system, as described in 1965, was that fishermen would send in their grocery orders with the fish shipments from the camps. These were transmitted to one of the grocery stores in Matagami and the groceries were sent out on credit. When fisheries pay checks were issued, they were kept by the grocer until the Indians came to town. In 1966 when this grocer was closed, and the other store refused the arrangement, the fisheries set up its own supply operation with a wholesaler in Amos. Matagami Town Council refused permission for a license for this operation to serve as a local store, but it did continue to supply the fishermen out on the lakes throughout the summer of 1966. By 1968, arrangements had again been made with a local grocer. The commercial fisheries operation therefore put considerable effort into supplying fishermen in camps near Waswanipi with cheap groceries from major commercial centers starting in 1963. Similar supplying of groceries on credit and with necessary transportation facilities were provided by those forest cutting sub-contractors who became the new 'patrons' of the Waswanipi (see LaRusic, 1968).

Thus, when H.A. Williamson visited the Waswanipi Hudson's Bay Company Post in September 1964, on a social and ethnological survey for what was to become the McGill-Cree Project, he was told that there were seldom more than fifteen families at the post at any one time (1964:30).

Another consequence of the move of summer residence of some Waswanipi from the Post to the new town sites was that there was a marginal decline in the fur trade at the Hudson's Bay Company store at the Post. The record of the fur purchases of the Post store, provided by the Northern Stores Department of the Hudson's Bay Company, indicates that after a general increase in harvests of otter, mink, marten and lynx in the late 1950's and early 1960's,[6] there was a slight decline in 1962-63 and 1963-64 and a significant drop in 1964-65 (Table 2-6). The reasons for the later drop will be discussed below.

It is probable that the initial declines in fur sales do not really reflect declining harvests by the Waswanipi. The Hudson's Bay Company store at Waswanipi Post was probably receiving a smaller and smaller portion of the furs sold. When the Waswanipi were living in settlements cash expenditures were periodically required, despite the general credit facilities offered by some of the pulp cutting and fisheries employers. Furs were sold on a cash basis to a number of local taverns, hotels and bars and to taxi drivers, outfitters, and some itinerant fur traders - all of whom were major suppliers of services and goods to the Indians. I do not have any data on the relative prices paid for the furs in the sales in towns and at the Hudson's Bay Company Post for this period, but the major reasons for the shift were not price but rather immediate access to goods. With the outfitters, taxi drivers, and inn managers, furs were essentially exchanged directly for either goods or services that were needed immediately, and so the Waswanipi Post Hudson's Bay Company store purchased fewer and fewer furs.[7]

In addition to this marginal loss in fur trade prior to 1964-65, and the significant loss of summer merchandise sales, it seems from the data available that the Hudson's Bay Company Waswanipi post may have also lost a significant percentage of its fall and winter outfitting business. This loss would most likely have been smaller than the decline in summer trade because the Hudson's Bay Company Post was virtually the only supplier in the region which stocked a number of specialized items needed for efficient winter hunting. Thus, during his visit to Waswanipi Post, H.A. Williamson reported that,

> "there were a greater number of people at the Post in September than during most of the summer (except for weddings) because a number of trappers had arrived to acquire outfits for the winter. Although only about 20 families appeared to be planning a full winter's trapping..." (1964:30).

Table 2-6 Annual Purchases of Fur Pelts by Hudson's Bay Company Post 1949-50 to 1964-65[1]

Year	Number of Pelts Purchased							
	Mink	Muskrat	Otter	Marten	Ermine	Fox	Fisher	Lynx
1949-50	161	3,574	46	-[2]	1,559	44	6	131
1950-51	79	2,320	25	-[2]	784	42	5	66
1951-52	75	1,790	24	-[2]	142	9	3	69
1952-53	79	1,979	31	-[2]	288	20	7	56
1953-54	98	1,697	35	-[2]	488	3	0	56
1954-55	47	1,403	39	-[2]	212	6	5	25
1955-56	82	1,540	70	-[2]	247	4	9	43
1956-57	80	2,389	38	-[2]	447	0	4	33
1957-58	140	2,544	63	-[2]	238	6	6	26
1958-59	140	2,300	54	-[2]	258	0	6	37
1959-60	251	1,662	65	-[2]	267	0	4	216
1960-61	375	1,399	78	-[2]	404	1	2	140
1961-62	241	912	84	-[2]	144	0	1	92
1962-63	86	1,166	39	57	76	0	5	111
1963-64	121	651	33	142	87	2	1	104
1964-65	52	231	13	88	199	0	1	50

Footnotes:

1. Source: Hudson's Bay Company, Northern Stores Department.
2. Not available.

If we can compare these 20 families to the estimate of 45 men, possibly 30 families [8], who spent the winter of 1964-65 primarily at hunting and trapping (Samson, 1966) then about one-third of the outfitting was no longer being done at Waswanipi Post by the fall of 1964. The decline in 1964-65 however may have been as much the result of new Hudson's Bay Company policies, described below, as it was a result of independent decisions by the Waswanipi not to use the store as a winter outfitting base.

As a result of the decline in summer sales, outfitting business, and a marginal decline in the fur trade, the continued existence of the Hudson's Bay Company store at Waswanipi Post was in considerable doubt by the summer of 1964. Williamson reported that the post was operating at a loss and that there was a real possibility that it would be closed within a year or two (1964:30). The Moccasin Telegraph reported in 1964 that, "unfortunately, the future of this store is not very promising, as many of the Indians have moved out to Matagami, Miquelon, or other places where work is readily available" (23(2):23).

The actual closing of the Hudson's Bay Company Post took place in the spring of 1965 in response to the declining economic profitability of the store. At the time of the closing the Hudson's Bay Company published a report which cited the assumptions being made by most non-Natives at the time:

> "The history of Waswanipi as an Indian settlement and trapping post appears to be coming to an end. No longer able to support themselves on trapping and fishing, nearly all the Indians have moved away to such centers as Matagami, or out to the highway, where work is available. Now only two or three families are left at Waswanipi, and we will have to close up this summer" (Moccasin Telegraph 24(3):21).

The relationship between the closing of the post and the decline of hunting and trapping by Waswanipi men appears however to have been quite different than the relationship assumed in this report. While a change in residences radically altered the economic viability of the post, it was the closing of the post that significantly altered the short-term economic viability of the

Waswanipi's hunting and trapping.

Williamson reported in the fall of the 1964 that the Hudson's Bay Company post was "continuing its operations to see in which direction development will take place" (1964:30). The developments during the hunting season of 1964-65 led directly to the closing of the store, and to a sharp reduction in hunting and trapping by the Waswanipi. As mentioned above, it was estimated that prior to the 1964-65 hunting season only 12 Waswanipi men, i.e. 14 percent, were not full-time hunters. In 1964-65 Samson estimated that only about 45 men out of 90 were primarily hunting and trapping in the winter (Samson, 1966:Table III, page 17), and many not the full winter season. The specific reasons for this substantial change are clarified by Williamson's discussion of what he observed at the Post in September 1964:

> "... only about 20 families appeared to be planning a full winter's trapping, very few planned to utilize the territory to the north of Waswanipi Lake. Most planned to trap south of the road. There was considerable discontent at the Post, because the Manager was on orders not to issue advances to the men who had not cleared outstanding debts. In the past few trapping seasons, a number of Indians took advances at the HBC Post but sold their furs in Amos and Senneterre. Some trappers drew advances at both the Post and from the Indian Agency in Amos, playing both against the middle. Buses now run daily between Miquelon, Senneterre, and Amos, so that it is a simple matter for the Indians to take their business to several places. An examination of sample accounts at the HBC Posts, showed that few trappers traded more than $500. worth of furs at the Post and that few cashed their Beaver cheque at the Post" (1964:30-31).

The major decline in full-time hunting in the 1964-65 season was not therefore a part of a steadily increasing trend away from winter hunting and towards winter wage labor. It was rather the result of an unanticipated limiting of credit for outfitting for winter hunting by the Hudson's Bay Company because of the economic unprofitability of this store and its doubts about its ability to recover many of the individual debts of the trappers.

It was in the last instance the abandonment of the Post, not of hunting, that led to the precipitous events of the fall of 1964 and to the closing of the Hudson's Bay Company store in the summer of 1965.

The assumption by non-Native observers that the Waswanipi were abandoning hunting in favor of permanent wage labor appeared to be confirmed by the events of 1964-65, and led to further pressures against continued involvement in hunting activities. After the summer of 1965 all the Waswanipi were living near the new settlements or along the main highways. In the fall of 1965, when people were preparing for the 1965-66 trapping season the welfare officers of the Indian Affairs Branch decided to limit the outfitting advances it normally provided to families leaving for several months in the bush. They decided to provide rations only on a monthly basis. In an interview by one of the McGill-Cree Project fieldworkers, an Indian Affairs officer explained the new policy in November 1965:

> "He [the official] said the Indians of Matagami as well as Miquelon drank as they never did before, since September. The office has decided not to give them any advance in money before they leave for the bush because with this system the Indians were always in debt. They will give them only the usual rations. These are in the form of a bond and not a cheque because they would drink it. If some Indians do not go trapping before Christmas they would not receive rations after Christmas, he said" (McGill-Cree Project Field Notes, Marcel Samson, 11/8/65; brackets mine).

The new policy of giving welfare on a monthly basis rather than a few months at a time solved the indebtedness problem but not the drinking problem by encouraging people to stay near enough to the settlements to make a monthly trip for their rations. The assumption implicit in this policy, namely that hunting was on the decline and the Waswanipi would shift to permanent involvement in wage employment was revealed two days later by the same Indian Affairs official when he reported to the fieldworker a discussion he had with two Waswanipi band members about possible locations for a new reserve site.

> "He /the official/ said he tried to make them understand that it is no good to have the Reserve far from the road because in a few years they will not trap anymore, their children will work and they will be sorry for having chosen a remote place" (McGill-Cree Project Field Notes, Marcel Samson, 11/10/65; brackets mine).

A third major change in the economic support for hunting and trapping occurred the following year when the government organized beaver pelt sale system was closed down in the Waswanipi region.

As part of the establishment of the beaver reserve system the Fur Service of the Quebec Department of Tourism, Fish and Game was legally the sole purchasing agent for all beaver pelts caught in northern Quebec. With the cooperation of the Department of Indian Affairs and Northern Development, the Fur Service would receive all beaver pelts, grade and process them, and send them to auction for the trappers. The Hudson's Bay Company store was actually the initial collecting and shipping agent in the system, for a part of the service and administration fees. This system was intended to cut down on the middleman costs between trappers and the auction, and it appears to have been successful. The trapper got a flat price per pelt, more than half of what they were worth, shortly after the pelts were shipped. Then a cheque for the difference between the initial payment and the actual auction price of his furs, minus a percentage service fee, would be sent some months later.

When the Hudson's Bay Company store at Waswanipi Post was closed, the government departments kept up the beaver pelt sales service using local residents as the collectors and shippers. However, as the Waswanipi appeared to be progressively and irreversibly choosing to abandon hunting for wage employment during 1964-65 and 1965-66, the increasing difficulty of running the service in the Waswanipi region did not seem to warrant the costs of remedying the growing problems (interview with government officials). The services were withdrawn in the winter of 1966-67 (LaRusic, 1968:50, footnote 5).

As mentioned previously, the Waswanipi had begun selling some pelts to non-professional fur buyers in the early 1960's, although the sale of beaver pelts to such individuals violated the law. This practice increased after the 1965 closing of the Hudson's Bay Company store at Waswanipi. Trying to stop this illegal trade seemed to the officers in charge to be in no one's interest, especially given the expected trends in trapping. As a result free-trading in beaver was officially permitted in the Waswanipi area starting in 1966-67. On the basis of the 1968-69 data, this change from government sales to free-traders reduced by approximately one-third the prices the trappers actually received for the sale of their beaver pelts, (Table 2-7). Beaver pelt sales accounted for 85 percent of fur pelt sales income in 1968-69 and 1969-70.

The effects of the Hudson's Bay Company, Indian Affairs Branch, and Fur Service policy decisions was a decline in the extent and intensity of hunting activity. The change in the number of men hunting has been cited above, and available data on the situation from 1964-65 on indicates that only about 50 percent of the adult men hunted in the three winters during which these changes occurred (Table 2-8). The decline in trapping after the fall of 1964 is also reflected in the records of beaver pelt sales available from the Fur Service of the Department of Tourism, Fish and Game of Quebec.[9]

A precipitous drop in beaver pelt sales, and by presumption in catches, occurred in the hunting seasons of 1964-65 and 1965-66 (Table 2-9). Some decline, over and above the variations that were occurring as a result of biological and environmental factors also appears to have occurred during the 1963-64 hunting season. It is not clear whether this figure represents a real drop in furs sold, or a drop in the accuracy of reporting and statistics due to the increased sales of furs off the Post. In any case, it is clear that there was a precipitous drop in beaver pelt sales in 1964-65, and that this continued in 1965-66.

Table 2-7 Mean Net Payment to Trappers per Beaver Pelt, 1964-65 to 1969-70, Waswanipi and Mistassini Compared

Year	Settlement: Mistassini[1]	Settlement: Waswanipi
1964-65	13.25	12.20[1]
1965-66	18.80	16.46[1]
1966-67	16.00	-[2]
1967-68	18.45	-[2]
1968-69	20.96	11.00
1969-70	15.13	9.00

Footnote:

1. Source: Quebec, Department of Tourism, Fish and Game.
2. Not available.

Table 2-8 Types of Activities of Waswanipi Active Males, Winters 1964-65, 1965-66, 1966-67

Type of Activity	Winter 1964-5[1]		Winter 1965-6[1]		Winter 1966-7[3]	
	Number[2]	Percentage	Number[2]	Percentage	Number	Percentage
Hunting	33	49	33	48	15	56[4]
Exploration	15	22	20	29	5	19
Forest Cutting	14	20	10	15	0	0
Sawmill					1	4
Mining	0	0	0	0	2	7
Other, Odd Jobs	6	9	5	8	4	14
Total	68	100	68	100	27	100

Footnotes:

1. From Samson, 1966:Table III, page 17. Based on sample of 68 of 90 active men, which did not include those at Chapais and Senneterre.
2. Calculated from percentage distribution of population in Samson, and the size of his sample. Slightly anomalous percentages in the original.
3. For Matagami population only, from Tanner, 1968:Table 1, p. 55.
4. LaRusic estimates that 50 percent of the families of the whole band went trapping (1968:391). This indicates that the differences between the 1966-67 figures and those for the previous two years may be more a function of sample differences than of changes over time.

Table 2-9 Beaver Pelts Sold by Waswanipi Hunters 1952-53 to 1970-71[1]

Year	Beaver Pelt Sales
1952-53	1,446
1953-54	1,878
1954-55	2,407
1955-56	3,134
1956-57	3,027
1957-58	2,829
1958-59	2,605
1959-60	2,324
1960-61	2,777
1961-62	2,400
1962-63	2,675
1963-64	2,118
1964-65	1,209
1965-66	990
1966-67	1,350
1967-68	1,636
1968-69	2,848
1969-70	2,225
1970-71	2,485

Footnote:

1. Source: Québec, Ministère du Tourisme, de la Chasse et de la Pêche, Division des Fourrures.

The immediate cause of this shift was in my view the unanticipated shortage of cash necessary to outfit for full winter hunting and trapping. This was the result of the changes that began with the move by many Waswanipi of their summer residences away from Waswanipi Post. One of the reasons for the initial migration away from the reserve had been the desire to find summer employment, and one of the reasons for summer employment was a desire to use the cash to improve hunting with more and better goods and services. It is therefore important to distinguish the aspirations of those Waswanipi who took summer employment and the assumptions of most non-Native participants in the events, for it was the latter assumptions that created the conditions under which hunting activity was abandoned by a number of Waswanipi men. The disruption of hunting activity which they observed was thought to be unavoidable by most non-Native people in government, commerce and education, because they assumed that the Waswanipi would inevitably abandon the traditional subsistence economic activities in favor of full-time wage employment. This assumption itself led to policy decisions which created the conditions under which hunting was made considerably more difficult for Waswanipi men.

The events of the mid-1960's did not however lead to a general abandonment of hunting activities. On the contrary, as the Waswanipi developed responses to the changing economic environment which returned hunting to its former importance. The products of hunting activity, especially food, remained critical components of the Waswanipi economy, as they had been for centuries. And, hunting as an activity remained the most respected of economic alternatives. There were however important changes resulting from the events of the mid-1960's, a new and permanent commitment to wage labor was made by a sector of the population, and the seasonal integration of hunting and employment which most Waswanipi had sought in the mid-1960's was finally achieved.

A choice between employment and hunting must be made for the winter period. As opportunities to take wage employment in the winter were increasingly available and as the limiting, without advanced notice, of the sources of credit needed for trapping occurred, more than 50 percent of the active adult male population sought winter employment as well as summer employment in the mid-1960's. The main winter jobs were in exploration work and forest cutting (Table 2-8). This initial and rapid change was followed by a slower reorganization of economic activities. After the initial disruptions during the 1964-65 and 1965-66 winters the percentage of men hunting and trapping in winter began to increase marginally, and by 1968 to 1970 the majority of adult Waswanipi men were involved in trapping activities each year (Table 2-10). However, the situation was not a return to pre-1964 conditions. A lower percentage of the men were now intensive hunters, and while virtually all Waswanipi men still engaged in some hunting and/or fishing during the course of a year, a clear majority were now taking employment during the course of a year as well (Table 2-11).

Examining the interrelationship of hunting and wage employment in 1968-69 and 1969-70, over fifty percent of the Waswanipi men were fully active hunters and trappers, i.e., spent five months or more in those activities during the fall, winter and spring. Of these men, 63 percent worked at least during the summer period (Table 2-12). On the other hand, 30 percent of the Waswanipi men worked at full-time jobs or were continually available for occasional work for nine months or more of the year. Of these men, 44 percent or more were able to do some hunting and trapping during the winter, most for more than two months. The remaining Waswanipi men engaged in some other part-time combinations of hunting and employment. Only among men with permanent jobs were the majority of men not engaged in hunting, but these represented less than 7 percent of all men.

Thus there was a rapid shift in the 1960's from a community in which there were relatively few men employed in winter, to a community in which one-third would work part-time in winter, and the majority of the men were working for at least a part of the year, and in which more than half hunted intensively as well.

The pattern of productive activities that existed in the period from 1968 to

Table 2-10 Employment Versus Hunting Activities of Waswanipi Active Males, Winters, 1964-65 to 1966-67 and 1968-69 to 1969-70

Year	Hunting		Employment		Total Number
	Number	Percentage	Number	Percentage	
1964-65[1]	33[2]	49	35[2]	51	68
1965-66[1]	33[2]	48	35[2]	52	68
1966-67[3]	15	56[5]	12	44[5]	27
1968-69[4]	69	72	27	28	96
1969-70[4]	66	63	39	37	105

Footnotes:

1. From Samson, 1966:Table III, page 17. Based on sample of 68 of 90 active men, which did not include those at Chapais and Senneterre.
2. Calculated from percentage distribution of population in Samson, and the size of his sample. Slightly anomalous percentages in the original.
3. For Matagami population only, from Tanner, 1968:Table 9, p. 55.
4. Not including men from Chapais or Senneterre.
5. LaRusic estimates that 50 percent of the families of the whole band went trapping (1968:39). This indicates that the differences between the 1966-67 figures and those for the previous two years may be more a function of sample differences than of changes over time.

Table 2-11 Hunting Activities and Employment Activities of Waswanipi Men, 1968-69 and 1969-70

Hunting Activities	1968-69		1969-70	
	Number	Percentage	Number	Percentage
Hunting from Bush Camps (≥5 months - winter)	59	55	54	50
Hunting from Bush Camps (<5 months - winter)	13	12	27	25
Winter Hunting from Settlement	7	7	6	6
All Winter Hunting	79	74	87	81
Summer/Occasional Hunting Only	18	17	20	19
All Hunting	97	91	107	100
Unknown	10	9	0	0
Total	107	100	107	100

Employment Activities	1968-69		1969-70	
	Number	Percentage	Number	Percentage
Permanent Employment	6	6	9	8
Occasional Employment All Seasons	26	24	31	29
Total Employment All Seasons	32	30	40	37
Summer Only Employment	34	32	37	35
All Employment	66	62	77	72
No Employment	32	30	29	27
Unknown	9	8	1	1
Total	107	100	107	100

Table 2-12 Relationship Between Employment and Hunting Activities of Waswanipi Men, 1968-69 and 1969-70

Hunting Activities 1968-69	Employment Activities: All Seasons Permanent	Employment Activities: All Seasons Occasional	Employment Activities: Only Summer	Employment Activities: No Employment	Employment Activities: No Data	Total
From Bush Camps (>5 months-winter)	0	5	32	22	0	59
From Bush Camps (<5 months-winter)	0	8	2	3	0	13
Winter Settlement Hunting	2	0	0	5	0	7
Summer/Occasional	4	13	0	1	0	18
Unknown	0	0	0	1	9	10
Total	6	26	34	32	9	107

Hunting Activities 1969-70	Employment Activities: All Seasons Permanent	Employment Activities: All Seasons Occasional	Employment Activities: Only Summer	Employment Activities: No Employment	Employment Activities: No Data	Total
From Bush Camps (>5 months-winter)	0	1	34	18	1	54
From Bush Camps (<5 months-winter)	0	18	1	8	0	27
Winter Settlement Hunting	2	0	1	3	0	6
Summer/Occasional	7	12	1	0	0	20
Unknown	0	0	0	0	0	0
Total	9	31	37	29	1	107

1970 and later was one of great individual fluidity. There were several different degrees of involvement in one or the other activity, and the situation varied somewhat from one year to the next. Furthermore, a significant number of individual men were themselves varying their choices from one year to the next (see below). An example of this is found in the classifications of individual men's involvement in hunting. According to ethno-classifications provided by the individuals themselves, or by other members of the community, in 1969-70, nine Waswanipi men were "former" hunters, i.e., men who appeared to the Waswanipi to have left hunting permanently, and ten were young men with no full-time hunting experience so that a total of 17 percent of the adult males were classed as uninvolved in serious hunting (Table 2-13). However, the fluidity of the situation is indicated by the fact that since 1970, I am aware of four of the nine men considered "former" hunters in 1968 to 1970 who have returned to full-time hunting for one or more years, and at least one of the men listed then as not having experience has also hunted full-time during some of the years since 1970. This fluidity appears to have been even greater prior to 1968.

A rough measure of the overall reorganization of economic activity that occurred during the 1960's is the estimated change in the sources and totals of cash income and the sources and totals of subsistence food production of the Waswanipi.

Unfortunately no comprehensive survey on individual incomes from employment and transfer payments were collected in this or previous studies at Waswanipi. Nevertheless, a generalized picture can be estimated of the main sources of cash income, from public records of the rate structure of government transfer payments, from the available data on involvement of Waswanipi men in wage employment, and from generalized data on the usual rates of income from the various occupations. The data and calculations for 1968-69 and 1969-70 appear in Appendix 2-1. While there are no precisely comparable figures for the earlier period, some comparisons may be made with data from a neighboring band, and results can be compared to more recent data (Appendix 2-2).

Table 2-13 Distribution of Adult Waswanipi Men Among Ethno-classifications of Involvement in Hunting[1]

Ethno-classifications	Adult Men	Percentage
"Former" hunters	9	8
"No Experience" hunting	10	9
"Training"	12	11
"Retired"	11	10
"Active" - Residual Category	65	61
	107	100

Footnote:

1. See Table 7-1.

In 1968-69 and 1969-70 the cash income of the Waswanipi was around $275,000 to $300,000 dollars. Of this amount approximately 60 percent came from employment, 30 percent from transfer payments, and 10 percent from the sales of fur pelts (Table 2-14). The cash income was equivalent to a per capita income of $680 to $725 dollars and a per family income of $3,950 to $4,225.

The cash incomes for the community of Mistassini in 1964 were estimated at $341 per capita (Hawthorne, 1966). Data from the period varies somewhat from year to year and from source to source. The total cash income for the community of Mistassini in 1963 was estimated at $471,500 by the Department of Indian Affairs and Northern Development (in Williamson, 1964: Table 6, Page 14) which is the equivalent of $445 per capita. Samson provides limited data on five Waswanipi men in 1964-65 whose families averaged $329 cash income per capita (Samson, 1966). Therefore, per capita incomes probably fell between $300 and $450 during the period from 1962 to 1964. At Mistassini some 36 percent of the total cash income was from the sale of fur pelts, 29 percent from transfer payments, and 36 percent from employment in 1963 (Table 2-14), and 35 percent was from transfer payments in 1964 (Hawthorne, 1966). Among the five Waswanipi families 18 percent was from fur sales, 36 percent from transfer payments, and 46 percent from employment (Samson, 1966:44-45; and Appendix 2-2).

The situation at Mistassini in 1963 was not exactly the same as at Waswanipi but the general economic features of the two communities were similar. A new housing program at Mistassini had created a large and accessible number of summer jobs and most able bodied men were working during the summer. On the other hand a clear majority, over 75 percent, of the Mistassini men were engaged in a serious enough winter trapping to have sold 10 or more beaver. From the estimates of Waswanipi fur incomes made in this report, it is probable that Waswanipi fur incomes were about half those at Mistassini on a per capita basis. This means that Waswanipi total cash incomes prior to 1964 probably were somewhat lower than those at Mistassini, and a comparison of Mistassini in 1962 to 1964 with Waswanipi in 1968 to 1970 will tend to under-

Table 2-14 Sources of Cash Income of the Waswanipi Community in 1968-69, 1969-70 and of the Mistassini Community in 1963-64

Source of Cash Income	Waswanipi						Mistassini[1]		
	1968-69			1969-70			1963-64		
	Amount	Per Capita[2]	Percentage	Amount	Per Capita[2]	Percentage	Amount	Per Capita[3]	Percentage
Transfer Payments	$84,785	$211	31	$79,918	$199	27	$132,000	$125	28
Employment	153,444	382	56	184,483	459	63	169,500	160	36
Fur Sales	35,386	88	13	27,026	67	9	170,000	160	36
Total Cash Income	$273,615	$681	100	$291,427	$725	99	$471,500	$445	100
Per Family Cash Income[4]	$3,965			$4,224					

Footnotes:

1. Source: Williamson, 1964:Table 6, page 14.
2. N = 402 (Does not include people not registered in Waswanipi band)
3. N = 1060. Source: Williamson, 1964:Table 1, page 6.
4. N = 69 (Does not include people not registered in Waswanipi band)

estimate the scale of the changes.

If we do consider the Mistassini and Waswanipi figures as a continuum, per capita cash incomes increased by between 50 and 100 percent in the five year period. The main source of this increase was clearly employment income, which more than doubled on a per capita basis, and which increased from about 35 percent of total cash income to 60 percent (Table 2-14). Transfer payments increased at a somewhat lower rate than total cash income on a per capita basis, and transfer payments provided approximately one-third of total cash income in both periods. Cash income from the sale of fur pelts however probably remained stable in total, but declined significantly as a percentage of total cash income over the period.

The increased significance of wages in the total cash economy was the result of both the shift of part of the male population from full-time hunting to being available for employment for the majority of the year, and of the shift to more intensive use of summer employment by those men whose primary activity was hunting. As a result of the changes cash incomes from employment were not evenly distributed among the population. In 1969-70 the average employment income of the 37 men who worked only in summers was estimated at about $1,050. The 31 men who worked occasionally throughout the year were estimated to have earned $3,250, and nine full-time employees averaged about $4,500 each in earnings. Thus while cash incomes from employment have increased in total, the largest gains have been made by those men who entered the wage labor market on an annual basis, as opposed to those who continued to hunt and trap and work for wages only in the summer. The increase in incomes of the latter group was important as will be indicated below. However, this points up the need to consider the subsistence production as well as cash incomes.

The increased involvement of Waswanipi men in wage employment, and the increased cash incomes derived from that activity were important factors in the changes that occurred in hunting and trapping activities during this period. Two factors were critical to the changes that occurred, the decline in the number of men hunting intensively and the costs of using the more isolated hunting territories.

The more distant northern hunting territories were only accessible by canoe and airplane during the 1960's. Canoe travel to the more distant territories could take several weeks, whereas southern territories near the road network would take only two or three hours or a day to reach. Long distance freighting by canoe was extremely difficult, and some men had 50 or more portages to reach their territories from Waswanipi Post. The Waswanipi saw this as difficult and relatively unrewarding labor as was indicated in the McGill-Cree Culture Change Questionnaire administered to adult Waswanipi men and women in the summer of 1965. Asked, "What are the things you like least in the bush?" The most common negative answers concerned possible shortages of food (23 of 125 responses) and travel during the open-water season (14 of 125 responses). It should be noted, however, that 52 of the 125 respondents said there was nothing that they did not like, or that they liked everything, which may reflect the fact that by 1965 almost no Waswanipi people were short of food or were making long freighting canoe trips to and from their hunting territories.

Reports on the locations of 19 hunting groups on which there were data for 1963-64, of a total of about 22 groups, indicated that only three were on hunting grounds of which the majority of the area is located north of 50°N latitude (Samson, 1964:Map 2, page 21). In 1964-65, at least one of these hunting groups did not return to a northern location (Samson, 1964:24).[10]

The reasons for this change would appear to involve two factors previously discussed, namely the access provided to the southern area and the increasing problems with credit.

The main parts of the road and rail network were completed by 1960, and up-grading of the roads continued after that. The bush roads off from the main road and railway network, which vastly expanded access to bush sites, were built mainly by the forest cutting operations which began to expand in

1963 (LaRusic, 1966:8). Access to southern hunting territories therefore started to improve significantly after 1960, and especially after 1963. Initially, it appears that the improved access made the use of southern territories more attractive for some hunters, who stayed in the south to hunt. I would hypothesize that the expectations of the hunters changed at this point and that a decreasing number of Waswanipi hunters were willing to undertake long and arduous canoe journeys to their hunting territories. This may have been related to the increasing quantity of goods being taken to the bush camps to provide security and efficiency on the hunting territory.

The alternative was air transport by chartered bush plane, but in 1964-65, only 3 of the 68 men interviewed had used airplanes to go to their hunting territories (Samson, 1966:5). It seems unlikely that many Waswanipi men could have afforded the air transportation alternative in the early 1960's, especially once credit and advances were withdrawn, and fur pelt prices declined. The Waswanipi hunters were therefore caught in a squeeze between their changing aspirations and the cash incomes necessary to maintain access to northern territories consistent with those aspirations. The decreasing use of less accessible hunting territories was probably related to the adoption of winter wage employment by some of the hunters.

By 1968-69, the situation had changed. During the course of the present study data were gathered on 18 hunting groups in 1968-69 and 21 groups in 1969-70. Of the hunting groups, 6 were located north of 50^{o}N in both 1968-69 and 1969-70 (Table 2-15). On a family basis, approximately 29 percent of the families used airplanes to travel to their hunting grounds, 31 percent travelled by road, and 40 percent went by canoe, all on short trips of less than a day from a road. All northern territories were used by airplane. Comparing this situation with conditions in 1963-64 and 1964-65, there is a two-fold increase in the use of northern locations and a similar increase in the use of airplanes.

These changes are probably related to the stabilization of the cash incomes

Table 2-15 Comparison of Locations of Hunting Groups in Winters of 1963-64, 1968-69 and 1969-70

Hunting Group Locations	Year					
	1963-64		1968-69		1969-70	
	Number of Groups	Percentage	Number of Groups	Percentage	Number of Groups	Percentage
North of 50°N Latitude	3	14	6	33	6	29
South of 50°N Latitude	16	73	12	67	15	71
Unknown	3	14	0	0	0	0
All	22	99	18	100	21	100

of hunters during the intervening period. As noted above, there had been a general increase in summer employment incomes during the period. There is some data on summer employment incomes for hunters. Incomes for a small sample of 4 hunters in 1964, reported by Samson, averaged $571 and ranged from $150 to $880. In 1965, 15 men working in forest cutting had average incomes of $780 for the summer, but 15 men commercial fishing averaged $262 (LaRusic, 1968: Tables I, II, pages 19 and 22). These figures suggest overall average incomes of $500 to $600. By comparison, I have estimated above that men who worked summers were averaging $1050 per summer in 1969 and 1970. Furthermore, in 1968-69 and 1969-70, Government of Canada welfare system was being administered by the band and the practice of cash advances in the fall had been re-established. Some hunters had also established credit for themselves at local stores by 1968.

The cumulative effect of these changes in the cash resources available to hunters was that the costs of air transport to more northerly territories could now be afforded by a number of hunters, and more of the Waswanipi area was again being hunted. This progressive renewed use of territories that had not been used for several years was apparent during 1968 to 1970.

One result of the renewed use of the northern territories was that the total harvests of wildlife appear to have returned to pre-1963 levels.

An indication of the trends in harvests of fur-bearing animals is given in Fur Division statistics. Despite the decline in beaver harvests following 1963-64, the annual harvest of beaver had returned to its previous levels by 1968-69 (Table 2-9). A similar pattern occurs for the other fur-bearers as well (Table 2-16).

In 1968 to 1970 about the same total number of beaver and other furs were being caught as had been caught in the 1950's, but there were fewer men hunting and trapping. If 12 men worked in winters before 1964, see above, then approximately 75 to 80 men were hunting all winter, whereas in 1968 to 1970

Table 2-16 Annual Harvests of Fur Bearing Animals by Waswanipi Men, 1950's, 1962 to 1964, and 1968 to 1970

Species	1950-51 to 1959-60 Mean Yearly Harvest	Yearly Harvest 1962-63	1963-64	1964-65	1968-69	1969-70
Beaver	2,456[1]	2,675	2,118	1,209	2,848	2,225
Mink	107	86	121	52	90	125
Muskrat	1,962	1,166	651	231	1,539	1,060
Otter	44	39	33	13	116	48
Ermine	337	76	87	199	169	30
Fox	9	0	2	0	2	13
Fisher	5	5	1	1	1	0
Marten	-	57	142	88	221	108
Lynx	65[2]	111	104	50	28	9

Footnotes:

1. Eight-year mean, 1952-53 to 1959-60.
2. Has major population cycles, range 1950-51 to 1959-60, 25 to 216 pelts.

some 55 to 60 were intensive hunters. The average harvests per hunter were thus increased by approximately one-third. However, while the re-organization of hunting activity resulted in a return to former harvest levels of furbearers and in higher per hunter harvests, it is worthwhile noting that this reorganization did not result in any apparent increase in mean incomes from the sales of furs.

In 1968-69 and 1969-70, the intensive hunters and trappers, averaged $600 and $450, respectively, from the sale of fur pelts. In 1965-66, a sample of 15 trappers caught an average of 29 beavers each (LaRusic, 1968:26-27) which gives average income from beaver pelt sales of $477, at the $16.46 recorded average price for Waswanipi beaver. With other furs, the total income from the sales of furs might have been 15 percent higher, or $550. Waswanipi hunters in 1964-65 averaged approximately $400 income from trapping (Samson, 1966:39-40).

Thus although the fur harvests increased on a per trapper basis, cash incomes from trapping were approximately stable on a per trapper basis. The average price actually received per pelt declined during the period. Average prices at fur auctions were generally higher, or similar, in 1968-69 compared to what they had been in 1964-65, although prices dropped in 1969-70 (Table 2-17). The actual prices paid to the Waswanipi trappers, however, had dropped from 1964-65 to 1968-69. The difference can be seen by comparing the changes in the beaver prices received by Mistassini hunters with those received by the Waswanipi hunters (Table 2-7). The reason for the sharper decline in prices at Waswanipi was the withdrawal of the beaver pelt sales service provided by the Fur Service, Quebec, Department of Tourism, Fish and Game.

Thus, the reorganization of the Waswanipi hunting activity occurred during a period in which the actual prices received by trappers for their pelts were declining, and the total income per trapper from the sale of fur pelts was roughly stable. This emphasizes that the reorganization of hunting activity resulted from the increased use of summer wages and transfer payments to

Table 2-17 Official Sales Prices of Fur Pelts, 1964-65, 1965-66 and 1968-69, 1969-70

Pelt	Trapping Season Prices					
	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70
Beaver[1]	$12.20	16.46	-[2]	-[2]	20.52	15.40
Mink[1]	17.00	18.00	10.00	12.00	15.00	7.00
Muskrat[1]	1.60	2.80	1.00	1.25	1.35	1.20
Otter[1]	30.00	35.00	18.00	23.00	27.00	33.00
Marten[1]	10.00	16.00	10.00	10.00	12.00	11.00
Lynx	17.00	45.00	30.00	30.00	35.00	27.00
Weasel	0.75	0.80	0.50	0.50	0.50	0.30

Footnotes:

1. Source of prices: Quebec, Ministère de Tourisme, Chasse et Pêche, Fur Division. All prices except beaver are average prices at auction sales. Beaver are average net prices to trappers.
2. Not available.

finance hunting costs. The change should therefore be viewed primarily as a reorganization of the economic conditions for subsistence hunting activity, rather than as a reorganization of commercial trapping on a more economic basis.

Unfortunately, there are no comprehensive data on the actual subsistence harvests of the Waswanipi during the mid-1960's, or earlier, to which the later data can be compared and trends documented. A gross approximation can be made for Waswanipi on the basis of data for Mistassini for 1963-64. Williamson gives the total subsistence food harvests for one hunting group during the full winter as 8635 pounds of food, of which 1600 pounds was waste, leaving 7035 pounds of food harvested (1964:Table 9, page 21). Williamson estimates that the harvests of average hunting groups would be about 1500 pounds less, or about 5500 pounds of food (1961:21). There were 47 hunting groups in 1963-64, so that total food harvest for all but the summer season would have been estimated at 250,000 pounds of food, or 236 pounds per person per year.

The figures for Mistassini hunting group harvests are probably somewhat too high for the Waswanipi hunting group harvests (LaRusic, 1968:27), and an average Waswanipi hunting group probably caught about 4,000 pounds of food a year in the early 1960's (based on LaRusic, 1968:27). This would give a total harvest of some 88,000 pounds of food, or a per capita harvest of some 220 pounds of food per year. From the data gathered in this study, we estimate, in a later chapter, that the subsistence food harvests for a portion of Waswanipi in 1968-69 and 1969-70 were about 165,000 to 154,000 pounds of food, or about 391 to 363 pounds per person per year (Table 2-18).

These figures suggest that although there was a significant decline in hunting and harvests during the mid-1960's, the total subsistence food production at the end of the decade was somewhat greater than in the early 1960's, both on a total production basis on a per capita basis.

Table 2-18 Pounds of Edible Food Provided by Harvests of Wildlife, Waswanipi, 1968-69 and 1969-70

Species or Species Group	1968-69			1969-70		
	Number Harvested	Pounds of Edible Food Harvested[1]	Percentage of Food Weight Harvested	Number Harvested	Pounds of Edible Food Harvested[1]	Percentage of Food Weight Harvested
Moose	131	44,802	27	101	34,542	22
Beaver	2,778	42,226	25	2,614	39,733	26
Fish	27,933	58,659	35	28,881	60,650	39
Ducks	2,771	2,771	2	3,499	3,499	2
Geese	696	3,062	2	631	2,776	2
Loons	131	314	0	182	437	0
Hares	2,277	3,871	2	2,277	3,871	3
Grouse	4,761	5,713	3	4,761	5,713	4
Otter	103	865	1	55	462	0
Marten	259	285	0	213	234	0
Mink	120	96	0	170	136	0
Weasel	289	87	0	244	73	0
Muskrat	1,326	1,459	1	1,067	1,174	1
Lynx	52	354	0	40	272	0
Bear	8	1,032	1	1	129	0
All		165,596	99		153,701	99

Footnote:

1. Using conversions on Table A8.1-15.

The overall value of hunting activities and of the harvests produced by such activities will be a major focus of the later portions of the present study. A preliminary assessment may be offered here of the economic and nutritional values of animal harvests.

The value of the products of hunting as income can be approximated by converting animals into weights of food and applying a cash value to those weights. The weight conversions used are the pounds of butchered food that can be obtained from the carcass of a specimen of each species or species group of animals. The butchered weights differ from edible weights in that they include those non-edible parts of the carcass that are usually included with the meat and organs of comparable animals sold by commercial butchers. Thus, in the case of mammal meats it includes that portion of the bone which is part of commercially butchered cuts, in the case of fowl and fish it includes the skeleton and appendiges. It should be noted here that many of these portions are eaten by the Waswanipi and the reader is referred to a more comprehensive discussion of these issues in Chapter 8 and Appendix 8-1 of the present study. On a butchered weight basis, Waswanipi hunting provided approximately 200,000 pounds of food a year in 1968-69 and 1969-70 (Table 2-19).

The cash value of this harvest may be approximated by its substitution value, the cash cost of the most closely comparable meats, fish and fowl available from local commercial outlets. The substitution cost is the best value available because there is no local market for food from wild animals, and because local exchanges among the Waswanipi are not usually made for cash but as part of a broad social exchange network (cf.,Usher, 1975b). The problems with such a standard of value are that such foods are not of comparable quality to the foods from bush animals in the view of the Waswanipi (cf., Berger, 1977). Commercially bought foods are not of comparable nutritional content, especially when compared to the nutrients available from the internal organs of freshly killed animals. On the basis of the local prices of cuts of beef and pork, of fish and of chicken in Miquelon and Matagami in 1970, I have adopted approximate values of $1.00 per pound for mammal meats, and $0.75 a

Table 2-19 Butchered Food Weight Potentially Available From Harvests of Wildlife, 1968-69 and 1969-70

	1968-69		1969-70	
Species or Species Group	Number Harvested	Pounds of Butchered Food[1]	Number Harvested	Pounds of Butchered Food[1]
Moose	131	58,164	101	44,844
Beaver	2,778	57,227	2,614	53,848
Fish	27,933	67,039	28,881	69,314
Ducks	2,771	4,711	3,499	5,948
Geese	696	3,898	631	3,534
Loons	131	367	182	510
Hares	2,277	4,326	2,277	4,326
Grouse	4,761	6,189	4,761	6,189
Otter	103	1,082	55	577
Marten	259	0	213	0
Mink	120	0	170	0
Weasel	289	0	244	0
Muskrat	1,326	1,856	1,067	1,494
Lynx	52	442	40	340
Bear	8	1,152	1	144
Total		206,453		191,068

Footnote:

1. Using Conversions on Table A8.1-15.

pound for fish and fowl. Therefore, the Waswanipi animal harvests would have a cash value of $185,000 to $170,000 per year for the two years under consideration (Table 2-20).

On this calculation the products of hunting activities, primarily food but also furs, provide a larger income than does employment for the Waswanipi, accounting for more than half of earned incomes (Table 2-21). On a total income basis hunting produces 43 to 48 percent of all incomes. These however should be considered minimum figures because they fail to take account of the social and cultural value of hunting as an activity, and they fail to take an account of, and value, the other products of hunting activities. Hunting involves the production of: numerous specialized implements, not commercially available, many of which are made from wood and bone locally procured; items of clothing and household use, including such things as moccassins, mittens, and blankets made from animal skins; camps built mainly out of locally produced logs, lumber and mosses; firewood for heating; and medicines prepared from locally procured animals and plants. These products, and others, would have to be valued to fully assess the income derived from hunting activities, and the inclusion of these values would increase the proportional importance of incomes derived from hunting.

Overall then, hunting activities have remained central to Waswanipi production and to Waswanipi incomes, and the standards of living of the community would be significantly lower were this not the case. The cash value of the products of hunting activities is itself however a limited basis of evaluation of the contribution of hunting activities to the standard of living of the Waswanipi.

An alternative valuation of hunting can be made on the basis of the nutritional value of the foods produced. This will have to take account of a range of the nutrients provided from bush foods, including energy, protein, vitamins and minerals. For such a valuation I have estimated the nutrient content of the edible portions of the carcasses of harvested animals on the basis of data available in the literature. No estimate is available, or will be made,

Table 2-20 Cash Substitution Value of Butchered Food Available, 1968-69 and 1969-70

Food Group	Assumed Replacement Value Per Pound	1968-69		1969-70	
		Butchered Food Weight, lbs.	Value	Butchered Food Weight, lbs.	Value
Mammal Meat	$1.00	124,249	$124,249	105,573	$105,573
Fish	0.75	67,039	50,279	69,314	51,985
Fowl	0.75	15,165	11,374	16,181	12,136
All			$185,902		$169,694

Table 2-21 Total Incomes in Cash and Kind at Waswanipi, 1968-69 and 1969-70

Source of	1968-69		1969-70	
Income	Value	Percentage	Value	Percentage
Food harvests	$185,902	40	$169,694	37
Fur Sales	36,149	8	27,585	6
Hunting Sub-Total	222,051	48	197,279	43
Employment	153,444	33	184,483	40
Earned Income Sub-Total	375,495	81	381,762	83
Transfer Payments	84,785	18	79,918	17
Total Income	460,280	99	461,680	100
Per Capita Income	$ 1,143		$ 1,147	

of the actual food intakes. The value adopted is the total of each nutrient potentially available for consumption, before cooking, from the animals which were harvested by Waswanipi hunters. Because there is no comparable community-wide estimate of commercially purchased foods available for consumption, I use as a comparative standard the recommended daily intake of each nutrient, from the Dietary Standard for Canada, a standard developed primarily for residents of southern Canada (Canada, 1975). This standard can be compared to the total of each nutrient which would be available per person per day, if all animals harvested by the Waswanipi were consumed by people, and if there were no cooking losses.

Based on an estimate of 171 to 155 million calories available from harvested animal foods (Table 10-10), Waswanipi hunting would provide 1,108 to 1,006 calories per person per day, or about 46 percent of the average daily energy requirements of southern Canadians. Energy requirements of active hunters are however considerably higher, as I will indicate in chapter 8. If production is considered on an adult consumption unit basis,[11] then there are 1500 to 1400 calories available from animal foods per adult consumption unit per day. Elsewhere I indicate that the hunting populations average requirements are about 4,000 calories per adult consumption unit per day. However, those living in settlements probably have lower caloric requirements. I have no detailed estimates of their requirements but if it is assumed, for purposes of this general evaluation, that their requirements were 25 percent lower than those of the hunting population,[12] then overall average energy requirements would be approximately 3,500 per adult consumption unit per day. Bush food harvests would then provide 40 to 43 percent of daily energy requirements. If the children away in residential school for nine months a year were not considered part of the resident population for that period, then the energy available per adult consumption unit per day would be 1754 to 1592 calories or 50 to 45 percent of requirements.

Energy value is not the sole nutritional value of animal foods, although as it turns out it is one of the more limited nutrients. Animal foods can provide the majority of recommended daily intakes of most other nutrients on which data are available, again assuming complete use by humans and no cooking losses. The details of required nutrient levels and of data on the nutrient composition of northern animal foods are reviewed in chapter 8, here I will simply summarize the community-wide calculations.

Given available data and standards, animal foods could provide for 100 percent of recommended daily intakes of protein, vitamin A, iron, and phosphorus (Table 2-22). They can provide for approximately 90 percent of recommended daily intakes of niacin, 76 percent of riboflavin, 63 percent of thiamin, 50 percent of vitamin C and 17 percent of calcium (Table 2-22). While there is no data on the actual food intakes, the great majority of these reported harvests were consumed by the Waswanipi, and therefore a very substantial, but undetermined, part of their nutrient intakes were provided by these food harvests. The nutritional value of the products of harvesting activities is therefore a critical aspect of the value of harvesting activities. Given the limited access to fresh commercial foods in Miquelon and Waswanipi River, and the costs, there is little doubt that without animal foods produced by hunting there would be a serious deterioration in the quality of the diet of the Waswanipi population, and ultimately a deterioration in their health. In this sense then hunting activities are a critical component of Waswanipi life and well-being.

Thus, the increased involvement in wage employment which occurred during the 1960's was not associated with a decline in subsistence production or the significance of such production for the Waswanipi communities. For one sector of the population, employment meant abandonment of intensive hunting, for another, employment meant income to be able to harvest more effectively, and it meant fewer intensive hunters so it was possible to make higher per hunter harvests. The choices individual Waswanipi made among employment and hunting opportunities led to a pattern at the community level where the increased participation in wage employment supported and enhanced subsistence production up to levels similar to those which had formerly existed. This emphasizes on

Table 2-22 Nutrients Available From Bush Foods in 1968-69 and 1969-70 in Relation to the Recommended Daily Intakes for Adults

Nutrient	Available From Bush Foods Per Person Per Day		Adult[2] Recommended Daily Intake[1]		Range of Daily Recommended Intakes for Different Ages and Sexes[1]	Percentage of Mean Male and Female Adult Recommended Daily Intake Available From Bush Foods
	1968-69	1969-70	Men	Women		
Energy (Calories)	1,108	1,006	2,700	1,900	1,400 to 3,200	43
Protein (gm)	94	85	56	41	22 to 56	100+
Thiamin (mg)	0.7	0.8	1.4	1.0	0.3 to 1.6	63
Niacin (mg)	14	14	13	18	5 to 21	90
Riboflavin (mg)	1.1	1.1	1.7	1.2	0.4 to 2.0	76
Vitamin C (mg)	16	15	30	30	20 to 30	50
Vitamin A (RE)	4,182	3,749	1,000	800	400 to 1,000	100+
Calcium (mg)	125	124	800	700	500 to 1,000	17
Phorphorus (mg)	930	879	800	700	250 to 1,000	100
Iron	14	13	10	14	7 to 14	100

Footnotes:

1. Dietary Standard for Canada, Table 13. (Canada, 1975: 70-71).
2. 36-50 years of age.

the one hand the continuing value placed on subsistence activities by a large sector of the Waswanipi population, and on the other hand the close relationship that now exists between subsistence activities and cash incomes.

The reorganization of economic activities which occurred therefore not only involved individuals making use of new economic opportunities, many people used those opportunities to pursue "traditional" goals, but with some new means. As a result, the Waswanipi had by 1968 to 1970 achieved levels of subsistence production that were probably comparable to the levels which had been "traditional" over the course of the earlier decades of this century. And, the basic integrity of the organization and values of their society and culture were maintained throughout the changes. The present study is an account of the hunting culture and activities of the Waswanipi.[14]

Footnotes for Chapter 2

1. In 1974, after the period in which the fieldwork for this study was completed these bands joined to form a supra-band-level association, the Grand Council of the Crees (of Quebec) in order to coordinate their responses to the James Bay Hydro-electric Project, commenced in 1971, and to provide a stronger political voice.

2. Single quotation marks not occurring inside double quotation marks are used for English glosses of Waswanipi words or texts.

3. A railway to James Bay was built some decades later, to Moosonee, Ontario in 1932. This line however was further west and had no direct impact on the Waswanipi region.

4. There is a long debate in the anthropological literature over the origins of the hunting territory system. I have reviewed the history of the debate elsewhere (Feit, 1969), and will consider the question again in a study now in preparation.

5. There is also an implication in the data that residential schooling was also affecting Cree language skills. Twenty-three adults said they could speak Cree fairly well, as opposed to fluently (LaRusic, 1968:Table IV, Page 33), which presumably reflected the situation of those recently returned from residential schools.

6. The increase in harvests about 1960 was probably due to wildlife population cycles in the case of lynx, but may have been due in the case of other species to an initial boost to hunting activity because of better outfitting with the additional cash from summer employment.

7. The Hudson's Bay Company did not lose all of these fur sales either because it was also the case that an increasing trade was developing at its merchandising stores at Chapais, Matagami and Senneterre. For example, in 1964, 14 men traded 241 beaver pelts through the Chapais store (field data provided by Ignatius LaRusic).

8. This is based on the ratio of 1.5 hunters per family, which was calculated from the data collected on 1968-69 and 1969-70 hunting group composition.

9. The Fur Service figures represent most of the beaver sales from Waswanipi because Quebec was the only legal selling agent for the pelts. The figures are reasonable reflections of the trends and do not simply reflect the shift in trade away from the Hudson's Bay Company Post, as all buying agents are supposed to forward the beaver pelts to the Service. The figures are therefore complete except for the illegal non-reporting trade which was possible in the white settlements and for which we have no estimates. It should be noted however that these are records of beaver

pelt sales and not directly of harvests. The pelts of many harvested beaver are not sold commercially. However, for the analysis of trends the sales records are valuable.

10. Williamson also reported that the initial decline in the use of northern traplines dated from about 1961 (1964:24).

11. The total adult consumption units represented by the population is calculated on the basis that each individual 0 to 6 years old is one-third of an adult consumption unit, those 7 to 16 years old are two-thirds of an adult consumption unit, those 17 to 64 equal one unit each, and those 65 and over equal two-thirds of an adult consumption unit.

12. The 25 percent figure is calculated on the basis of data on Igloolik Inuit (Godin, 1976).

13. A detailed discussion of the data, assumptions and qualifications joined to this statement appear in chapter 8.

14. The emphasis on subsistence production has continued among the Waswanipi in the years following the period of the main fieldwork for this study, 1968 to 1970. While the history of many of these developments are generally beyond the scope of the present study, some of the data available warrants mention. In 1973, a survey of the winter economic activities of the Waswanipi men at Matagami concluded that 69 percent of the adult males were engaged in hunting (Hurley, 1974:3). Thus survey, made during a peak of opportunities for employment created by the James Bay Hydro-electric Development Project, indicated a comparable level of involvement in hunting and winter wage employment to that reported in earlier studies (Hurley, 1974:3; and Table 2-8). In 1975-76 the Waswanipi band was asked to classify the 167 men over the age of 18 and out of school by the extent of their involvement in hunting. Thirty-six men, or 22 percent, were considered to be not active because of employment, 9 men, or six percent, because of age or illness, 116 men, or 72 percent, were considered active hunters, of which 69 men, or 43 percent of all the men, were considered intensive hunters (reported in JBNQNHRC, 1978:Table B-1, page 51). These figures indicate a continuing level of participation in hunting activities throughout the mid-1970's.

CHAPTER 3 - ETHNOECOLOGY: DEFINITIONS, ASSESSMENTS, PROPOSALS

> "The perfection of tools, the adoption of organized hunting and gathering practices, the beginnings of true family organization, the discovery of fire, and most critically... the increasing reliance upon systems of significant symbols (language, art, myth, ritual) for orientation, communication, and self-control all created for man a new environment to which he was then obliged to adapt. As culture, step by infinitesimal step, accumulated and developed, a selective advantage was given to those individuals in the population most able to take advantage of it... until what had been a small-brained, protohuman *Homo australopithecus* became the large-brained fully human *Homo sapiens*... We are, in sum, incomplete or unfinished animals who complete or finish ourselves through culture... Man's great capacity for learning, his plasticity, has often been remarked, but what is even more critical is his extreme dependence upon a certain sort of learning: the attainment of concepts, the apprehension and application of specific systems of symbolic meaning... men build dams or shelters, locate food, organize their social groups, or find sex partners under the guidance of instructions encoded in flow charts and blue prints, hunting lore, moral systems, and aesthetic judgments: conceptual structures molding formless talents...
> Between what our body tells us and what we have to know in order to function, there is a vacuum we must fill ourselves, and we fill it with information (or misinformation) provided by our culture" (Geertz, 1966b:110-113).

A - Introduction

This rather long quote summarizes the empirical evidence and reasonable inference about the nature of human evolution which, in my understanding, is the basis for the axiomatic claim by many cultural anthropologists that human beings constitutionally strive to create a coherent world out of their complex and continuously novel experience, and that only with such an organization does most human action become possible.[1] By means of cultural ordering, the always unique things and events of experience and the always unique situations for action are reduced to a more limited range of typified things, events and situations, to which relatively standardized understandings, rules and behaviors may be appropriate. By this means the animal which lacks sufficient genetically programmed means of living socially constructs a world in which it can live, a world with a limited number of alternative possibilities and with presumably manageable choices (although still extraordinarily complex by the standard of our scientific ability to comprehend). Cultural theorists differ in claiming how this cultural organization should be analysed - as a cognitive order, a symbolic order, a structural order, a dramatic field, or any of the varieties and combinations of each. But cultural theorists of many of these varieties agree that culture is in some sense an ideational system. In this view, which I share, the study of human behavior necessarily involves the study of, or at least assumptions about, human ideation. It is in this sense that the study of human ecology can be said to necessarily involve the study of cultural ecology.[2]

Many cultural anthropologists have called for a linking of studies in ecological anthropology with studies of ideational systems, especially cognitive, including Hallowell (1942:5; 1966:272), Conklin (1954a; 1962a), Frake (1962a), Berlin (1970:16-17), Spradley (1972:15), Keesing (1974a:74), and Sahlins (1976:91). As I noted in Chapter 1, Frake has provided the most quoted programmatic statement for such a link:

> "An ethnographer, then, cannot be satisfied with a mere cataloguing of the components of a cultural ecosystem according to the categories of Western science. He must also describe the environment as the people themselves construe it according to the categories of their ethnoscience. From a presentation of the rules by which people decide on the category membership of objects in their experience, an ethnographic ecology can proceed to rules for more complex kinds of behavior: killing game, clearing fields, building houses, etc. Determining the requisite knowledge for such behavior shows the ethnographer the extent to which ecological considerations, in contrast, say, to sociological ones, enter into a person's decision of what to do" (Frake, 1962a:55).

If I may be permitted one further quote, a more recent statement by Berlin suggests a more evolutionary approach to linking ecological and ideational analyses, and one that has been influential in recent years:

> "Ironically, it is precisely in the area of man's relation to nature that I think /the/ neglected call for viewing language in an evolutionary perspective offers exciting promise as a common meeting ground for cognitively oriented anthropologists and those who argue for a more sophisticated understanding of man in terms of the influences of the material world. Language must certainly be seen as at least one kind of cultural behavior, and it is reasonable to assume that aspects of man's adaptation to his natural world will be reflected in language. As such, man's linguistic classification of the environment cannot be ignored in research which seriously claims to illuminate cultural ecological processes" (Berlin, 1970:16; brackets mine).

As noted in Chapter 1, these programmatic statements have, by and large, gone unheeded. Only a very limited number of studies linking culture as ideation to ecological activities have been made. As examples of comprehensive studies linking ideation and ecology there are only Conklin's continuing work in the Phillipines (Conklin, 1954a; 1954b; 1975 /1957/; 1960b; 1967), and Bulmer's folk biological studies (especially 1967, 1968, 1970, 1974). There are also a few short examples of specific links such as Johnson's study of agricultural practices (1974) and Forman's of fishing practices (1967). Several British social anthropologists have studied the relationship of the natural order to the social structural order (Douglas, 1966, 1971, 1973a, 1973b; Tambiah, 1963; Leach, 1960, 1964; Willis, 1975).

Most ecologically oriented anthropologists appear to be unconvinced that a link between ideational studies of culture and ecological studies of adaptive human behavior is critical, or even necessarily productive given the aims of ecological study (e.g., Vayda and Rappaport, 1968:490-491). To understand why there has been no significant development of ethnoecology, despite the evidence of the critical role such analysis should, in principle, play in human ecological analysis requires an examination of the development of ethnoecological studies. In this chapter I examine and assess ethnoscience and in particular that part of ethnoscience which is concerned with cognition of the environment as revealed in linguistic labels, what has been called "folk systematics". I indicate the accomplishments, problems and anomalies that have developed in these studies, and how these anomalies are linked to the basic definitions and assumptions of ethnoscience.

After reviewing the present state of the field I outline alternative definitions and assumptions for cultural study which suggest an alternative means by which I think cultural and ecological anthropology could meaningfully and practically be linked. I would like to call this "ethnoecology". The prefix "ethno" is used here in the sense of "the system of knowledge and cognition typical of a given culture" (Sturtevant, 1964:99).[3] By ethnoecology I will mean the study of those domains of culture that incorporate a people's knowledge of the environments in which they live and of the relationships between men and those environments. Ethnoecology is therefore a sub-field within cultural anthropology, and also within cultural ecology.

B - Folk Systematics - Assumptions, Accomplishments, Problems

It seems to me to be particularly relevant to assess the direction ethnoecology has taken, and the accomplishments and limitations of the field, from the point of view of its relevance to cultural anthropology, for two reasons. Firstly, some cultural anthropologists have claimed that the study of people's classification of their natural environment would be a particularly productive area for cognitive analysis (Kay, 1970:17), and to a large degree this anticipation has been followed and ethnosystematics has become one of the most active and important areas of current research on cognitive structures. Secondly, this work exemplifies many of the currently held assumptions and analytical techniques that characterize much of the field of cognitive anthropology, and it makes clear the relevant accomplishments that promote, and the significant problems that have hindered, the linking of cultural anthropology and ecological anthropology.[4] While the optimism of the earlier years of ethnoscientific studies has faded, there remain the claims that cognitive analysis as it is developing has something to offer those interested primarily in other sub-disciplines (e.g., Black and Metzger, 1965; Tyler, 1969a; Kay, 1970; Berlin, 1970). There is also a growing literature of criticism of ethnoscience, some of it from within the field, by those who think this goal is eluding the researchers (e.g., Berreman, 1966; Harris, 1964, 1968; Geertz, 1973; Keesing, 1972a, 1974a; Randall, 1976). It is important to assess the promises and the critiques.

i) Assumptions and Accomplishments

According to ethnoscientists much of the social learning by which cultural knowledge is transmitted and created takes place through the use of language. Many concepts, propositions, values and plans are coded in language, and are in fact learned through the manipulation of language in social interaction. For the ethnographer therefore, a study of linguistic behavior may be an effective means of constructing and testing a theory of a culture. If human beings learn the ideational systems which comprise a culture, then it is in the process of learning a language and how to use it that people acquire the bulk of their culture (Goodenough, 1957). If the knowledge that enables people to ascertain appropriate behavior is acquired from other people, it must be communicable, and for the most part is must be communicable by talking (Frake, 1964b). Cognitive anthropologists may disagree on how much of cultural knowledge is or is not communicable linguistically and on how significant this knowledge may be, but a major common assumption to date has been that not all but a "sizeable chunk", "the bulk", "a central portion", "most", of cultural knowledge is verbally communicable (Frake, 1962b, 1964b; Goodenough, 1957; Hymes, 1964a, 1964c, and quoted in D'Andrade and Romney, 1964:235-236; Kay, 1970:23).

The great bulk of the work that has been done by cognitive anthropologists is therefore based on semantic analyses. Other formal analytic techniques for the analysis of non-linguistic behavior have also been developed, but not in as much detail, and they will not be considered here (e.g., Frake, 1964a; Metzger and Williams, 1963b; Videbeck and Pia, 1966; Werner, 1966). The study of the nomenclature of a native language has been considered the easiest means to discovering the ideational system (Tyler, 1969b:6) because linguistic behavior is readily observable, elicitable, recordable, describable, and relatively replicable.

a. Nomenclatures

The method of much of cognitive anthropology has been to elicit and analyze the terminological systems of informants by an operationally explicit methodology in order to reveal the principles of thought which generate the linguistic behavior (Frake, 1962b). Thus the terms "ethnographic semantics" and "ethnosemantics" describe the "systematic study of the meanings of words and the role of these meanings in cognitive systems" (Kay, 1970:20).

The problem ethnosemantists have set for themselves is to elicit a nomenclatural system (terms) and to discover the semantic content of those terms by finding out the types of things that are included in the concepts to which those words refer (Frake, 1962b). It is therefore a major assumption of cognitive anthropology, that the meaning of a term is its referential significance, and this assumption is accompanied by a further assumption that denotative meanings have primacy over connotative meanings.

The classification of objects of the natural and social environment that are terminologically distinguished by a name is called a segregate (Conklin, 1962a). Formal analysis seeks to discover the ordering of segregates by describing relationships between the segregates, that is by internal analysis of the formal or logical structure of the system of segregates (Tyler, 1969b). The emphasis is on internal consistency, completeness and form. The key tools for this analysis are controlled eliciting, contrast sets, and a number of formal structures of relationship thought to be commonly occurring, or applicable to segregate systems. Data for analysis are elicited in the native language by discovering linguistically correct questions that relate entities that are conceptually meaningful to the people under investigation (Black and Metzger, 1965). Such questions can be used to elicit answers which are steadily, i.e. repeatedly, related to the questions that elicited them, and that contrast with other answers elicited by modified or alternate questions (Williams, 1966). Such a series of questions and responses can be explicitly recorded, and tested by replication (Frake, 1964b; Black and Metzger, 1965). At its extreme, such eliciting has been associated with the "white room technique" which seeks to control some of the variables, other than semantic context, that may affect responses (Black, 1969a).

The segregates of the nomenclatural systems formally elicited are analyzed in contrast sets, a concept that has been variously defined (Conklin, 1962a; Frake, 1962b; Sturtevant, 1964; Kay, 1971). A general definition of contrast set is a class of mutually exclusive segregates which occur in a culturally relevant setting, context, environment, situation (Sturtevant, 1964). Contrast sets occur at many levels. By exploring the features that distinguish the segregates of a word from the segregates of any other word that can be substituted for it and that contrasts in use with the given term, the concepts coded in that word, i.e., its meaning, are established (Goodenough, 1964a; Kay, 1970, 1975).

b. Organizing Principles

Domains are defined as the range of all the segregates that contrast in a given context; it is a culturally relevant boundary. Domains can therefore also exist at many levels of analyses. Domains and the classes into which they are mapped are not isolated singular units, nor do they simply form contrast sets, they are organized into larger groupings.

Among the types of organization such groupings of categories may have are taxonomies, paradigms, trees, spheres of influence and others (Kay, 1969; Tyler, 1969b). The anthropologist not only seeks to discover the nomenclatural system, segregates defined by contrast and the domain limits of his informants, he seeks to discover the ordering logic, the formal structure, of the domain. Where the relationships between segregates are relationships of inclusion, a segregate at one level being included in only one segregate at the next more general level, the segregates all together form a taxonomy (Sturtevant, 1964; Kay, 1971, 1975). Taxonomies are probably the most extensively studied cognitive organizations and are the basis of much of the work in folk systematics.

Folk systematics has been defined as the "field of study concerned with the elucidation of those general principles which underlie prescientific man's classification, naming, and identification of living things" (Berlin, 1973:259).

As such, folk systematics is part of the larger fields of folk biology and ethnosystematics. Studies in folk systematics have been made of ethnobotanical and ethnozoological taxonomies and in numerous sub-disciplinary areas (c.f., Conklin, 1972). Berlin has described the study of folk systematics as comprised of three areas: the study of nomenclature, the study of classification, and the study of identification. To date, no complete study of all areas of a community's folk systematics has been completed (Berlin, 1973:259).

The first and foremost finding of the study of folk systematics is that cultural knowledge of local flora and fauna is not only vast, it has been found to be organized and systematic. "The primitive natural systematist is apparently as much concerned with bringing classificatory order into his biological universe as is his western counterpart" (Berlin, 1973:260). Similar conclusions have been reached by Bulmer (1974:12) and by Hunn (1975a:27), and in the earlier work of Conklin (1954a, 1954b, 1975). These findings are consistent with the general assumptions of cultural anthropologists.

c. Classification and Phenomenal Reality

A second finding concerns the relationship of the folk classification to phenomenal reality. In the earliest studies of folk systematics it was assumed by the authors that the segregates of folk taxonomy would not correspond to the systematic animal and plant classifications of Western science. Conklin wrote in 1962:

> "In respect to any particular local biota, there is no reason to expect the folk taxa to match those of systematic biology - either in number or range" (Conklin, 1962a).

Conklin argued that folk taxa only related to locally relevant or directly observable phenomena, in contrast to the taxonomic units of scientific classifications, that the criteria used for defining taxa may vary greatly from culture to culture, the number and positions of levels of contrast might change from one sector of a folk system to another unlike the named levels of contrast in a scientific taxonomy (species, genera, family, etc.) and finally folk systematics has no formal rules for nomenclatural recognition or rejection of taxa (Conklin, 1962a).

Conklin's own study of the Hanunoo had shown that while a scientific classification of the flora of their region identified about 1300 species, the Hanunoo recognized some 1800 different kinds of plants (Conklin, 1962a:129). Furthermore, his studies of the classifications of plants by the Hanunoo indicated that the reported discriminations were based on leaf shape, color, habitat, size, shape, etc. (Conklin, 1954a:131ff), and his studies of the domain of color clearly showed that the conceptualization of color phenomena was significantly different from Western classification (Conklin, 1955). The general difference was that the Hanunoo plant classification was based on vegetative characteristics of segregates, the scientific classification on reproductive structures (Conklin, 1954a:160). Conklin stressed that Hanunoo taxa could not be indiscriminantly equated with scientific taxa.

Berlin, Breedlove and Raven claimed that Tzeltal (Mexico) plant specifics "clearly do not correspond in a predictable way with botanical specifics" (1966:273) based on a comparison of 200 Tzeltal plant specifics with botanical species. The comparison showed only 68 Tzeltal specifics that mapped in a one-to-one fashion with botanical species, 82 were less differentiated (more than one botanical classification mapped into a Tzeltal specific) and 50 were over differentiated (one botanical classification mapped into several Tzeltal classifications) (Berlin, Breedlove and Raven, 1966:273). Of the 68 one-to-one correspondences, 40 were plants which were introduced to the area after Spanish conquest (Berlin, Breedlove and Raven, 1966:274). They reported that there were, in general, good morphological grounds for Tzeltal categories and grouping given the attributes which characterize Tzeltal classification system. They also recognized that there are discontinuities between many groups of organisms, nevertheless, they emphasized the different kinds of classificatory systems, and that there is a significant difference between scientific and folk biological classificatory systems, The scientific system is a general system because the categories are distinguished on the basis of many features, and the members of any segregate possess many attributes in common, whereas in folk system classes are distinguished by few features that are of particular interest for specific purposes. In so far as the folk system of classification often uses characteristics for classification that are also used in the botanical classification this "clearly tells us nothing about the structure of nature itself, but a great deal about our own view of this structure" (Berlin, Breedlove and Raven, 1966:274-275).

These views have been challenged by Bulmer. However before reviewing his claims it is important to clarify the issues involved. Here we are concerned with identification, which is the study of the criteria used when assigning organisms to classes, criteria presumably definable on some universal grid (Berlin, 1973:359). The relationship between a folk classification and a scientific classification exists at several levels, including a methodological level, a translation level, and a conceptual level, and these need to be distinguished.

When cognitive anthropologists seek to identify the referents of the labels and the categories of the folk biological classification they ask informants to classify biological specimens. The categories may be identified by observing animals and plants in natural settings, collecting specimens or displaying pictures. How the informant makes the classification and what he can report of the process are then analyzed to reveal the criteria for the classification made. In order to make efficient records of such eliciting and to analyze them, the scientific classification of the stimulus eliciting the behavior is identified. The completeness of the eliciting stimuli are also checked against the scientific inventory of taxas for the region in which the informants live (Bulmer, 1970:1075). When the folk categories are constructed their referents must be communicated to other scholars efficiently, and this is done by identification in a scientific classification. This is the reason all folk systematic studies include glosses for the categories of the folk classification (emics) in the categories of the scientific classification (etics).[5] The etic categories are not categories of the folk system but are used to discover and describe folk systems so that the identifications made can be compared cross-culturally. In short, the scientific classification serves as the etic grid for the study of the folk classification.

The analyst does not however discard the emic analyses. The emic categories are the ones that are used meaningfully in the given folk system being studied and are most convenient for describing the internal relationships between the ideational systems of the given culture, including the biological nomenclature and other cultural domains (cf., the discussion of etics and emics in Goodenough, 1971:6-8; 1970:113-130; and, Pike, 1964).[6] To return to the question then, given the descriptive and analytic relationship that exists between folk systematics and scientific systematics, what is the relationship of the folk classification to phenomenal reality?

Based on his studies of Karam (New Guinea) ethnozoology Ralph Bulmer has argued that at the lowest level of categories folk classifications, like scientific classifications, are concerned with the objective discontinuities in nature, which define biological species, and this is so even where the folk-taxa do not correspond one-to-one with biological species (1970:1081-1082). He argues that there are evident and real discontinuities in nature (Bulmer, 1970:1083). Human populations which directly exploit natural resources for their living categorize the relevant aspects of the natural environment in a "biologically realistic way" (Bulmer, 1970:1082). Bulmer goes on to qualify what he means, stating that this does not preclude "non-biological" taxa being applied, it does not mean that all living things are so classified, nor that only economically important ones are classified in a biologically realistic way, nor that knowledge of economically important taxa is limited to what needs to be known for practical purposes. Furthermore it does not mean any folk categories can, in a connotative sense, be treated as identical to specific scientific categories (cf., Conklin, 1962a).

The correspondence is a "conceptual" correspondence between the great majority of terminal taxa of a folk taxonomy and species recognized by zoologists, because an appreciation of the nature of natural species underlies both the folk taxonomy and the scientific taxonomy (Bulmer, 1970:1076; and, Bulmer and Tyler, 1968:334-335). That is, they are conceptually the same kind of classifications. The lower level taxa of a folk taxonomy are not highly specific categories based on specific features, they are natural (general) units defined by the multiple attributes of the distinctive "way of life" of each type of animal, including among others-appearance, behavior and habitat (Bulmer, 1970:1078). As such lower order taxa of the folk taxonomy are logically comparable to the "species" of the general scientific classification. Both the folk and scientific classifications therefore "reflect biological reality", but this does not mean that individual taxa can be simply equated (Bulmer, 1970:1078).[7] Bulmer claims that when a folk taxa includes together several species people are generally aware, or at least some of the members of the society are aware, that there are differences among the animals or plants classed together, and that when the folk taxa splits species people are generally, although not always, aware that they are distinguishing polymorphic varieties, or sexes, or life-stages (Bulmer and Tyler, 1968:334-335; and Bulmer, 1970:1079). To this extent the comparison of taxa is an inadequate measure, an under-measure, of the degree of correspondence of the two classifications.[8]

Bulmer notes that classifications that are based on multiple features and that correspond to some significant degree with "natural species" are not found throughout folk biological classifications. Lowest level taxa that correspond to uncommon things and taxa that correspond to very familiar and highly important things may be classified on the basis of single features (Bulmer, 1970:1087). It also seems to be the case that culturally unimportant and highly important things tend to be respectively under- and over-differentiated (Berlin, Breedlove and Raven, 1966:273) although, again, the comparison may not be as simple as they suggest. The higher level taxa in a folk biological classification seem not to be dominated by highly specific factors but by broader factors because the taxonomically significant features selected as the basis of the classification are culturally significant in general. As a result the higher order taxa tend to show little correspondence to scientific biological taxonomies or to other folk taxonomies (Bulmer, 1967). The core of the lower level taxa however are biologically realistic Bulmer claims and Berlin now appears to agree (Berlin, 1973:260-267). It may be the case that these principles typically apply not only to ethnosystematic categories but also to the key ethnoecological categories of non-scientific cultures. On the basis of his review of the general scope, detail and accuracy of cultural knowledge revealed in studies of folk biology and ethonecology Bulmer has stated that:

> "... a vast amount of apparently accurate knowledge is possessed about aspects of the integration of plant and animal communities - of the topographic, soil and climatic conditions required by wild as well as cultivated plants, of the kinds of plants and their parts which provide food or refuge for different kinds of animals and of the role of birds and mammals in the propagation and dispersal of plants" (Bulmer, 1974:12).

These findings support the general assumption of cultural anthropology that culture identifies and makes possible meaningful recognition of differences that may have a reality over and above cultural ordering, however impossible to know such ordering other than through cultural knowledge. Ethnosemantics does not therefore claim that nature is just culture, pure and simple. On the other hand it needs to be stressed that Bulmer was not reducing culture to nature.

Bulmer's point is made in the context of arguing that his findings confirm Levi-Strauss' argument that folk categories of species are seen as "natural units" by the users of the classification, and that it is specifically this logical character of the categories that is part of the cultural significance of folk systematics (Bulmer, 1970:1072; cf., Levi-Strauss, 1963, 1966; Leach, 1964). It is the logical character of the classification, the grouping of irreductible individual organisms into units which themselves are "natural" and which are therefore subject to grouping and regrouping on the basis of extraordinarily diverse criteria, that make animals good to think with. The whole of Levi-Strauss' argument goes beyond the scope of this review, but it indicates that the classification is both "natural" and also culturally constituted.

Bulmer himself had made this point eloquently in his extended analysis of "Why is the Cassowary not a Bird?" (1967). In this analysis he shows how the identifying criteria needed to separate primary taxa in Karam folk-zoology in no way exhaust the cultural significance and meaning of a category such as the cassowary. To elaborate on the meaning of the classification of the cassowary for the Karam, Bulmer has to introduce a discussion of the major classifications of the immediate world of the Karam, the types of productive activities, the contrasts between the major food produced and kinship roles and rights, in addition to the features of appearance and behavior of the cassowary (Bulmer, 1967; cf., also Douglas, 1957).

ii) Problems

a. Referential Meanings

These findings demonstrate that the relationship between culture and reality is neither a reduction of reality to cultural order pure and simple, nor a reduction of culture to a natural order pure and simple, but rather a dialectical mutual production (for parallel claims see Sahlins, 1976; Schneider on kinship, 1968, 1972; and Sahlins on color, 1977). In these respects, the findings of folk systematics are consistent with the assumptions of cultural anthropology as defined in this study. However, Bulmer's findings also have implicit in them a critique of ethnosemantic analysis as now practiced. On one hand, if the taxa are natural categories, i.e., distinguished on the basis of mutual criteria then the categories are capable of multiple meanings, they are multi-vocal. And, if the higher orders of the classification link animal categories to cosmic categories then the meanings of animal categories cannot be understood without reference to the wider cultural system. The multi-vocal character of animal categories contrasts with the restrictive and arbitrary limitation of meaning to referential meaning in folk systematics. As Bulmer shows the referential meanings and the purely taxonomic criteria are not adequate for indicating the significance which specific animals have for men. To explore this limitation further I will examine the folk systematicists assumption that taxonomic structures are fundamental structures of thought.

b. Taxonomic Structures

Taxonomic structures have been identified as fundamental principles of human knowledge by most cognitive anthropologists (Frake, 1962b:81; Conklin, 1962a; Berlin, 1970:4; Kay, 1971:867). Berlin has claimed that formal taxonomic structures have been found to be quite similar in many languages, and that they represent true universal, or near universal, characteristics that do not merely reflect the investigator's views (Berlin, 1970:4). Taxonomic structures are the fundamental organizing principle of folk biological classification (Berlin, 1973:260). The key feature of folk biological taxonomies is that the taxa which occur as members of the taxonomy are always "mutually exclusive", i.e., a lower order taxa is always unambiguously assignable to a higher order taxa (Berlin, 1973:260).

Berlin also claims to have distinguished five, or possibly six, hierarchic ranks in folk biological taxonomies into which almost all taxa of any given taxonomy can be classified by an intersection of biological, taxonomic, psychological nomenclatural principles (Berlin, 1973:260; 1976; Berlin, Breedlove and Raven, 1974). Finally, it is claimed that folk biological taxonomies may universally exhibit evolutionary developmental sequences (Berlin, 1970:14-15; 1972). These principles taken together constitute an ambitious project to formulate universal principles of folk systematics and to link such principles to an evolutionary framework.

Taxonomic structures are supposed by definition to conform to the features of mutual exclusivity (Berlin, 1973:260) and/or strict-inclusion-of-sets (Kay, 1971:868). Considerable work however indicates that folk biological classifications are persistently anomalous with respect to these taxonomic assumptions.

Reports of such anomalies were made by Bright and Bright (1965) and Black (1967). For example, Black in a study of Ojibwa ethnoscience, found that there were groups of terminal taxa of tame animals that informants indicated could be strictly included in one higher order taxa glossed 'tame animals', but they also claimed individual terminal taxa of the group could be included in alternate higher order taxa such as 'large animals' and 'birds'. Black notes that "informants did not feel the need to describe mutually exclusive classes" (Black, 1967:120). Bulmer cites a similar case (Bulmer, 1974:17). Black goes on to suggest that taxonomies of semantic structure may not be as universal as has been assumed (Black, 1967:127). Probably anomalies of this sort would have been found even more commonly had it not become recommended practice in recent years to exclude from folk systematic analysis introduced species. Note, however, that not all Black's 'tame animals' are recent introductions, dogs were probably known prior to contact by Europeans some three hundred and fifty years ago.

Other types of anomalies have also been reported with increasing frequency in recent years. Randall has reported cases of data that cannot be adequately structured using taxonomic hierarchies of inclusion and exclusion. Thus in a small taxonomy of things 'created by God on earth' a distinction is drawn between 'land flesh' and 'sea flesh' and a downward chain under the former is 'vegetation', 'non-woody vegetation', 'seaweed', and then types of seaweed. Randall claims 'seaweed' is considered a type of 'non-woody vegetation' and a 'type of vegetation', but it is not considered to be a type of 'land flesh'. That is, there are indirect inclusion relationships that are not transitive (Randall, 1976:546-548). Bulmer refers to instances of taxonomic problems that appear to be similar (Bulmer, 1974:17).

Hunn has noted another type of anomaly the existence of residual taxa. A taxon at one level will include several specific taxa at the next lowest level each of which refers to a distinctive perceptual thing, but there will also be a residual taxon at the lower level referring to all the other members of the higher taxon not included in other specific lower taxa. This residual taxon is not defined by distinctive perceptual criteria (Hunn, 1976:511).

Doubts about taxonomic structures are also raised by problems of individual variation. Folk biological taxonomies are frequently constructs such as an ideal informant or omniscient informant would produce, presumably a sum of the knowledge of many individual informants. Gardner has recently conducted a study in which he claims that assuming such a taxonomic model can be based on averaging, summing or taking a mean of individual responses may not be reasonable. His informants frequently rejected as completely unacceptable patterns of relationship among taxa that had been offered by other informants. This suggests that considerable incompatibility of structures among different individuals may exist (Gardner, 1976:459).

Gardner suggests that this may be related to the finding that individual knowledge is related to stages in individual intellectual life histories (Gardner, 1976:463). A related observation has been made by Bulmer who has pointed out the implications for rigid taxonomizing of the fact that individuals extend and modify their beliefs in the light of personal experience (Bulmer, 1968:638). When asked to explain categories and interpretations Bulmer's informants do not refer to tradition, or to "expert" opinions, but regularly refer back to personal observation (Bulmer, 1974:11). This rather unsurprising discovery raises questions about the assumption that while knowledge increases throughout a person's life, a basic knowledge is acquired at a very early age (Conklin, 1975:176, 1960a). Bulmer concludes from this that the systems of classification must be flexible in order to permit each individual to incorporate into it what he learns from his ongoing experience (Bulmer, 1974:11). Such flexibility and elasticity preclude premature assumptions about the rigidity and uniformity of the cognitive structures.

Problems with the definition and exclusivity of taxa have led several authors to doubt that concepts are in fact stored in the human mind as units with clearly defined boundaries. Instead there are various suggestions that "central tendencies" or "prototypic images" may comprise the core of a concept, the boundaries being less precise and definable (Bright and Bright, 1965:253-254; Keesing, 1968:66; Berlin and Kay, 1969; Kay, 1975:151).

This not only makes the link between terminological system and cognitive system complex, as Bulmer has been claiming (Bulmer, 1974), it is further evidence that significant sectors of cognitive structure may be unlabeled and unconscious (Berlin, Breedlove and Raven, 1968; Berlin, 1974; Keesing, 1973a). If people's categories frequently do not have clearly defined boundaries, and if the relationships among categories are frequently non-transitive, this indicates that people's knowledge may not actually be "stored" or "used" as taxonomic structures as has often been assumed (Hunn, 1976; Randall, 1976:549-552).

iii) Limitations: Domain Boundaries and Linkages Between Domains

These and other problems in the analysis of folk systematics have convinced some commentators that such methods seriously limit the usefulness of the resulting studies. For example, there are the related issues of cross-cutting classificatory principles and the boundaries of the system. At the higher order levels of the folk taxonomy features widely used in the culture are critical for defining classes as opposed to more narrow and specific features which are often critical for defining the classes at the lower levels of the taxonomy. The diversity and types of upper level classifications that have been discovered indicate that there often are cross-links to other classificatory structures - including technological utilization, dietary status, economic and ritual significance (Bulmer, 1974:23). For example, the term for 'tree' an ethnobotanical category may serve as well as a resource category, as 'timber' or 'firewood' (cf., Metzger and Williams, 1966; and also Brown, 1974 and Berlin, 1974). Perchonock and Werner, using a card-sorting method of elicitation, found with Navaho that taxonomies of food terms intersect extensively with folk biological classifications (Perchonock and Werner, 1969).

Cognitive studies in general indicate that there is an intersection of classifications in human cognitive systems. Studies in semantic analysis and in other traditions of cultural analysis have increasingly indicated that the cultural structures that apply in one cultural domain often apply in other domains as well (cf., Vogt, 1965; and, Schneider, 1969). It has been shown that to provide an ethnographic description of behavior of a specific type it is necessary to interrelate principles from a wide range of domains, and this is possible precisely because domains may be ordered in similar ways (Keesing, 1967:14).

This question is related at its most general level to ambiguity in the definition of the domains of folk systematics. The problem can be approached from the perspective of the indeterminacy of the head term of the taxonomy, the "unique beginner" in Berlin's terminology (Werner and Fenton, 1973:572). Berlin argues that a concept of 'plants' has no doubt been widely recognized since earliest times, but a distinctive label for this category is not common in folk biological classification (Berlin, 1972:78-82). 'Plants' and 'animals' have served as the unique beginners in most ethnosystematic studies. One obvious result of present practice is that the reports of Berlin and his colleagues studies of both Tzeltal and Aguaruna folk botany do not identify any taxa that do not appear to refer, or potentially refer, to what would be classified as botanical phenomena in scientific systematics. This need not be the case. While the decision concerning where to place the boundaries of the domain is in some sense an entirely arbitrary decision from the native point of view, and it must be so in some senses for the analyst too, it may still be worthwhile to ask what would happen if ethnosemantic researchers selected as the upper limit of their domain a category that was not distinguished by its close approximation of the major scientific classificatory scheme of scientific biological study. Conklin has indicated that among the Hanunoo the "usually invisible" components of the universe comprise a different order of classification and are sub-divided into personalized spirits and impersonal forces and these are further classified in a taxonomically definable structure (Conklin, 1975:226-249). The impression I get however is that if the head term of the domain were different the visible and the usually invisible classificatory orders might form part of the same structure.

This is the case in Black's study of the Ojibwa which started with a more general unique beginner, 'living things'. She received initial response lists from informants to the question "what are all the kinds of living things?" that included the names of taxa the phenomenal referents of which would not be included in a scientific taxonomy. Among these were 'thunder', 'stones', 'spirits', 'sun', 'moon', 'wind', 'ocean', and others (Black, 1967:94-98).[9] The beginner was selected because its cultural and cognitive saliency were clear in the earlier work of Hallowell (Black, 1967:74-86). All these "extra-biological" taxa were eventually classed as a separate sector within the comprehensive taxonomy (Black, 1967:112 and 115-116). Black's analysis of the Ojibwa classifications assisted her broader study of the Ojibwa belief systems at the core of which she found the semantic contrast between the two categories 'spirits' and 'indians' or 'human beings' (Black, 1967:170). Because Black sought a salient domain definition, it provided a wider contextualization for the ethnosemantic study, linking it to other domains of the total culture. The present practice in folk systematics cuts the research off from exploring the linkages and the wider cultural contexts that make the domains studied by folk systematics potentially interesting domains within cultures.

Many authors seem to feel that the problems associated with the formal taxonomic structures used to date are serious limitations on the usefulness of semantic analyses as presently formulated, that the logic adopted isolates analyses from precisely those problem areas in cultural studies that appear likely to be most productive of new insights (Keesing, 1972a, 1972b and 1973a; Gardner, 1976; Hunn, 1976, Randall, 1976).

iv) Folk Systematics and Ethnoecology

The implications of these various problems of folk systematics for the field of ethnoecology can now be considered. Frake claimed using the Hanunoo example that the study of folk systematics was relevant to the study of ethnoecology:

> "By discovering what one must know in order to classify plants and other ecological components in Hanunoo fashion, one learns what the Hanunoo consider worth attending to when making decisions on how to behave with their ecosystem" (Frake, 1962a:55).

Vayda and Rappaport criticized this formulation, first by differentiating ethnosystematics, the classification and naming of biological things, from ethnoecology, knowledge of how those things behave and how they influence each other. Then they went on to argue that there "are no universally applicable procedures for inferring ethnoecology or the actual relations within an ecological system from ethnosystematics" (Vayda and Rappaport, 1966:491). In their view ethnosystematics may be relevant to ethnoecology, but it is not necessarily so. And, ethnoecology is potentially relevant to the study of human ecology

(Vayda and Rappaport, 1968:490).

A main feature of the current development of ethnosystematics is that it has proceeded to develop in ways that isolate it from other branches of folk science, including ethnoecology. The definition of folk systematics is that it elucidates the "general principles which underlie prescientific man's classification, naming, and identification of living things" (Berlin, 1973:259). To pursue this goal it appears as if the anomalous aspects of folk biological classification have been ignored or minimized. And, it turns out, many of these ignored features of folk classification are in one way or another related to linkages between folk systematics and wider knowledge in folk science.[10]

These problems of folk systematics bring into focus the question of cultural meaning, which remains a problem for ethnosemantics in general. The assumptions and models being used are too simple to approach the original goal of providing a description of cultural knowledge, and the methods used are not adequate to providing an account of the cultural meanings. Folk systematics, in particular, and ethnosemantics in general, are dealing with phenomena that are too isolated from the actual use of ideational systems by individuals.

Keesing, in a critique of ethnosemantics in the context of kinship studies (1972b; see also 1972a for a broader perspective) points out that the phenomena studied are by definition and by method isolated in a linguistic context which is then held constant so that a word can be defined denotatively. But this can be done only within the frame in which a word is studied, a process that disguises the problems and realities of the polysemy of words and the related fact that their specific meanings cannot be sorted out by ignoring their use in specific contexts (Keesing, 1972b:18-19). He frankly outlines the presumption and consequences of such an approach:

> "For fifteen years, we have been trying to wedge the semantic systems of non-Western peoples into boxes we learned how to build from analyzing kin terms. Ethnoscience, building on kinship - derived models of contrast sets and emphasizing controlled eliciting frames, has predisposed us to think of semantic systems in monosemic terms. Despite its claims of 'emically' codifying the thought-world of a people, ethnoscience has implicitly reduced the rich

> polysemy of language toward simplistic sets of monosemic labels for 'things' into which people are supposed to carve their world" (Keesing, 1972a:19-20).

Keesing goes on in a series of papers to amplify and detail the consequences of a lack of connotative definition, contextualization and over-abstraction, on the meanings that can be studied. A key of Keesing's critique is that the ethnosemantic analogy between culture and language now seems less plausible than it was when it was first introduced in the 1950's and early 1960's. In linguistics transformational grammar has replaced earlier descriptive linguistic theory, as the most commonly shared model among linguists, and the transformational model itself is now considered inadequate by proponents of the yet newer generative theory. The ethnosemantic premises were based on analogies to pre-transformational linguistic theory (Keesing, 1972a:300-307). In the first instance linguistics is primarily concerned with rules for converting cognition into verbal behavior. Whereas, if cultural beliefs are concerned with deciding what is, deciding what can be, deciding how one feels about it, deciding what to do about it and deciding how to do it, then cultural beliefs are primarily concerned with deciding the appropriateness of cognitions to perceived contexts or situations. Specifying the relation of belief to behavior is not the only focus of cultural analysis. Keesing suggests that there is no basis for easily assuming that these two problems are sufficiently similar to make extensive borrowing of linguistic ideas and methods appropriate for the anthropological task (Keesing, 1972a:316). The question of similarities is an empirical one, not one that can be taken as a basic assumption of research.

In the second instance Keesing also argues that there is a growing body of evidence that casts doubt on the ethnosemantic assumption that labeled lexical categories are directly related to the cognitively salient units with which people order experience. Evidence of this from ethnosystematics has been cited above, for example, Bulmer's claim that people know often that two or more types of animals are being called by the same name. Keesing claims that there is no reason why many cognitively salient units might not be related to labeled lexical categories (Keesing, 1973a:444-5). He suggests that the models we use should include models of unconsciousness, should be able to account for labeling where it occurs, and should be able to account for the folk categories themselves, not just assume their existence (Keesing, 1973a:445; for a similar commentary see Hunn, 1976:520-521).[11]

Cultural anthropologists therefore need to find a theoretical basis that will allow them to address the central concerns of the field while giving results that are psychologically realistic. Unfortunately there is no fully adequate theoretical and methodological stance available, so that one has to go back to the basics, adopt a position and explore how to apply it.

C - Definitions and Assumptions for Ethnoecology

At the moment, cultural anthropology seems to be less easily defined by any agreed upon theory or methodology than it is by an objective that is broadly agreed upon and by a number of general definitions, and assumptions for future exploration which may come to have general acceptance during the next few years. I think these definitions and assumptions are sufficient to indicate a basis for a rapprochement between cultural anthropology and cultural ecology.

When it is claimed that culture is an ideational system a series of distinctions and assumptions are implied by that claim. The first is that men live in a socially constructed world, and that all human experience, knowledge and understanding of "reality" is already organized and structured by the subject in such a way that the known can never be known in isolation from the knower, indeed even this way of talking about the relationship is false. This active participation of the subject in the creation of experience occurs at all levels including the simplest perceptions (Holzner, 1972:24). Thus the intentionality of human beings enters into their knowing, as well as their communicating and their acting. Men cannot know a world independent of the way their ideation structures their experience (Berger and Luckman, 1967), and yet the world that is known is never simply the construct of an individual human being.

The particular level of ideation that is of primary interest to the anthropologist is cultural. Culture is not any ideation, it is the socially learned body of belief by which people organize the world so that it may be known and acted in. Culture is therefore a socially shared set of beliefs about the world, the self, and the relationship between them. Cultural beliefs are themselves interrelated and to some degree consistent so they form ordered sets. Although every people have ways of expressing parts of their culture as a series of propositions, the whole of culture is not available in such form (Dolgin, Kemnitzer and Schneider, 1977).

The focus of culture is the individual but the individual as a socially constituted being. Each individual develops expectations of the beliefs significant other persons in his environment use to understand and act in their world, and he uses this model of their beliefs to guide his interactions with other people (Goodenough, 1971:36). In the course of such interaction the beliefs an actor attributes to other people are revised and changed as expectations are and are not met. By this means a significant degree of agreement is established between individuals about the beliefs they publicly share, but each individual remains the focus of the beliefs, and culture is the individual versions of the agreed upon beliefs (Goodenough, 1971:37).

Culture as ideation or belief must be distinguished from behavior and the consequences of behavior, which have also been labeled "culture". What is socially shared becomes part of each individual through learning, and what can be learned is not behavior, emotions, people or things, as such, but rather an organization of those things (Goodenough, 1957). People, things and behavior interrelate as natural systems, social systems, production systems and ecological systems, among others. Such systems are comprised of the patterns of recurring behavior of communities of people in environmental contexts, and the analysis is often focussed on the consequences of such behavior and on the stabilizing processes in such systems. The social scientist who analyzes such systems often speaks of them as "reality". Culture as ideation is distinguished not only from behavior but also from the products of behavior, including non-material products such as myth and ritual. Culture is a system of belief about behavior, people, things, environments and their relationships.

The content of culture has been classified diversely, and one classification by

Goodenough divides culture into four types of ideation: percepts and concepts (knowledge for deciding what is), propositions and premises about cause and effect relationships and about accomplishing purposes (knowledge for deciding what can be), value and sentiment systems of preference and for choice among purposes (knowledge for deciding how one feels and what to do), and principles of action for accomplishing purposes (knowledge for deciding how to do it) (Goodenough, 1971:22; 1961a:522).

A consequence of defining culture as beliefs, a cognitive reality, is that culture cannot be directly observed. The native member of a society learns the culture of his group in social interaction. The task of the social scientist himself is therefore to also construct the culture based on his interaction with members of the society.

The task of the ethnographer, seeking to describe the culture of a community is to construct his version of the shared beliefs. In typical practice, the ethnographer interacts with a large number of members of a group, some of whom become significant others for him, and his account of the culture of the group is a generalization about their beliefs, their variation and/or mode, which he abstracts from his interactions with these significant others (Goodenough, 1971:37). It is assumed that these beliefs apply to others in the group. In this regard the ethnographer is like a native (Goodenough, 1971:38), only the anthropologist may be more analytical, and he surely is less experienced.

The culture described in an ethnography is therefore not a description of the knowledge of any one individual, nor it is a description of the psychological functioning of an individual actor. Culture as described is a model abstracted from the ideational order, and not that order itself (Keesing, 1973a:441). Culture is, in this sense a theory about the shared elements of the knowledge of the members of a group, about how socially shared knowledge is organized, interpreted and used.

The cultural system is a construct, model or theory, constructed by the observer from data based ultimately on the myriad of actual performances of people in their daily lives. The concrete acting of human beings is the basic problem as well as the basic datum of cultural anthropology (Schneider, 1976:198).

The regularly recurring patterning that is found in human behavior and in the material and social arrangements and which "give a community the semblance of a homeostatic system" are governed, at least in part, by processes at the ideational level (Goodenough, 1961a:521, 524ff). The institutions of social and economic systems are created and maintained as products of culturally informed human action, the actions of individual people, and these systems are in this sense artifacts of a cultural tradition (Goodenough, 1963:271). Action however can never be solely determined by culture, although culture has a role in determining social action (Schneider, 1976). Situation, past experience, setting, motivation in total, all have roles in determining social action.

Culture is a social reality that appears as a reality external to an individual because it is built up out of a myriad of acts and communications of other persons, and thus is learned by each individual as something that is not his own creation. But culture itself is an abstraction from the myriad of individual actions and does not exist outside of its continual actualization in the actions of individual human beings (Berger and Luckman, 1967). Culture and act are therefore in a dialectical relationship each continually in the process of being produced and thereby changed. Culture is therefore continually in the process of formation and transformation.

The "meaningfulness" of human action is manifested in the continuing integration of ongoing experience into a culturally constructed world created by internalizing and externalizing belief in action (Dolgin, Kemnitzer and Schneider, 1977). Culture does not just make possible representation of experience, or even just make possible the constitution of experience, culture makes it possible for experience to be meaningful to an individual by making possible links between experiences, i.e., a system of meanings that has a history, that is a tradition. Individuals make nature knowable and meaningful by transforming it through culture. The specific relationship between culture and "natural reality" follows from this. Human beings live in a nature that is culturally constituted. Culture at one level is critical for individual experiences of differences in phenomena, and at another is a structure for identifying some among all of the "real" differences as significant while ignoring others (Sahlins, 1976). This identification is part of the larger system of cultural meanings. The main process is not a cumulative discovery of natural differences, but a creation of meanings through the use and extension of cultural beliefs to natural phenomena (Sahlins, 1977). Nature is always part of a man's perception of it, and that perception is formulated through culture; there is therefore no independent knowledge or understanding of nature apart from a cultural definition of it (Schneider, 1976). However, while there is, in some sense, a nature that becomes known through culture, there is no human action with reference to nature that is without meaning for the actors.

Human beings externalize their understandings in action. They are able to consciously recognize their own intentions, their acts, and the consequences and thus to culturally order, but not determine, the consistencies and discrepancies between thought, action and consequence. The effects of actions are thus often unanticipated, but they are always subject to meaningful interpretations (Dolgin, Kemnitzer and Schneider, 1977). Human beings thereby confirm the reality of their socially constructed world in action just as they also reinterpret that world through action. Confirmation is always implied in reinterpretation and the relationship of man and nature is therefore also dialectical.

The application of these general contemporary orientations of cultural anthropology to the field of cultural ecology seems to me to be the present task of ecologically oriented cultural anthropologists. The present study is intended to explore some of the ways to develop cultural ecology that would be consistent with the general orientations of cultural anthropology and the theoretical focuses of ecological analysis.

I think a first step in this direction is to focus on the interaction of culture, action and experience in ecologically relevant decision-making.

Such a focus provides a means of identifying and relating relevant cultural domains and categories, and relevant action patterns.

Action requires more than the knowledge of a cultural belief, it requires knowledge and experience of situations in the social and ecological world. This has implications for the type of classification structures likely to be discovered in human cognition. Randall has pointed out that it is likely:

> "... that the most important classification problem routinely facing intelligent human is to operate adequately in a physically demanding, complex, and often dangerous socioecological environment. Doing this does not involve constructing taxonomic trees, but rather, in a particular situation, selecting a contrast set of characteristics which is both sufficiently specific to achieve a practical and safe result and sufficiently general to accomplish one's purposes efficiently. If this is the primary use of classification, then it is in the mechanisms of choice and in the historical context of choice than we must look for an explanation of classification" (Randall, 1976:552).

In order to act and decide men must organize an ideational construct of the situation and a set of goals or values compounded out of cultural beliefs, personal experience, history and situational factors. One framework for describing and analyzing these constructs for action in particular situations is decision-making model. Decisions may be defined, for the purposes of this discussion, as:

> "The selection (consciously or unconsciously) of a mode of action which can be considered on the basis of one's evidence, as cognitively distinct from another mode of action" (Howard, 1963:434).

The situations are themselves known for actors and the cultural analysis should consist not only of cultural beliefs about actions but of the cognitive organization of contexts in which cultural beliefs about actions are appropriately applied (Basso, 1972:46). In an interesting study of an Athapascan Indian community in Western Canada, Basso has shown in a simple case how classification of ice conditions, means of travel, and degrees of safety and risk are related in a structure that is the basis for a practical set of rules for behavior specifically related to the relevant features of the social and physical contexts in which they are used and acted upon (Basso, 1972). Basso links three sets of native categories: a classification of objects, including persons, toward which behavior is directed; a classification of appropriate situations for behavior; and, a classification of segments of the behavioral repertoire, the alternative actions an individual has at his disposal (Basso, 1972:33; see also Keesing, 1967:2). Basso's analysis illustrates, in his own words:

> "... both the feasibility and the utility of describing the performance of cultural activities in reference to decision-making processes in which conceptual categories and situational variables work <u>together</u> to condition the selection of behavioral alternatives" (Basso, 1972:47).

The linking of cultural beliefs about the things in the world to the cognitive ordering of situations and behavioral alternatives through decision-making offers a way to link cultural analysis to real actors in real situations.

D - The Present Study

In the present study I describe those cultural belief systems of the Waswanipi which are relevant to their understanding of their environment and their own place in it. I do this with two aims in mind. On one hand I want to describe the belief system as a means of meaningfully ordering the experiences of the Waswanipi world. On the other hand I try to show how this belief system is used to act meaningfully in that world, so as to both confirm understandings and accomplish intentions.

I attempt to formulate this basic analysis of Waswanipi culture in a way that is generally consistent with the particular interests of an ecological anthropologist. The techniques used by anthropologists to study beliefs and values are diverse including the analysis of myths and folklore, rituals, cosmologies, linguistic structures, and public symbols (see review by Black, 1973). For the ecological anthropologist however, an extensive analysis of the sort demanded by contemporary standards for the description of belief systems and culture through analyses of myths, ritual practices, or linguistic structures, will in most cases represent a detour from the main focus of the work and will preclude completing the main goals within the framework of a single study. Fortunately, in my view, this detour is not necessary.

Current studies of belief and value have reaffirmed that any one of many types of culturally informed action can reveal the cultural structure. It seems probable that the structure appears somewhat differently in each case, some features being uniquely revealed in each type of research, and common features being emphasized differently in each type of study (for recent discussion, see LaFontaine, 1972:xvii; Laboratoire d'anthropologie amérindienne, 1973). The important point however is that the study of any of the many culturally informed patterns of action appears to be capable of revealing a significant portion of the structure of the culture. This would appear to follow from the fact that cultures have been shown to have replicate structures in many different domains. The similarity of cultural structure as revealed by alternative data and methodologies has been made clear again in recent studies of eastern Algonkian cultures. Using ethnoscientific methodologies, Black (1967) generally confirmed Hallowell's (1955) world view analysis of key parts of Ojibwa culture structure; and, using narratives and ritual respectively, Preston (1975) and Tanner (1976) have reached a comparable view of key parts of Eastern Cree culture; and, studying myths Savard (1971, 1973, 1977a, 1977b) and Lefebvre (1971) have shown Montagnais cultural structures that parallel those revealed by ethnozoological analyses (Bouchard and Mailhot, 1973), and ritual analyses (Vincent, 1973, 1977).

For the ecological anthropologist, this holds out the promise that rather than gathering a totally distinct body of data from which to analyze the belief and value components of a culture it may be possible to derive these largely, but not entirely, from data that would be gathered as part of a decision-making study in any case. The analysis will be distinct, but the data will be directly related to informants explanations of ecologically relevant action, as opposed to a general study of myths, or rituals as such.

On this assumption I collected accounts of the interaction of men and the other 'living beings' of their world as reported by the Waswanipi, and used this series of statements, this ethnoecological data, in order to reveal a part of the culture of the Waswanipi, namely that part that is ethnoecologically relevant. In particular, I started by asking the Waswanipi to teach me what are the usable parts of their world, and how they proceed to use them. The emphasis was on asking people what animals they use, and how they hunt them. This account revealed the things of their world (Chapter 4), the causality, value and meaning of the world (Chapter 5), and the recipes or plans for action (Chapter 6). Secondly, these data were related to observation and records of the actual actions of hunters. This behavioral analysis of actual performances is discussed later in this study.

In practice, in the field, beginning the work by asking what existed in their world, and then asking what they used, and how they hunted struck informants as an extremely natural procedure. It led <u>them</u> eventually to suggest that I should learn some of their explanations because, as they explained to me, I could not really understand what I was learning about hunting activity without understanding what it meant to them. The study of the Waswanipi account of things and of their own hunting activity therefore led into a study of the belief and value systems by which they explained that activity and its consequences. There was therefore an integrated framework for gathering data on ethnoecology and on ecologically relevant activities.

This method of proceeding explains the separation made between parts II and III of the present study. Part II is mainly based on the analysis of Waswanipi verbal accounts of their activities and beliefs and values which are analyzed to reveal a culturally shared system of knowledge. Part III is based on the analysis of actual activities undertaken in specific circumstances by specific individuals, and recorded either by observation or from actors' reports, but analyzed in this case to reveal the situational relevance of the action and its actual consequences. No *a priori* assumption is made about the correspondence between the cultural structure as revealed in statements about hunting, and the specific actions of individual hunters as independently recorded. These relationships are sought rather than presumed.

In part II of this study I focus on the cultural system. Chapter 4 describes the folk classification of the domain 'living beings'. I focus on the most commonplace 'living beings' and show how the understanding of these categories and their organization can be enhanced by contextualizing them in relation to parallel domains and in relation to higher order categories. Specifically I look at how commonplace 'living beings' are related to the categories of food for human consumption, and how they are related to the most broad categories of 'living beings' which ultimately define the extension of the world and the limits of the knowledge the Waswanipi have of it. In the process of providing this description I use various techniques for gathering the relevant data, techniques that are informed by formal methods but that do not constitute a full formal eliciting nor a full ethnosystematic analysis. The results of the study of the categories of 'living beings' confirm the existence of a set of natural categories at the lower taxonomic levels. However, the analysis also strongly suggests, data are insufficient to demonstrate, that these categories and the more inclusive categories of 'living beings' are not organized into a taxonomic structure by the Waswanipi themselves. I suggest one of the reasons why this may be the case, namely that various logical principles for relating categories may be applied jointly, rather than individually, to organize cognition, and there may be as a result, cultural variation in the resulting logical structures of domains in different cultures. This issue is developed at the end of the next chapter.

Chapter 5 is a description of the basic propositions and values that the Waswanipi use to explain the relationships among the 'living things' of their world, and that serve as principles for action in that world. The focus is on the cultural meaning of 'hunting' which I show to be central to Waswanipi knowledge of themselves and their world. I show how there are a small number of basic models of the relationships between 'living things' and how these models are used in diverse domains. I also show how specific categories of 'living beings' come to have a broad range of meanings because they are related to categories in diverse domains, and how such "multi-vocal" categories are central to Waswanipi propositions and values. In the course of analyzing Waswanipi cultural knowledge I find it necessary to go beyond the analysis of elicited data to analyze implicit relationships between statements and a limited number of ritual actions.

In the final chapter of Part II I show how the Waswanipi formulate basic models for action, recipes, using the categories, propositions and values discussed in the previous two chapters. The primary focus is on models for hunting the most important 'animals'. I use a decision-making framework in this chapter to integrate the basic elements of the models for action. I attempt, by focussing on decision-models to formulate Waswanipi culture not only as a model of hunting, but as a model for hunting. Decision-models make it possible to link the study of beliefs to models for action and then to link models for action to real situations. Decision-models can be used this way because they provide a framework for the actors, and for the analysts, to formulate anticipations of action and their consequences and to compare and analyze such anticipations in relation to the record of action in real situations. For the actor, the consequences of action are related to anticipations in complex ways that influence the actual historical course of action. For the analyst, the intention is not to find some simple congruence, but to document the actual historical interaction of culture and action.

This use of decision-models in cultural analysis can, I think, provide a highly effective way of linking cultural and ecological anthropology. This is, of course, not new in anthropology. The use of decision-making as a construct in anthropology has been called for by several authors (cf., Goodenough, 1971, Frake, 1962a, 1962b; Howard, 1963; Werner, 1966; Videbeck and Pia, 1966; Keesing, 1967; Kay, 1970:20). Nevertheless, the use of decision-making frameworks has not become widespread among cultural anthropologists interested in cognition, partly I suspect because of an overemphasis and over-extension of the distinction between "anticipation" as opposed to "prediction", "competence" as opposed to "performance" (for an example of such over-extension see Tyler, 1969:13-14) and symbolic as opposed to normative (Schneider, 1968). If ultimately culture and action are dialectically related, as has been claimed earlier, then it is critical that the relationship be a focus of the research on human cultures. For ethnoecology this will require moving from a study of folk systematics to classifications of any relevant things, plus relevant contexts and behaviors and the linking of such classifications to the study of meaning on one hand and to models for decision processes on the other. In Part III of this study, I go on to use the decision-models formulated in Chapter 6 to help explain and comprehend the actual record of hunting performances of the Waswanipi.

Footnotes for Chapter 3

1. For statements parallel to those of Geertz see Hallowell, 1950, 1956 and 1960; and Keesing, 1974:74; and also Geertz, 1962.

2. "Cultural ecology" is used here in the sense of a human ecological study comprising ideational elements, and not in the sense in which Julian Steward used the term. The distinctions involved are reviewed at other points in this study.

3. In my use of "ethnoecology" I do not imply adherence to formal eliciting techniques or formal semantic analysis as the means of producing an ethnographically sound study, for reasons I will indicate. When I mean the latter I use the term "formal semantic analysis" and if I want a wider term to also include formal eliciting methods I use "formal methods".

4. This is not intended to be a comprehensive assessment of folk systematics from the perspective of cognitive anthropologists, nor from the point of view of general anthropology, it is specific to what I take to be the interests of ecological analysis in anthropology.

5. Glosses are translation labels that are recognized to be neither definitions nor exact equivalents, but necessary for analysis and communication (Conklin, 1962a).

6. In passing it should be noted that in the senses of "etic" and "emic" used here, there is not a choice to be made between pursuing a solely emic nor a solely etic descriptive or analytic procedure, as has sometimes been claimed (Harris, 1968). Cultural studies in the view adopted here are necessarily both etic and emic.

7. The extent to which scientific systematics reflects biological reality, and the existence of "natural" species have been debated among biological scientists as well as among social scientists interested primarily in folk systematics. For references see Conklin, 1972 and Berlin, n.d.

8. For a recent discussion of measuring the degree of correspondence between folk and scientific biological classifications see Hunn, 1975b. He does not however account for the complexities Bulmer raises.

9. Black's unique beginner was not labeled with a lexeme, but a derived inflected form (Black, 1967:228). The lack of a mono-lexemic label for the unique beginner is not unique as we indicated above.

10. Berlin, Breedlove and Raven say in their monograph on Tzeltal Plant Classification that an:

> "important ethnographic concern is to indicate in what ways the Tzeltal utilize their knowledge of plants... how the recognized natural resources of

> the plant world are exploited in ways of cultural significance" (1974:xv).

The ecologically concerned anthropologist will however be disappointed that the ethnography does not go significantly beyond a listing of the uses to which each plant is put.

11. In some respects, this issue is a variation on the question of the "psychological validity" of componential analyses (Wallace and Atkins, 1960; Romney and D'Andrade, 1964; Hammel, 1964; Conklin, 1964; Wallace, 1965; Goodenough, 1965; Schneider, 1965; Colby, 1966; Burling, 1964, 1969; Tyler, 1969a). The problem now however is not that there are too many solutions, but rather too few.

CHAPTER 4 - WASWANIPI CONCEPTS OF THE LIVING BEINGS OF THE WORLD

It has been claimed that hunting is the central activity of James Bay Cree people and that the experience of hunting whereby men kill animals and then eat their bodies to sustain themselves and their families is an experience laden with implications that touch the core of the Cree culture. In this and in the next chapter I try to demonstrate specifically how and why this is so. The first aim was to determine basic elements of the Cree classification for use in further questioning, and then to place Cree concepts of animals and living things into their cultural context in order to comprehend their role in the structure of meaning the Cree give their world.

The purpose of the present chapter is to identify, order and discuss Waswanipi concepts ofthe domain living beings; because living beings are critical in ecological analyses, and because some living beings are the object and the source of the hunt. In this chapter I explore some of the basic organization of animal living being categories by studying the relationships among the categories, and with the categories in the closely related domain 'foods', and then by setting these common 'living beings' in the context of the more extensive categories of the 'living beings' domain. The analysis raises questions concerning the assumed universality of orders based solely on the principle of logical inclusion.

For the purposes of the present study it was necessary to elicit data in the early stages of fieldwork on the Cree classification of and names for the different kinds of animals and living things which the Cree conceive as components of the world in which they live. For the purposes of this study, and for the reasons cited above, a full study of Cree folk systematics was thought not to be appropriate and none was undertaken. Emphasis was placed on the study of those domains that were revealed to be the most significant and relevant, and only broad surveys were made of those domains which data indicated were of lesser significance. Methodologically this chapter represents the results of my efforts to use and develop a number of techniques whereby cognitive data relevant to a study in cultural ecology can be efficiently gathered early in the research process. Many of the methods developed by ethnoscientists are highly rigorous, but also require so much time and effort to use that research never gets beyond the ethnoscientific data and their analysis. I have tried to find field techniques and procedures that will provide data for the definition of conceptual categories and of the basic organization of such categories but which are sufficiently efficient that such work can comprise only a part of a larger study. As such I have drawn on some ethnoscientific techniques, but I have not applied them as would an ethnoscientist because I felt I was able to check my results against data being collected by a wide range of other techniques. Methodologically the present study has been a preliminary experiment toward this end.

In addition to developing appropriate eliciting frames, I have used two methods in particular at the earliest stages of the study, identification of illustrations and picture sorting. The aim was to provide partially structured data gathering situations that were not overly formalized. The methods I used were not intended to provide comprehensive and definitive analyses by themselves. Rather, I used these methods to provide basic data relatively early in the research program that: a) were needed to pursue other aspects of the research in a culturally informed manner; b) allowed for the checking of the preliminary data during other aspects of the research program, especially using less structured techniques such as informal interviews and participant observation; c) allowed for the integration of the preliminary data with contextualizing data from parallel domains or larger domains; d) made it possible to present the results in a clear format. In this and in the next two chapters, I indicate the accomplishments and limitations of the methods used, in the course of presenting a basic outline of the Waswanipi belief system for hunting and living in the world.

A - Specific Categories of Animal Living Beings, "Natural" Categories

The first and primary technique used to elicit the Cree classification of the animals and plants recognized as distinctive kinds was to have informants examine illustrations of animals and plants in the standard biological inventories for Canada or Quebec and to have them identify those kinds that were either known to them or found in the Waswanipi region. This method was comparatively simple and quick to use, and it was supplemented by field observation and checks of the most common kinds of animals. The method however has specific limitations, some of which it shares with the more common method of observing and collecting specimens, and some of which are unique and make the results here difficult to directly compare with other ethnosystematic accounts based on the collection of specimens.

The problems of this method of proceeding are that it presents for identification phenomena (illustrations) that: 1) are not in context so that behavior and habitat cannot be observed directly, although they can be, and were, discussed; 2) lack those physical features that depend on three dimensional presence, particularly size and accurate color; 3) the illustrations tend to emphasize, by perspective, posture and other means, those features considered most distinctive to Western observers who, for example, are often concerned with distinguishing a given species from a similar species found elsewhere but not necessarily found in the region inhabited by the people under study. The first of these problems is true of the use of collected specimens as well as of illustrations. A result of the second and third problems is that illustrations have a higher level of ambiguity for identification than would a specimen. There is a question therefore of the quality of the illustrations and of the reliability of the responses. This problem has been partly resolved by frequent observation and identification of common animals in naturally occurring settings with Waswanipi informants. In the case of some of the animals that appeared to be important but which were sufficiently uncommon that natural occurrence was not frequent, specimens were sought from informants and identified by the author in the field according to standard keys for identification. This method was only used however for a limited number of animals. Observation and examination of specimens, resolved some but not all of the ambiguities of identification. Cases where ambiguity is known to still exist are identified in the data presented below.[1]

A second question concerns distortions in the results that may have been introduced because the items presented for identification were not naturally occurring objects but rather illustrations designed to distinguish as discrete units those animals or plants identified as discrete by Western science, that is, the species classification. To the extent that these distinctions are picked up by informants the illustrations may encourage identification of units that are not normally distinguished. On the other hand the illustrations or the absence of illustrations that would be appropriate to the Waswanipi context, may fail to elicit units that are normally distinguished.

I was alert for indicators of the occurrence or non-occurrence of the first of these potential problems, a form of over-identification. Observations of animal and plant identifications in naturally occurring settings were sufficient to establish a high level of confidence that this potential problem did not occur with the most commonly occurring species. The elicitation setting itself provided further evidence because cases of grouping separate illustrations together and saying they were all the same kind of animal did occur in the interviews, and there was a level of agreement between informants in these cases that appeared to be comparable to the level of agreement achieved in general. Furthermore, particularly interesting case was found where an informant reported he had learned to distinguish two kinds of what he had previously taken to be a single kind of animal from information provided by visiting scientists. The informant made clear the source of her knowledge and clearly distinguished it from culturally recognized knowledge. This range of observations leads me to believe that over-differentiation is not a serious problem in the present data.

My observations indicate that the identifications made were, in general, in common use in everyday situations, and were used and agreed upon by a much larger number of informants than those that were specifically asked to identify the illustrations. Cases of individual knowledge and use were also distinguishable.

This does not mean, however, that Western scientific classifications have not had an impact on Waswanipi classifications; two cases of a Western classification possibly affecting Waswanipi classifications are cited. These possible impacts on classification have a long history in the region, and are simply treated here as parts of the process of Waswanipi culture today. As the data indicate the Waswanipi classification was clearly distinctive from the western scientific classification and, as I will show later, was well integrated into its wider cultural context. The classification reported herein is therefore presented as a reasonably accurate account of the socially shared and learned classification in use by Waswanipi at the time of the study.

The fact that some informants were well aware of differences between their classification and a Western account led them to clearly point out the differences of which they were aware. This was brought out during the eliciting procedure in the numerous cases, for example, when informants would, while observing a single illustration, say that the Waswanipi know there are several kinds of those animals, and proceed to list the different kinds and their distinctive features. In at least one case mentioned below, the scientific record indicates that the Waswanipi may have taught a difference to some of the visiting scientists.

Under-identification, meaning failure of the eliciting procedure to generate a complete list of classifications, does however remain a problem, as it would with any method used for a brief period at the beginning of a study. One aspect of this will be discussed below, but for present purposes it is important to note that the classifications presented may not be complete. In the cases of common mammals and larger fish, I believe the lists are complete on the basis of naturally occurring observations, but for birds sufficient observations were not made and the list is incomplete, as it may also be for small fishes. In the cases of amphibians, reptiles and insects the illustrations I worked with proved to be both incomplete and relatively more ambiguous than those for mammals, fish and birds, and the results presented here should be considered preliminary and substantially incomplete. It should also be noted that animals from many classes were simply not studied at all, including crustacea and other non-insect invertebrates.

The method of eliciting by means of illustrations, like the method by means of specimens, has the potential advantage that it is not dependent on necessary verbal labeling of concepts. To check whether eliciting verbal labels would significantly affect identification in the present case, the initial runs were made in two ways. Some informants were asked to identify all the animals they recognized in the illustrations but no names were asked for, while other informants were asked to give the names of the animals they knew in the illustrations. In both cases it was found that informants included in their identifications animals they recognized on the basis of verbal reports of others but which they had never seen and they also included identifications of rare animals which they recognized on the basis of a very limited number of observations in their lifetimes, and for which they reported there was no Cree name.[2] Because these initial runs with the two methods showed no significant difference between identifications when names were requested and when they were not, later eliciting sessions were accompanied by requests for names.

One final small-scale check was run to see if any distortions of identifications of categories by Waswanipi informants may have resulted from use of illustrations from Western texts. A local Waswanipi man who was noted for his drawings was commissioned to draw a series of pictures of animals common in the Waswanipi environment, mainly for a picture sorting test which will be discussed below. Thirty-nine illustrations were prepared and they were also used to elicit identifications and names of the animals. The names were identical to those collected with the scientific illustrations, and the identifications were comparable. The identifications even showed similar levels of ambiguity and uncertainty suggesting that the problem of ambiguous identification, at least for common animals, related to the use of illustrations, rather than to the source of the illustrations.

Results of the illustration identification sessions are presented below. The identifications of illustrations are presented first along with comparisons to the scientific lists of species found in the region. This is done only for those groups of animals for which the data on Cree identifications are reasonably complete. More extensive data on the naming of animals is then presented.

Extended comments on the particular identifications and on ambiguities are presented in appendixes that explain the tables. One set of Waswanipi identifications of living beings was elicited with illustrations in The Mammals of Eastern Canada by Randolph L. Peterson (1966). The book contains line drawings of approximately 100 mammals, of which 35 appear on the scientific list of mammals of the Waswanipi Region (Appendix 4-1).

Reviewing the approximately one hundred illustrations in the text, Waswanipi informants identified thirty as animals commonly known to them, excluding apparent misidentifications. In addition, they identified illustrations of three animals known to them but not considered as usually occurring in the region at present (arctic fox, polar bear[3] and seal). Illustrations of five of the animals of the mammals list were not identified by Waswanipi informants. Four were of rats, mice or voles. While the relative cultural importance of these animals is low, the data suggest that lack of identification was linked to problems with illustrations. One informant mentioned the existence of other animals of that kind, but he did not find illustrations of them. If this case of unclear illustrations is excluded it appears that in all but one case, least weasel, the Waswanipi informants distinguish distinct kinds of living beings that correspond one to one with the scientific species classification of mammals.

A list of the illustrations of species that appear on the list of mammals of the Waswanipi region and/or that were identified by informants as occurring in the region or known to them appears as Table 4-1.

The labels of the various taxa were also collected, as indicated above, and the names, including the variations are listed on Table 4-2. Most identifications from illustrations of mammals were clear and unambiguous. In Appendix 4-2 I review the evidence for the identifications that I treated as incorrect, and I review the data on those species that were not identified by the Waswanipi.

The illustrations of fishes in Freshwater Fishes of Eastern Canada by W.B. Scott (1967) were used to elicit identifications by Waswanipi people of living

Table 4-1 List of Illustrations of Mammals Identified as 'Living Beings' Known by Waswanipi Informants

Illustration Names[1]	List of Mammals of the Waswanipi Region[4]	Identified as Known by Waswanipi Informants (Number of Informants)
Pigmy Shrew	X	2
Masked Shrew	X	5
Water Shrew	X	1
Star-nosed Mole	X	5
Eastern Mole[3]	-	1
Little Brown Bat	X	4
Silver-haired Bat[3]	-	1
Snow-shoe Hare	X	4
Arctic Hare[3]	-	1
Eastern Cottontail[3]	-	1
Eastern Chipmunk	X	4
Woodchuck	X	5
American Red Squirrel	X	5
Northern Flying Squirrel	X	4
American Beaver	X	5
Deer Mouse	X	2
Gapper's Red-backed Vole	X	0
Southern Bog Lemming	X	2
Heather Vole	X	0
Muskrat	X	6
Meadow Vole	X	0
Meadow Jumping Mouse	X	1
Woodland Jumping Mouse	X	0
Porcupine	X	5
Wolf	X	5
Red Fox	X	6

(CONTINUED)

Table 4-1 List of Illustrations of Mammals Identified as 'Living Beings' Known by Waswanipi Informants (Continued)

Illustration Names[1]	List of Mammals of the Waswanipi Region[4]	Identified as Known by Waswanipi Informants (Number of Informants)
Arctic Fox[2]	-	3
American Black Bear	X	5
Polar Bear[2]	-	2
American Marten	X	6
Fisher	X	5
Ermine	X	5
Least Weasel	X	0
American Mink	X	6
Wolverine	X	4
Striped Skunk	X	6
River Otter	X	6
Lynx	X	6
Seal[2]	-	3
Caribou	X	4
White-tailed Deer	X	4
Mouse	X	6
Pygmy Sperm Whale[3]	-	1
Racoon[2]	-	1

Footnotes:

1. Names after Banfield, 1974.
2. Informants reported as known by them but not regularly occurring in the Waswanipi region.
3. Apparent mis-identification by informant #2, see text.
4. From Appendix 4-1.

Table 4-2 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Mammals

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure Number (Peterson, 1966)	Nos. of Informants[1]	English Gloss	Comments
činistokapikošiš (apokšiš)	"sharp nose" apokšiš	6	19,69,2,52[2],71[2]	Long-tailed Shrews	Picture of common shrew; informant (69) stated there are "three kinds of apokšiš"
	"same"	6	69		Picture of water shrew
	"same"	6	69		Picture of pigmy shrew
apoksisatint$_s$ueo?	"small"	6	2	?	Picture of pygmy shrew; identification uncertain
katčinoioetapokšiš (apokšiš)	"long tailed" apokšiš	78-79	19,2	Deer Mouse	May include other species
nipiapokšiš (amiskapokšiš, apokšišitč)	"water" or "beaver" apokšiš	87	19,69	Lemming Mouse	
kaosotaoapikošiš	"jumps far", three kinds	108	69	Jumping Mouse	

(CONTINUED)

Table 4-2 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Mammals (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure Number (Peterson, 1966)	Nos. of Informants	English Gloss	Comments
nanaspatenčešu (našpačinčešu)	"hands are on wrong side of body"	22	69,2,14,52,71	Star-nosed Mole	
		18	19		Picture of eastern mole
pikoalačiš (opikoalačiš)	"only one kind"	25	19,69,14,52	Little Brown-bat	
		31	2		Picture of silver-haired bat
oapuš		43	19,69,2,14	Varying Hare	Locally called "rabbit" in English
		45	71		Picture of arctic hare; informant indicated "summer" illustration which is very similar in appearance to varying hare.
		52	52		Picture of cottontail
anekočaš		61	19,69,2,71	Red Squirrel	Three kinds of "squirrels"
šašakaoanikočaš (šaškonikočaš, sakonikočas šašakoanekočas)	"long, narrow squirrel"	67	19,69	Eastern Chipmunk	

(CONTINUED)

Table 4-2 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Mammals (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure Number (Peterson, 1966)	Nos. of Informants	English Gloss	Comments
pimiaoanekočaš (maonikočas, miaoanekočas)	"flying squirrel"	73	19,69,2,14,52	Northern Flying Squirrel	
oinesk		63	19,69,2,14,52	Woodchuck	
amisk		75	19,69,2,14,52	Beaver	
oačesk (oačesko)		101	19,69,2,14,52,71	Muskrat	
kako (kaoko)		112	19,69,2,14,52	Porcupine	
maekan (maikan)		117	19,69,2,14,52	Timber Wolf	

(CONTINUED)

Table 4-2 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Mammals (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure Number (Peterson, 1966)	Nos. of Informants	English Gloss	Comments
mačešu (mačešo)		122	19,69,2,14,52,71	Red Fox	Cree recognize one "kind" of red fox, and several colors of pelts
ošaočešu (ousoučešu)	"red fox"		69,2	Red-colour phase	
makateočešu (maketeomačešu)	"silver fox"		69,2	Silver phase	
kaooanetukmačešu	"cross fox"		2	Cross or red and black phase	Identification uncertain
oiškunčešu	"dark fox"		69	Black phase	Identification uncertain
oapčešu (oapačešu, oapčešiš)	"white fox", "not here, one killed once by a man in his 40's"	120	19,69,2	Arctic Fox	

(CONTINUED)

Table 4-2 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Mammals (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure Number (Peterson, 1966)	Nos. of Informants	English Gloss	Comments
masko		126	19,69,2,14,52	Black Bear	
oapasco	"white bear" "we know of [it]"	128	69,2	Polar Bear	
sukšiš		132	19,69,2,14,52	Ermine	Locally called "weasel" in English, probably includes least weasel
sakoešu		138	19,69,2,14,52,71	Mink	
oapistan		142	19,69,2,14,52,71	Marten	
oček		144	69,2,14,52,71	Fisher	
kuekuačeo (kuekuečeo)		147	69,2,52,71	Wolverine	

(CONTINUED)

Table 4-2 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Mammals (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure Number (Peterson, 1966)	Nos. of Informants	English Gloss	Comments
šikoak (šikao)		151	19,69,2,14,52,71	Skunk	
ničuk		153	19,69,2,14,52,71	Otter	
pišu		158	19,69,2,14,52,71	Lynx	
ačuk	"known "not here"	164	19,69,2	Seal	First seal illustration in book
oaoaskešu (oaoaskešeo, oaškešu)		180	19,69,2,14	Deer	
mus		182	19,69,2,14,52,71	Moose	
ateko		184	19,69,2,52	Caribou	

(CONTINUED)

Table 4-2 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Mammals (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure Number (Peterson, 1966)	Nos. of Informants	English Gloss	Comments
"no name"	"killed one" in 1968	130	19	Racoon	Mask and tail preserved and seen
"no name"	"fish like that in Lake Matagami"	200	52		Picture of pygmy sperm whale; name not collected

Footnote:

1. Each person who served as an informant in this study was given an identification number which is used on this and successive tables.
2. Identifications, but no names collected from informants no. 52 and no. 71.

things of the Waswanipi region. Because difficulty was experienced identifying some fishes from the small scale photographs in Scott's book, in later sessions line drawings in Les Poissons du Québec by E. Juchereau-Duchesnay and St-Denys Duchesnay (1964) were used as well, in conjunction with Scott.

There are approximately 110 illustrations of fish in the book by Scott, and there are 26 species that are considered likely to occur in the Waswanipi region (Appendix 4-1). The identifications made by Waswanipi are listed on Tables 4-3 and 4-4, the names appearing on the latter.

The fourteen illustrations of fish on the list of fishes of the region were identified as known to the Waswanipi, although ambiguity remains with respect to some identifications. All informants identified the photos of the mooneye and goldeye which were side by side in the Scott book. They indicated however that they were the same fish. As mentioned above, one informant told me that her father recognized that these were two different fishes because about 1963 he had worked with two biologists who had come to study the fishes of the region, and they had showed him that they were two different fishes. Before that he believed that they were one kind of fish. In the present study I consider the single classification to best represent the Waswanipi culture classification at the time of this study. It is interesting to note that the Waswanipi fisherman and the biologists were able to communicate about the classification of the specimens and one was able to convince the other that a distinction exists where it had not been noted before.

With respect to nemeo and činošeo, identified from illustrations of sturgeon and pike respectively, informants indicated that they recognized more than one kind of each of these fish. Each kind has the same name, plus a second descriptive term. Two kinds of 'sturgeon' are recognized by informants as common in the region, the distinction being made primarily, but not solely, on the basis of color, the black fish being considered distinct from the grey. The black fish are only found in some lakes, Olga and Pusticamica are those most often mentioned. At least one family recognizes a third kind of 'sturgeon'

Table 4-3 List of Illustrations of Fishes Identified as 'Living Beings' by Waswanipi Informants

Illustration Names[1]	List of Fishes of the Waswanipi Region[6]	Identified as Known by Waswanipi Informants (Number of Informants)
Lake Sturgeon	X	4
Mooneye	X	) 4
Goldeye	X	)
Brook Trout	X	3
Lake Trout[2]	-	3
Lake Whitefish	X	4
Cisco, Lake Herring	X	4
Golden Shiner[3]	-	2
White Sucker	X	4
Longnose Sucker	X	4
Northern Redhorse[3]	-	2
Fallfish	X	3
Common Shiner[3]	-	2
Chubs (other Species)[3]	-	1
Northern Pike	X	4
Burbot	X	4
Trout-perch	X	-
Walleye	X	) 4
Sauger[4]	X	)
Yellow Perch	X	3
Bluegill[3]	-	1
Logperch	X	-
Mottled Sculpin	X	-
Slimy Sculpin	X	-
Spoonhead Sculpin	X	2
Deepwater Sculpin[3]	-	2
Creek Chub	X	-

(CONTINUED)

Table 4-3 List of Illustrations of Fishes Identified as 'Living Beings' by Waswanipi Informants (Continued)

Illustration Names[1]	List of Fishes of the Waswanipi Region[6]	Identified as Known by Waswanipi Informants (Number of Informants)
Spottail Shiner	X	-
Blacknose Shiner[3]	-	1
Lake Chub	X	-
Ninespine Stickleback	X	-
Brook Stickleback	X	-
Longnose Dace	X	-
Pearl Dace	X	1
Carp[5]	-	1
Goldfish[3]	-	1

Footnotes:

1. Names from Scott and Crossman, 1973.
2. Informants reported as known by them but not regularly occurring in the Waswanipi Region.
3. Apparent mis-identification by informants, see text.
4. Illustration not chosen but existence noted, see text.
5. Uncertain identification, see text.
6. From Appendix 4-1.

Table 4-4 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Fish

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure No. (Page in Scott, 1967 (S) or Juchereau-Duchesnay, 1964 (J))	Nos. of Informants	English Gloss	Comments
nemeo		7(S)	2,81,114,115	Lake Sturgeon	
mašamekos	"small" mašamek	21(s),11(J)	2,114	Brook Trout	
mašamek		21(S),11(J)	81	?	Picture of brook trout; may be used for both brook and lake trout (which are not found at Waswanipi)
		23(S),13(J)	114		Picture of lake trout
nemeks (nemakoš)	"not here"	23(S),13(J)	81,115	Lake Trout	
ate' amek (atekameko, atikamek)		27(S),17(J)	2,81,114,115	Lake Whitefish	

(CONTINUED)

Table 4-4 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Fish (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure No. (Page in Scott, 1967 (S) or Juchereau-Duchesnay, 1964 (J))	Nos. of Informants	English Gloss	Comments
iutenemek (utenemko)	"lots of Olga Lake",	57(S)	115	Round Whitefish?	Picture of golden shiners; Identification very uncertain
	"not many", "jumps, makes waves", "windfish"	51,52(S)	81		Picture of goldfish, carp
	"windfish" "round white-fish"	27,29(S)	114		Picture of whitefish, cisco "like iutenemek"
očulapi		29(S)	2,81,114,115	Cisco	
(očulapies)		57(S)	81		Picture of golden shiner
nepakatso (nepakatsu, nipakatišao)	"flat fish"	34,35(S)	2,81,114,115	Goldeye includes Mooneye	
činošeo (činoša)	"lots of colors", "longfish"	39,41(S)	2,81,114,115	Pike	Picture of Northern pike, muskellunge

(CONTINUED)

Table 4-4 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Fish (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure No. (Page in Scott, 1967 (S) or Juchereau-Duchesnay, 1964 (J))	Nos. of Informants	English Gloss	Comments
namapi		44(S)	2,81,114,115	White Sucker	
mikoašan		45(S)	2,115	Longnose Sucker	
(mikošao)		45,47(S)	81,114		Picture of longnose sucker, Northern redhorse
aotuso		54(S)	2,114	Fallfish	Picture of fallfish; examined specimen
		54,60(S)	81		Picture of fallfish; common shiner
	"stonefish, lots in rapids"	60,64(S)	115		Picture of common shiner, chubs.
miakatu		80(S)	2,81,114,115	Burbot (Ling)	
okaš		100,101(S) 38(J)	2,81,114,115	Walleye includes Sauger	

(CONTINUED)

Table 4-4 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Fish (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure No. (Page in Scott, 1967 (S) or Juchereau-Duchesnay, 1964 (J))	Nos. of Informants	English Gloss	Comments
osaoeo		102(S), 37(J)	2,81,115	Yellow Perch	
(ošaoeo, osaoeš, ošaoes)		93(S)	114		Picture of bluegill
očikiačueo ?		117,118(S)	2	Sculpins	Picture of sculpins; Informant uncertain of name
miakatus	"small miakatu", "friend of miakatu"	119(S)	81,115	Sculpins	Picture of sculpins
namešiš	"small fish"	66(S)	2	Small Fish general name	Picture of blacknose shiner
nemapiš		53(S)	2	?	Picture of pearl dace

on the basis of an unusual fish they caught many years ago. It had no boney plates on the back, and had hair-like structures in their place. This is not recognized as a distinct kind by other informants so far as I could determine. The Cree have apparently reported the two different kinds of 'sturgeon' they recognize to fisheries biologists who have worked in the area (Magnin, 1964:278-279; LeJeune, 1965:70; Roussow, 1957:555) and the biologists appear to accept the differences pointed out by the Waswanipi, but consider that in the scientific taxonomy this difference is at the level of sub-species of the single species of sturgeon found in the region. A similar distinction between brown and black sturgeon is recognized in other areas of the Province of Quebec by some biologists (Roussow, 1957:555).

In a similar fashion Waswanipi informants recognize two kinds of 'pike' one distinguished by its larger teeth. They also recognize considerable color variation in 'pike' but so far as I have been able to determine they do not use these variations as a basis for distinguishing kinds of pike, but rather for descriptive terms applied to particular specimens. The two kinds of 'pike' have not been recorded or discussed by fisheries biologists. A number of problems of identification were encountered especially with the smaller fish and these are discussed in the notes on the identifications, which appear as Appendix 4-3.

Eliciting of identifications of birds was done using the colored illustrations in W. Earl Godfrey's The Birds of Canada (1966). There are approximately 450 illustrations of bird species, many including separate illustrations of the sexes, of mature and immature forms, of seasonal variations and of details of the appearance of the bird. Approximately one hundred and thirty species appear on the list of the birds of the Waswanipi region (Appendix 4-1). Cree informants selected 111 illustrations as known to them, of which 45 were not on the list of birds of the Waswanipi region (Table 4-5). Of these 45, twenty-one were apparent or highly probable mis-identifications, the remaining twenty-four were birds that probably do occur in the Waswanipi region. These may occur

Table 4-5 List of Illustrations of Birds Identified as 'Living Beings' by Waswanipi Informants

Illustration Names[1]	List of Birds of the Waswanipi Region[3]	Identified as Known by Waswanipi Informants (Number of Informants)
Common Loon	X	3
Red-necked Grebe	-	1
Horned Grebe	-	2
Great Blue Heron	-	2
American Bittern	X	3
Canada Goose	X	4
Brant	X	-
Snow Goose	X	2
Black Duck	X	3
Shoveler[2]	-	1
Pintail	X	1
Mallard	-	2
Green-Winged Teal	X	-
Blue-Winged Teal	X	-
Ring-necked Duck	X	-
Lesser Scoup	X	2
Greater Scoup	X	1
Common Goldeneye	X	3
Bufflehead	-	2
Old Squaw	-	3
Common Scoter	-	4
White-winged Scoter	-	3
Surf Scoter	-	2
Common Merganser	X	2
Red-breasted Merganser	-	2
Hooded Merganser	-	1
Bald Eagle	X	4

(CONTINUED)

Table 4-5 List of Illustrations of Birds Identified as 'Living Beings' by Waswanipi Informants (Continued)

Illustration Names[1]	List of Birds of the Waswanipi Region[3]	Identified as Known by Waswanipi Informants (Number of Informants)
Golden Eagle	X	-
Marsh Hawk	X	1
Goshawk	X	1
Osprey	X	1
Red-tailed Hawk	X	-
Pigeon Hawk	X	1
Sparrow Hawk	X	-
Sharp-Shinned Hawk	X	-
Broad-Winged Hawk	X	-
Gryfalcon (adult)	-	1
Peregrine Falcon (immature)[2]	-	1
Ruffed Grouse	X	4
Sharp-tailed Grouse	X	2
Greater Prairie Chicken[2]	-	2
Spruce Grouse	X	3
Willow Ptarmigan	X	4
Rock Ptarmigan	-	1
Semipalmated Plover	X	1
Short-billed Dowitcher	-	1
Greater Yellowlegs	X	3
Lesser Yellowlegs	X	2
Sharp-tailed Sandpiper[2]	-	1
Upland Plover[2]	-	1
Common Snipe	X	1
Spotted Sandpiper	X	1
Semipalmated Sandpiper	X	1
Sandpipers (lots, not specifically identified)		1

(CONTINUED)

Table 4-5 List of Illustrations of Birds Identified as 'Living Beings' by Waswanipi Informants (Continued)

Illustration Names[1]	List of Birds of the Waswanipi Region[3]	Identified as Known by Waswanipi Informants (Number of Informants)
Virginia Rail	x	-
Sora	X	-
American Coot	X	-
Killdeer	X	-
American Golden Plover	X	-
Blackbellied Plover	X	-
Solitary Sandpiper	X	-
Pectoral Sandpiper	X	-
Least Sandpiper	X	-
Herring Gull	X	3
Iceland Gull[2]	-	1
Glaucous-winged Gull[2]	-	3
Bonaparte's Gull	X	-
Common Tern	X	2
Caspian Tern[2]	-	1
Forster's Tern[2]	-	1
Arctic Tern	-	1
Roseate Tern[2]	-	1
Belted Kingfisher	X	4
Mourning Dove	X	-
Great Horned Owl	X	4
Snowy Owl	-	4
Great Gray Owl	X	1
Hawk Owl	X	1
Boreal Owl	-	1
Burrowing Owl[2]	0	1
Common Nighthawk	X	3

(CONTINUED)

Table 4-5 List of Illustrations of Birds Identified as 'Living Beings' by Waswanipi Informants (Continued)

Illustration Names[1]	List of Birds of the Waswanipi Region[3]	Identified as Known by Waswanipi Informants (Number of Informants)
Yellow-bellied Sapsucker	X	2
Downy Woodpecker	X	2
Northern Three-toed Woodpecker	X	1
Hairy Woodpecker	X	1
Red-headed Woodpecker	-	1
Yellow-shafted Flicker	X	-
Black-backed Three-toed Woodpecker	X	-
Olive-sided Flycatcher	X	1
Thraill's Flycatcher	X	1
Yellow-bellied Flycatcher	X	1
Eastern Wood Pewee[2]	-	1
Least Flycatcher	X	-
Barn Swallow	X	1
Tree Swallow	X	2
Bank Swallow	X	-
Gray Jay	X	2
Common Raven	X	2
Common Crow	X	3
Black-billed Magpie	X	1
Black-cupped Chickadee	X	1
Mountain Chickadee[2]	-	1
Gray-headed Chickadee[2]	-	1
Boreal Chickadee	X	-
Red-breasted Nuthatch	X	1
Winter Wren	X	-
Brown Creeper	X	-
American Dipper[2]	-	1

(CONTINUED)

Table 4-5 List of Illustrations of Birds Identified as 'Living Beings' by Waswanipi Informants (Continued)

Illustration Names[1]	List of Birds of the Waswanipi Region[3]	Identified as Known by Waswanipi Informants (Number of Informants)
Sage Thrasher	-	1
Skylark[2]	-	1
Swainson's Thrush	X	1
Hermit Thrush	X	1
Northern Waterthrush	X	1
Louisiana Waterthrush[2]	-	1
American Robin	X	3
Eastern Bluebird	X	-
Ruby-crowned Kinglet	X	2
Golden-crowned Kinglet	X	-
Cedar Waxwing	X	2
Bohemian Waxwing[2]	-	1
Northern Shrike	X	-
Solitary Vireo	X	-
Red-eyed Vireo	X	-
Philadelphia Vireo	X	-
Yellow Warbler	X	1
Parula Warbler	X	-
Black-and-white Warbler	X	-
Kirtland's Warbler	-	1
Magnolia Warbler	X	1
Tennessee Warbler	X	-
Magnolia Warbler	X	-
Nashville Warbler	X	-
Camp May Warbler	X	-
Myrtle Warbler	X	1
Townsends Warbler[2]	-	1

(CONTINUED)

Table 4-5 List of Illustrations of Birds Identified as 'Living Beings' by Waswanipi Informants (Continued)

Illustration Names[1]	List of Birds of the Waswanipi Region[3]	Identified as Known by Waswanipi Informants (Number of informants)
Black-throated Green Warbler	X	1
Black-throated Blue Warbler	X	-
Blackpoll Warbler	X	-
Bay-breasted Warbler	X	-
Blackburnian Warbler	X	-
Palm Warbler	X	-
Prairie Warbler	-	1
Ovenbird	X	-
Connecticut Warbler	X	-
Mourning Warbler	X	-
Common Yellowthroat	X	-
Canada Warbler	X	-
Wilson's Warbler	X	-
American Redstart	X	1
Baltimore Oriole	-	1
Rusty Blackbird	X	1
Brewer's Blackbird[2]	-	1
Red-winged Blackbird	X	3
Common Gackle	X	-
Brown-headed Cowbird	X	-
Common Startling	X	-
Bobolink	X	-
Evening Grosbeak	X	-
Pine Grosbeak	X	3
Common Redpoll	X	-
Pine Siskin	X	-

(CONTINUED)

Table 4-5 List of Illustrations of Birds Identified as 'Living Beings' by Waswanipi Informants (Continued)

Illustration Names[1]	List of Birds of the Waswanipi Region[3]	Identified as Known by Waswanipi Informants (Number of informants)
American Goldfinch	X	-
Purple Finch	X	-
Red Crossbill	-	2
White-winged Crossbill	X	1
Savanna Sparrow	X	-
Vesper Sparrow	X	-
Slate-colored Junco	X	-
Tree Sparrow	X	1
Chipping Sparrow	X	-
Field Sparrow[2]	-	1
White-crowned Sparrow	X	1
Golden-crowned Sparrow[2]	-	2
White-throated Sparrow	X	-
Swamp Sparrow	X	-
Lincoln's Sparrow	X	-
Fox Sparrow	X	-
Song Sparrow	X	-
Snow Bunting	X	3

Footnotes:

1. Names from Godfrey, 1966.
2. Apparent mis-identification by informants, see text.
3. From Appendix 4-1.

with varying degrees of frequency and uncommonness. At the extreme, one informant identified an illustration of a bird indicating that he had seen that bird once in his lifetime. Identification of other birds not on the list of common birds of the region is the result of the occasional occurrence of many birds, and of the annual migrations of many species which pass through the region briefly and/or occasionally. Many of the Waswanipi identifications fall into one of these two categories, but some appear to be of other types.

The illustrations of some sixty-six birds which occur on the list of birds of the Waswanipi region were not identified by informants. In cases where an illustration of a bird thought to occur in the territory was not selected, it is often difficult to determine the significance of the omission. In some cases it may indicate ambiguities in the illustrations for identification, in others it may indicate that the illustrated bird is included with other already identified. Illustrations were frequently too numerous to effectively pick up comments on such groupings. Some suggestions concerning these cases appear in the notes on the identifications in Appendix 4-4. The Waswanipi identifications coincided with birds on the regional list for 65 illustrations. A list of the names of the identifications appears on Table 4-6.

Identifications were also made with pictures of some amphibians and reptiles and some insects, but the illustrations used were not adequate and were used with only two informants each. The results are incomplete and tentative (Tables 4-7, 4-8). Identifications of plants and vegetation are listed in Appendix 4-5.

Comparison of those lower level categories of living things unambiguously identified in this study with the species classification of Western science indicates a generally high level of correspondence with respect to the distinctive kinds of animals (Table 4-9). This is especially the case for mammals and fish. However, the results of this study are <u>not</u> directly comparable to those of full scale studies in folk biology, and these results probably over-estimate the degree of correspondence. The comparison can only be made for those sectors of the range of identifications where a high degree of ambiguity did not make identifications for a given series of illustrations uncertain. On this

Table 4-6 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Birds

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Plate and Drawing Nos. (Godfrey, 1966)	Nos. of Informants	English Gloss	Comments
maak		1,1a	2,69,115	Common Loon	
maakus	"summer loon" "young, looks like this in summer"	1,1b	2,69	Young of the year	Illustration of young in first winter
šikip		2,1a	69	Red-necked Grebe	
šikipš	"smaller of two" šikip	2,4b	69,115	Horned Grebe	
otcičak (mištamaacošu, otičak)	"summer"	5,6	2,69	Great Blue Heron	
kapašišit maacuso (maacaoseo)	"small"	6,4	2,52[1],69	American Bittern	
nisk (nesk)		7,1	2,52,69,115	Canada Goose	Includes Brant?

(CONTINUED)

Table 4-6 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Birds (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Plate and Drawing Nos. (Godfrey, 1966)	Nos. of Informants	English Gloss	Comments
oaoao		8,1	2,115	Snow Goose	
(oeoeo)					
oapšip	"white duck"	9,1a,b	69	Pintail	
inšišip		9,2	52,69,115	Black Duck	
(inšep)		10,5	115		Picture of shovler
ominuk		9,3a,b	2,52	Mallard	Number 69 "never" drawing 9,3
mišukuško (misekousku, misuks)	"few nest"	12,3	2,69,115	Common Goldeye	Includes scaups?
	"smaller"	14,1	115		Picture of hooded merganser
		11,2,3	2		Picture of lesser and greater scaup
iukiškutešup		11,2	115	Lesser Scaup	

(CONTINUED)

Table 4-6 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Birds (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Plate and Drawing Nos. (Godfrey, 1966)	Nos. of Informants	English Gloss	Comments
oakeius (oačeuše, oačieusk)		12,2	69,115	Bufflehead	
aaoešiš	"lots in spring, none in summer"	13,1	2,69,115	Old Squaw	
kueskušepatum		13,3	2,52,69,115	Common Scoter	
(kuešipatum, kuekueskeošepatum)		13,5	2		
amiskošip	"beaver" duck	13,5	69,115	White-winged Scoter	
akuaikan (kuaikan)		13,4	69,115	Surf Scoter	
aseko (ašek, asuk)		14,2	69,115	Common Merganser and/or Merganser	Possibly used at two levels
		14,3	2,115		

(CONTINUED)

Table 4-6 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Birds (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Plate and Drawing Nos. (Godfrey, 1966)	Nos. of Informants	English Gloss	Comments
kapšišit asuk	"small asuk"	14,3	115	Red-breasted Merganser	
mit$_c$iseo (miksu, mitsu)		15,3	2,52,69,115	Bald Eagle	
pipunseo		16,1	69	Goshawk	"Winter" hawk
akošameseo	"summer"	16,5	69	Osprey	
t$_c$et$_c$ekus		18,2,a	69	?	Picture of peregrine falcon, first-year immature; identification uncertain
pisakatamoo		18,4	115	Pigeon Hawk	
paspasčeo (paspast$_c$eo)	"winter"	21,1	2,52,69, 115	Ruffed Grouse	

(CONTINUED)

Table 4-6 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Birds (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Plate and Drawing Nos. (Godfrey, 1966)	Nos. of Informants	English Gloss	Comments
atisko		21,2	69,115	Sharp-tailed Grouse	
(atesko)		21,3	52,115		Picture of prairie chicken
mištikueo	"winter"	22,2,3	52,69,115	Spruce Grouse	
(mistčekoeo)					
piao		22,2;21,3	2,114[2]	Grouse	General term
oapiao	"just in winter"	22,4	2,52,69,115	Willow Ptarmigan	
(oapeio)		22,5	115		Picture of rock ptarmigan
tueskis		24,4	69	Sandpipers	Picture of semi-palmated plover; diminutive of tčuesk. Includes plovers?
(tčueskšišit)	"lots of kinds"	27	2,52,69		Picture of sandpipers

(CONTINUED)

Table 4-6 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Birds (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Plate and Drawing Nos. (Godfrey, 1966)	Nos. of Informants	English Gloss	Comments
tčuesk (čuesk)		26,5,6	2	?	Picture of greater and lesser yellowlegs; identification uncertain.
		29,3	115		Picture of sharp-tailed sandpiper
šešešeo (šešešu, šašasu)		26,5,6	69	?	Picture of greater and lesser yellowlegs; identification uncertain
		25,5	2		Picture of short-billed dowitcher; identification uncertain
		30,6	115	?	Picture of upland plovers; identification uncertain
otitapisiu		26,5		?	Picture of greater yellowlegs; identification uncertain
$t_c$iiasko (tčiasko, čiask)		32,5	52,69,115	Gulls	Picture of herring gull
		32,2	2		Picture of iceland gull
	"same as" herring gull	33,4	2,52,115		Picture of glaucous-winged gull
		33,5	115		Picture of herring gull, juvenile

(CONTINUED)

Table 4-6 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Birds (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Plate and Drawing Nos. (Godfrey, 1966)	Nos. of Informants	English Gloss	Comments
$t_c$iiaskus (čieskiš)	"small $t_c$iiasko", "also another kinds"	35,5	69,115	Terns	Picture of common tern
		35,6	115		Picture of Forster's tern, arctic tern, roseate tern
maškekčieskiš		35,8	115	?	Picture of caspian tern; identification uncertain
oibitčiiask	"small $t_c$iiasko"	--	69	?	Identification uncertain
ot$_c$ištčimaniseo (okiskimeniseo)		37,3	52,69,115	Belted Kingfisher	
inupš		37,3	2	Belted Kinfgisher	
oomiseo (oomšo, oomisu)	"all year"	38,1	2,52,69,115	Great Horned Owl	

(CONTINUED)

Table 4-6 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Birds (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Plate and Drawing Nos. (Godfrey, 1966)	Nos. of Informants	English Gloss	Comments
oapikaeo (oapakieo, oapakiu)	"only winter"	38,5	2,52,69,115	Snowy Owl	
kukukao		39,2	115	Great Gray Owl	
oomsis	"small owl"	40,1	2	Hawk Owl	Picture of hawk owl; identification uncertain
ekaka oapatakpiešiš	"blind owl", "can't see in daytime", "all year"	40,4	69	Boreal Owl	Picture of burrowing owl
		40,5	2		Picture of boreal owl
maskot$_c$akos	"small owl" "bear soul, hear it, kill a bear"	--	69		Identification uncertain
tipiskoupiešiš (tipskoupiešiš)		41,6	52,69,115	Common Nighthawk	

(CONTINUED)

Table 4-6 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Birds (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Plate and Drawing Nos. (Godfrey, 1966)	Nos. of Informants	English Gloss	Comments
nipunpespasteo (paspasteo)		42,6	2,69	Woodpeckers (type?)	Picture of yellow-bellied woodpecker; "summer woodpecker"
		43,1	2,69		Picture of downy woodpecker
pipunpaspasteo	"all year"	43,5	69	Northern three-toed Woodpecker	"Winter woodpecker"
nipunpiešiš	"summer birds, no special name"	44,3	69	Summer Birds	Picture of olive-sided flycatcher
mitšukšiš (mitčiškošiš)	"summer"	46,6	2,69	Swallows	Picture of tree swallow
		46,5	2		Picture of barn swallow
kakaču		47,7	2,52,69	Crow	
(kakačoe)		47,8	2		Picture of raven
aaseo		47,8	69	Raven	

(CONTINUED)

Table 4-6 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Birds (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Plate and Drawing Nos. (Godfrey, 1966)	Nos. of Informants	English Gloss	Comments
kuekuešu	"all year"	47,4	2,69	Canada Jay	
(kuekuešoe)					
(oiscatčan)			61[2]		
mičikiščiš		48,5	2	Chikadees?	Picture of black-capped chickadee; identification uncertain
(mit$_c$ikiskišiš)					
		48,1	69		Picture of mountain chickadee; identification uncertain
čitimikanečiš	"lazybones"	48,7	69	Red-breasted Nuthatch	Picture of red-breasted nuthatch
tčimioanpiešiš	"rainy bird"	49,4	52,69	Winter Wren	Other wrens included?
mast$_c$iskat$_c$nis	"summer"	49,7	69	?	Picture of American dipper; unidentified

(CONTINUED)

Table 4-6 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Birds (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Plate and Drawing Nos. (Godfrey, 1966)	Nos. of Informants	English Gloss	Comments
koatiš	"summer"	51,7	69	Trushs (types?)	Picture of Swainson's trush
(čoačiš)		59,8	2		Picture of Northern watertrush
pipičeo (papačeo)	"summer"	52,5	2,52,69	American Robin	
ošakapalačiš (šet$_c$ipalot$_c$is)	"braid at back", "summer"	53,7	2,69	Cedar Waxwing	
ošaooakopiešiš	"yellow bird"	55,2	69	Yellow Warbler	
nemesčeopiešiš	"thunder bird", "summer"	56,4	69	Warblers (types?) and orioles	Picture of magnolia warbler
		56,6	69		Picture of Kirtland's warbler
		60,7	69		Picture of American redstart
		61,5	69		Picture of Baltimore oriole

(CONTINUED)

Table 4-6 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Birds (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Plate and Drawing Nos. (Godfrey, 1966)	Nos. of Informants	English Gloss	Comments
t$_c$at$_c$akaio	"summer"	62,1	69	Blackbirds	Picture of rusty blackbird
(tčitčikaio)		62,4			Picture of red-winged blackbird
astčokočešiš		64,5	2	?	Picture of pine grosbeak; identification uncertain
oskamieo		64,5	69	?	Picture of pine grosbeak; identification uncertain
(oskoneao)		65,1	2		Picture of red crossbill
oskonies	"small oskanieo"	65,1	69	?	Picture of red crossbill; identification uncertain
iamieopiešiš	"praying bird"	68,1	69	White-crowned Sparrow	

(CONTINUED)

Table 4-6 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Birds (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Plate and Drawing Nos. (Godfrey, 1966)	Nos. of Informants	English Gloss	Comments
oapaiakošiš (oapiekošiš)	"spring", "white"	69,7	2,69	Snow Bunting	

Footnotes:

1. Informant no. 52 provided identifications but no names.
2. Informant no. 61 provided names for drawings he made. This is one occasion on which he provided a term other than that recorded in examining printed illustrations.

Table 4-7 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Amphibians and Reptiles

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Page Number (Mélançon, 1961)	Nos. of Informants	English Gloss	Comments[1]
okikalačakus		24,30	115	Salamanders[2]	
teteo (tečteo)		42,55	115,114	Frog (type?)	Picture of bullfrog, leopard frog; identification uncertain
iek		51,79	115,114	Common Toad	Picture of green frog, common toad; identification uncertain
kuešašu		62	115	Mink Frog	
matskoetč (mestukiek)		64	115,114	Wood Frog	
omatskuču		55	115	Frog (type?)	Picture of leopard frog; identification uncertain
minčeteinepuk	"two kinds"	none	115	Snake (type?)[3]	No adequate illustration

(CONTINUED)

Table 4-7 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Amphibians and Reptiles (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Page Number (Mélançon, 1961)	Nos. of Informants	English Gloss	Comments
mestikanepuk		none	115	Snake (type?)	No adequate illustration
atčinepek		109	114	Snake (type?)	Picture of brown snake; no adequate illustration

Footnote:

1. With the scientific classification, and on the basis of distributional evidence, two or three species of salamanders probably occur in the region, one toad species, six frog species, and one species of snake (Appendix 4-1).
2. There appears to be one label for the three species of salamanders that are thought to occur in the region.
3. Three names for snakes were provided, but only one species is thought to occur in the region.

Table 4-8 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Insects

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Page No. (Zim and Cottam, 1956)	Nos. of Informants	English Gloss	Comments
očeo		153	53,114	Flies (types?)	Picture of housfly
(očes)		106	114		Picture of greenbottle fly
otemiskopiačeo	"beaver bug"	150	53	Beaver Flea?	Picture of black carpet beetle
(otamiskupačeo)		113	114		Picture of hairy burying beetle
muteo		150	53	Clothes Moth?	Picture of clothes moth
amuš		148	53	Bee (type?)	Picture of sweat bee
mistamo (amu)	"big one"	148	53,114	Bumble Bee	Picture of bumble bee
amusuč (oskan amu)	"smaller"	146	53,114	Wasps	Picture of paper wasp

(CONTINUED)

Table 4-8 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Insects (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Page No. (Zim and Cottam, 1956)	Nos. of Informants	English Gloss	Comments
očielikus (očičeikus, očelokuš)		138	53,114	Ants	Picture of carpenter ants
čiakatuš		136	53	?	Picture of pigeon horntail
kaotesknit (kaooesit)	"like this, but not it"	132	53,114	Beetle (type?)	Picture of horn beetle
nepiškamaut		128	53	May Beetle	Picture of may beetle
kapešinašit		123	53	?	Picture of striped cucumber beetle
atik‿mek maukan		118	53	Ladybird Beetles?	Picture of ladybird beetles
oastenkisis (oaštuenčiešiš)		116	53,114	Fireflies	Picture of fireflies

(CONTINUED)

Table 4-8 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Insects (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Page No. (Zim and Cottam, 1956)	Nos. of Informants	English Gloss	Comments
kamaskaosit maničus (kamititaooapukan)?		110	53,114	Hairy Beetle (type?)	Picture of rose chater
kaopiot		107	53	?	Picture of tachinid fly
mištemišak (mesaco)		105	53,114	Black Horse Fly	Picture of black horse fly
mističečimeo (mistikičime)		104	53,144	Crane Fly	Picture of crane fly
satčimeo (kičemeo)		103	53,114	Mosquitos	Picture of house mosquito
oumšiš (oastennamaoan kokopšiš)		92	53,114	Underwing Moths	Picture of underwing moths

(CONTINUED)

Table 4-8 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Insects (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Page No. (Zim and Cottam, 1956)	Nos. of Informants	English Gloss	Comments
šaoinikan matoš		93	53	Moth (type?)	Picture of imperial moth
sikunkokopšiš		79	53	Swallowtail (type?)	Picture of tiger swallowtail; "spring" kokopšiš.
mistakokopšiš	"big"	79	53,114	Swallowtail (type?)	Picture of black swallowtail
nipiskokopšiš (oapakun kokopšiš(?))		77	53,114	Common Sulphur	Picture of common sulphur; "water" kokopšiš
oapakunkokopšiš		76	53	Butterfly (type?)	Picture of butterfly
	"flower" kokopšiš	71	114		Picture of painted lady
kaišpak		71	53	Butterfly (type?)	Picture of painted lady

(CONTINUED)

Table 4-8 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Insects (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Page No. (Zim and Cottam, 1956)	Nos. of Informants	English Gloss	Comments
nemeo kokopšiš	"sturgeon" kokopsis, "when he comes sturgeon runs"	75	53,114	Eastern Tailed Blue	Picture of Eastern tailed blue
kaošiošit		70	53	Butterfly (type?)	Picture of red admiral
koaipsit kokopšiš	"dark"	69	114	?	Picture of mourning cloak; identification uncertain
		100	53		Picture of codling moth
nočimkesuč		60	53,114	Monarch	Picture of monarch
kuecšiš		55	53	Dragonfly	Picture of ant lion
		50	114		Picture of green darner
mištatuekatu		50	53	?	Picture of green darner; big dragon fly?

(CONTINUED)

Table 4-8 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Insects (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Page No. (Zim and Cottam, 1956)	Nos. of Informants	English Gloss	Comments
matikopisatat		49	53	Water Striders	Picture of water striders; other types of aquatic bogs?
kaskut(?)		38	53	Spittlebug	Picture of spittlebug; uncertain recording of name
kapsukatamut		35	53	Leaf Hoppers	Picture of rose leaf hopper
koskotuš (koskotaos)	"with and without red legs"	26-28	53,114	Grasshoppers	Picture of grasshoppers; includes crickets?
	"noise made"	22	114		Picture of field crikets
muškuskomičuš		22	53	Field Crickets	Picture of field crickets
tipaskunčešiš (topaskunčešiš)	"caterpillar", "crawls like measuring", "measurer"	--	53,114	Larvae, Caterpillar (type?)	Cankerworm?

(CONTINUED)

Table 4-8 Waswanipi Cree Names and Identifications of 'Living Beings' Elicited With Illustrations of Insects (Continued)

Names in Cree (Less Common or Specific in Parentheses	Informants' Comments	Page No. (Zim and Cottam, 1956)	Nos. of Informants	English Gloss	Comments
maskotipaskunčešiš	"hairy one"	--	114	Caterpillar (type?)	"Bear" tipaskunčešiš

Table 4-9 Comparison of Part of the Waswanipi Domain of 'Living Beings' and Species Classification[1]

Species Groups	No. of Species on Lists of Fauna of the Waswanipi Region	No. of Distinct 'Living Beings' Recognized by Waswanipi	Revised No. of Species on Lists of Fauna, Including Waswanipi Identifications
Mammals[2]	28	27	28
Fishes[3]	14	14	14
Birds[4]	82	71	104
Totals	124	112	146

Footnotes:

1. This table only includes for comparison those types of 'living beings' and species that were adequately identified during this study. This is probably a biased sample of data, see text for discussion. Comparisons are only for species and 'living beings' occurring in the region.
2. Excluding rats, mice and voles, but including muskrat.
3. Excluding small fishes, for which specimen identifications would be necessary.
4. Excluding rails, coots, shorebirds, warblers, sparrows and related birds.

basis, rats, mice, voles (but not muskrat), small fishes, rails, coots, shorebirds, warblers, sparrows and related birds were excluded from the comparison. This did not eliminate all ambiguous cases; reasoned judgments were made where possible and most have been reported in the appendixes. However, the general effect of excluding areas for which data are incomplete is probably to increase the numerical correspondence between the Waswanipi classification and the scientific species list. This is so because the areas of continuing ambiguity are cases where species are physically small, are generally of low cultural importance, or are in groups of species for which there are numerous closely related species found in the region. These are the cases where less differentiation in Waswanipi categories than in the scientific species classification would be most likely to occur. It is clear for example that there are only distinctively labeled general categories for some classes of smaller birds, and it appears that the same is true for the smaller fish.

In the areas for which the comparison can be made the Waswanipi categorize into 112 terminal taxa the fauna which are similarly classified by scientific taxonomies into 146 species (Table 4-9). The major differences are in the smaller birds, and it is possible that this difference would be somewhat smaller were more intensive identification work with specimens done for this area.

However, despite these qualifications, the first result of the identification of the specific animal living beings recognized by the Waswanipi indicates that among the larger and more common species there is a close correspondence between the specific kinds of living beings identified by the Waswanipi and the species identified by Western science. Furthermore, it is clear that the Waswanipi classifications are "natural" in the sense that the Waswanipi are able to discuss diverse criteria, including feeding habits, appearance and habitats, for distinguishing each distinct kind of living being they identify. These results are therefore consistent with the findings of ethnosystematics in general. However, while the results of the present study indicate that there is a significant correspondence between Waswanipi specific classifications of animal living beings and the scientific species classification, this does not imply there is a significant correspondence of meanings between the two systems. This can be seen by examining how the Waswanipi categories of living beings are organized, and noting the ways in which they differ significantly from the scientific taxonomy both in relation to the more inclusive categories and to the criteria for such groupings.

B - Inclusive Categories, and the Relationships Between More and Less Inclusive Categories

In order to study the relationships and organization of the animal living being categories identified by means of the illustrations I elicited more general categories for grouping the specific categories. No attempt was made to elicit a complete taxonomic structure, nor to formally test the categories elicited, for reasons previously cited. Nevertheless, it was clear that more inclusive categories did exist and that there were clear preferences for certain criteria for classifying kinds of living beings together. More inclusive categories of living beings were elicited for the areas where the lists of categories of living beings were most complete. This was done by direct and by informal questioning and by recording data occurring during general interviews and during naturally occurring conversation. However, to elicit a more systematic set of data, yet one that would not presume a classification with taxonomic ordering, a picture-test situation was developed. This eliciting technique will be described below, but first some of the more inclusive categories extracted from other settings will be described.

When I asked informants how all the specific things which had been identified from the illustrations could be called, I received three responses. The least common response was $\underline{\text{pimat}_{s}\text{ioin}}$ which informants called "life" and "living things" in English, and which I propose to gloss as 'living beings'.[4] I will discuss the extent and significance of this term later, but it should be noted now that $\underline{\text{pimat}_{s}\text{ioin}}$ appears from my data to be a term for life itself and for the things which are alive.

A second term that was offered was nitaoičičikan which was said in English to refer to "all things that grow" including those specific 'living beings' already identified with illustrations, plus plants and human beings, inioatč.

The third term offered was aoesisutč, glossed as 'animals', in a sense which contrasts with the term iniaotč, people or 'human beings'. Aoesisutč in this sense glossed 'animal' has a scope that may be roughly comparable to the scope of the word "animal" as it is commonly used in its wider sense in English; but this usage appears to be common only to Waswanipi informants with formal education. For most Waswanipi aoesisutč contrasts with 'human beings' but also with a series of other categories, piešutč, glossed 'big bird', piešisatč, glossed 'small birds', nemesatč, glossed 'fish' aoakanatč, glossed 'domesticated animals' and menčusutč, glossed 'bad animals'. In this more restricted sense the category aoesisutč includes all of the larger mammals; the category piešutč includes all of the larger birds including waterfowl, game birds, and larger predatory species of owls, hawks, and gulls; the category piesišatč includes the smaller birds; the category nemesatč includes all of the fish; the category aoakanatč includes all the domesticated animals, except the dog, atimotči.

The 'dog', 'human beings', and possibly 'cats', puši, are categories that contrast with aoesisutč, and also with the specific categories of 'living beings'. Menčusutč includes: insects, worms, reptiles, amphibians, small mammals, possibly crustacea and non-insect invertebrates, and others. In this more commonly accepted usage of aoesisutč the term could be glossed 'large mammals' and would not include birds, fish, amphibians, reptiles, or insects.[5] A limited eliciting of examples of the membership of each of the categories was done with informants to establish the general scope of the "more inclusive" categories (Table 4-10).

In the context of identifying various 'living beings' with illustrations of animals a series of other labels occurred which appeared to have a degree of inclusion that fell between the "more inclusive" categories listed above, and the specific categories of 'living beings'. These categories appeared to me

Table 4-10 Specific Examples of 'Living Beings' Included in "More Inclusive" Categories of 'Living Beings'

More Inclusive Category		Some Specific	Numbers of
Name in Cree	English Gloss	Categories Included	Informants
aoesisutč	'Large Mammals'	'Moose'	115
		'Beaver'	59,114,115
		'Muskrat'	59,114,115
		'Mink'	59,114,115
		'Otter'	59,114
		'Ermine'	115
		'Bear'	59,114
		'Polar Bear'	59
		'Seal'	59
		'Wolverine'	115
		'Woodchuck'	115
		'Caribou'	114
		'Deer'	114
		'Rabbit'	114
		'Mice'[1]	59
		'Mole'[1]	59
piešutč	'Big Birds'	'Crow'	114,115
		'Bunting'	115
		'Great Horned Owl'	115
		'Great Grey Owl'	115
		'Bald Eagle'	115
		'Hawk'	115
		'Ruffed Grouse'	115
		'Spruce Grouse'	115
		'Ptarmigan'	114,115
		'Gulls'	115

(CONTINUED)

Table 4-10 Specific Examples of 'Living Beings' Included in "More Inclusive" Categories of 'Living Beings' (Continued)

More Inclusive Category		Some Specific	Numbers of
Name in Cree	English Gloss	Categories Included	Informants
piešutč	'Big Birds'	'Geese'	114
		'Loon'	114
		'Ducks'	114
piesisutč	'Small Birds'	'Woodpeckers'	114,115
		'Canada Jay'	114,115
		'American Robin'	114,115
		'Cedar Waxwing'	115
		'Warblers'	115
		'Common Nighthawk'	115
		'Hawk Owl'	115
		'Sandpipers'	115
		'Terns'	115
		'Belted Kingfisher'	114,115
nemesutč	'Fish'	'Whitefish'	114
		'Dore'	114
		'Pike'	114
		'Sturgeon'	114
		"All fish"	115
mančusutč	'Bad Animals'	'Frogs'	59,115
		'Flies'	115
		'Mosquitos'	115
		'Butterfly'	115
		'Bat'	59,115
		'Mice'[1]	115

(CONTINUED)

Table 4-10 Specific Examples of 'Living Beings' Included in "More Inclusive" Categories of 'Living Beings' (Continued)

More Inclusive Category		Some Specific	Numbers of
Name in Cree	English Gloss	Categories Inclued	Informants
mančusutč	'Bad Animals'	'Mole'[1]	115
		'Flying Squirrel'	115
		'Chipmunk'	115
		'Snakes'	59,115
		'Salamander'	59,115
aoakanatč	'Pets'-'Domestic Animals'	'Chicken'	114
		'Cow'	114
		'Horse'	114
		'Pig'	114
		'Cat'	114
		'Turkey'	114

Footnote:

1. Mice and moles were included as kinds of aoesisutč by #59 and as kinds of mančusutč by #115. The latter classification is more common, based on data gathered in other contexts.

to be used commonly in naturally occurring conversations. Some of these categories, I will call them "less inclusive" categories, grouped specifics that the Waswanipi considered to be "alike" or "about the same" or "related". Apokšiš, for example, glossed 'mice', is a category which includes several mice and shrews. The term itself occurs in the names of the various kinds, for example: činistokapikošiš, katcinoioetapokšiš, nipiapokšiš and kaosotaoapikošiš. Similarly, anekočaš refers both to a specific category that can be glossed 'red squirrel' and also to a category that includes šašakaoanikočaš, 'chipmunk' and pimiaoanekočaš, 'flying squirrel', and which would be glossed 'squirrel' in general. The term šišiputč refers to 'ducks' collectively and pioaitč to the 'grouses', including paspasčeo 'ruffed grouse', atisko 'sharp-tailed grouse', mištikueo 'spruce grouse', and oapiao 'willow ptarmigan'. The term atekamek which is glossed 'lake whitefish' may also refer to a category that includes očulapi, 'cisco', and may be glossed 'whitefishes'.

These are all "natural" categories, but many of these "less inclusive" categories cut-across the "more inclusive" categories (Table 4-11). Thus anekočaš includes a squirrel classed as a 'large mammal' and a squirrel and the chipmunk that are classed both as 'bad animals'; nipiaoesisutč, 'water animals' includes several 'large mammals' along with the 'lemming mouse' a 'bad animal', kiaskutč includes 'gulls' which are 'big birds' and 'terns', literally labeled with the word for gull in a diminutive form, which are 'small birds', and oohoomšoutč includes owls from the 'big birds' and 'small birds' categories.

The implication of this structure is that a strict taxonomic relationship cannot exist among these categories. It should be noted that I do not claim this evidence is conclusive, the membership of the categories involved was not fully tested for inclusion, nor were the contrasts between categories fully tested. Nevertheless, it seems to me unlikely that further testing would have resolved this structure into one consistent with a taxonomic hierarchy. For present purposes the data were considered sufficient to warrant an alternative exploration of the relationship among categories. In order to provide an eliciting context in which to define categories of 'living beings' that would not be

Table 4-11 Specific Examples of 'Living Things' Included in "Less Inclusive" Categories of 'Living Things'

Less Inclusive Category		Some Specific	More Inclusive
Names in Cree	English Gloss	Categories Included	Categories of Specifics
anekočaš	'squirrels'	'Squirrel'	'Big Mammals'
		'Flying Squirrel'	'Bad Animals'
		'Chipmunk'	'Bad Animals'
nipiaoesisutč	'water animals'	'Mink'	'Big Mammals'
		'Otter'	'Big Mammals'
		'Beaver	'Big Mammals'
		'Muskrat'	'Big Mammals'
		'Lemming Mouse'	'Bad Animals'
apokšiš	'mice'	'Long-tailed Shrews'	'Bad Animals'
		'Deer Mouse'	'Bad Animals'
		'Lemming Mouse'	'Bad Animals'
		'Jumping Mouse'	'Bad Animals'
šišiputč	'ducks'	'Black Duck'	'Large Birds'
		'Pintail'	'Large Birds'
		'Old Squaw'	'Large Birds'

(CONTINUED)

Table 4-11 Specific Examples of 'Living Things' Included in "Less Inclusive" Categories of 'Living Things' (Continued)

Less Inclusive Category		Some Specific	More Inclusive
Names in Cree	English Gloss	Categories Included	Categories of Specifics
pioaitč	'grouses'	'Ruffed Grouse'	'Large Birds'
		'Sharp-tailed Grouse'	'Large Birds'
		'Spruce Grouse'	'Large Birds'
		'Willow Ptarmigan'	'Large Birds'
maakutč	'loons'	'Common Loon'	'Large Birds'
		'Red-throated Loon'[1]	'Large Birds'
niskutč	'geese'	'Canada Goose'	'Large Birds'
		'Snow Goose'	'Large Birds'
kakačoutč	'crows'	'Crow'	'Large Birds'
		'Raven'	'Large Birds'
paspasteo	'woodpeckers'	'Summer Woodpecker'	'Small Birds'
		'Winter Woodpecker'	'Small Birds'
kiaskutč	'gulls'	'Gulls'	'Large Birds
		'Terns'	'Small Birds'

(CONTINUED)

Table 4-11 Specific Examples of 'Living Things' Included in "Less Inclusive" Categories of 'Living Things' (Continued)

Less Inclusive Category		Some Specific	More Inclusive
Names in Cree	English Gloss	Categories Included	Categories of Specifics
oohoomšoutč	'owls'	'Great Horned Owl'	'Large Birds'
		'Snowy Owl'	'Large Birds'
		'Great Grey Owl'	'Large Birds'
		'Hawk Owl'	'Small Birds'
atekamek	'whitefishes'	'Whitefish'	'Fishes'
		'Cisco'	'Fishes'
iekutč	'frogs'	'Common Toad'	'Bad Animals'
		'Wood Frog'	'Bad Animals'
mentuč	'insects'	'Wasps'	'Bad Animals'
		'Worms'	'Bad Animals'

Footnote:

1. The Red-throated loon is known from neighboring regions although it does not occur in the Waswanipi region. It was not mentioned during the identifications with illustrations of birds, although it was discussed on other occasions.

dependent on verbal labels, and that would provide evidence of category relationships, a picture-sorting exercise was developed. As mentioned earlier a Waswanipi man was commissioned to prepare a series of drawings of important 'animals'. The choice of kinds of 'animals' was left to him. Thirty-nine drawings were produced with colored pencils on white 8½" x 11" paper, the names are listed on Table 4-12. They were each mounted on cardboard 10" x 14" and numbered to correspond to a list of English and Cree names. In each use of the picture set, an individual was given half of the pictures, randomly selected, and asked to put together the pictures of those animals that were alike, spreading them out on a table, bed or floor. Individuals were free to make as many groupings as they liked and to leave as many drawings as they chose in no definite grouping. When the individual stated they were finished they were asked why it was that they put each of the groups of pictures together. The name of each picture was elicited to be sure of the identification of membership of the groups. The second half of the drawings were then given to the individual to make a second run, for which the procedure was the same. The full record of results appears in Appendix 4-6. The exercise was administered five times but it proved of low interest to informants and was not used further. One use was comprised of one run by a woman and the second by her son. This is treated as one complete use in the tabulations.

Twenty-two groupings emerged from the exercise (Table 4-13). They are formed by listing together all groupings that contain the same membership, the more inclusive groupings being the head groupings (labeled with a letter 'A', 'B', etc.). Listed below the head groupings are all those groupings whose memberships are completely included in the larger grouping (within parenthesis), and all groupings more than half the membership of which is included in larger groupings (within slashes /   /).

Detailed comments on the compositions of the groups, on the extent to which similar groups were formed by different informants and on the similarity of the explanations of the groups are provided in Appendix 4-6, and notes appear on Table 4-13. Several of the groupings formed correspond to "more inclusive"

Table 4-12 Names and Numbers of Drawings Used in Picture Sorting

Card No.	Name in English	Name in Cree
# 1	Kingfisher	ot$_{c}$istčimaniseo
# 2	Ptarmigan	oapiao
# 3	Frog	iek
# 4	Robin	pipičeo
# 5	Woodpecker	paspasteo
# 6	Gray (Canada) Jay	kuekuešu
# 7	Fisher	oček
# 8	Wolverine	kuekaučeo
# 9	Ermine	sukšiš
# 10	Marten	oapistan
# 11	Ruffed Grouse	paspasčeo
# 12	Moose	mus
# 13	Black Bear	masko
# 14	Walleye	okaš
# 15	Whitefish	atekamek
# 16	White Sucker	namapi
# 17	Sturgeon	nemeo
# 18	Goldeye	nepakatso
# 19	Burbot	miakatu
# 20	Great Horned Owl	oomiseo
# 21	Red Squirrel	anekočaš
# 22	Hare	oapuš
# 23	Red Fox	mačešu
# 24	Canada Goose	nisk
# 25	Wolf	maekan
# 26	Beaver	amisk
# 27	Mink	sakoešu
# 28	Lynx	pišu
# 29	Otter	ničuk
# 30	Muskrat	oačesk

(CONTINUED)

Table 4-12 Names and Numbers of Drawings Used in Picture Sorting (Continued)

Card No.	Name in English	Name in Cree
# 31	Porcupine	kako
# 32	Bat	opikoalačiš
# 33	Caribou	ateko
# 34	Skunk	šikoak
# 35	Lake Trout	namakoš
# 36	Pike	činošeo
# 37	Crow	kakaču
# 38	Loon	maak
# 39	Black Duck	šišip

Table 4-13 Groupings of 'Living Things' in Picture Sortings[1]

Grouping Code	Membership of Group (English Gloss)	Picture Numbers[2]	Informant Number[3]	Comment by Informants
A	Owl, Goose, Crow, Loon, Duck	20,24,37, 38,39	114	- 'big birds'
i		(24,39)	55	- eat grass along the shore
			71	- both get something to eat under the water
			56	- eat grass along shore
ii		(20,37)	55	- eat the food you kill - they rob you
B	Ptarmigan, Ruffed Grouse	2,11	55	- in winter, eat twigs along the shore
			71	- doesn't know, about the same
			56	- eat twigs along shore
			114	- 'big birds'
C	Kingfisher, Robin, Woodpecker, Gray Jay	1,4,5,6	114	- 'small birds'
i		(4,5)	71	- eat flies and worms

(CONTINUED)

Table 4-13 Groupings of 'Living Things' in Picture Sortings[1] (Continued)

Groupings Code	Membership of Group (English Gloss)	Picture Numbers[2]	Informant Number[3]	Comment by Informants
D	Beaver, Mink, Otter, Muskrat	26,27,29, 30	114	- 'water animals'
i		(27,29)	55	- both go in water to eat fish
			71	- both eat fish
			68	- both always hang around beaver houses
ii		(26,30)	55	- eat same food, that tree [poplar]; stays in beaver dam
			56	- eat poplar
			116	- when winter comes, gather up things for winter
iii		/26,30,31/	71	- eat bark off a tree
E	Fisher, Fox, Wolf, Lynx, Skunk	7,23,25,28, 34	71	- eat same things, rabbit
i		(7,23,25,28)	55	- hunt almost the same - rabbit, partridge
ii		(23,28)	56	- scared away easily
iii		/23,25,28, 33/	114	
F	Fisher, Weasel, Marten	7,9,10	114	- pelts sold
		(9,10)	55	- eat our meat on a platform

(CONTINUED)

Table 4-13 Groupings of 'Living Things' in Picture Sortings[1] (Continued)

Groupings Code	Membership of Group (English Gloss)	Picture Numbers[2]	Informant Number[3]	Comment by Informants
G	Porcupine, Skunk	31,34	114	- have similar names
H	Moose, Bear	12,13	114	- big game - meat is good
I	Bear, Wolf	13,25	116	- when hungry not scared at all
J	Bear, Porcupine	13,31	56	- they do things slowly
K	Bear, Skunk	13,<u>34</u>[4]	55	- hibernate all winter
L	Moose, Hare	12,22	71	- eat leaves and twigs
M	Squirrel, Hare	21,22	114	
N	Sturgeon, Goldeye, Burbot, Pike	17,18,19,36	71	- eat other fish (except sturgeon) eats weeds
i		(18,19)	56	- around in water
ii		(19,36)	55	- eat other fish
O	Walleye, Sucker, Sturgeon, Pike	14,16,17,36	68	- all stay in water - fish
i		/14,15,17/	114	- best kind to eat

(CONTINUED)

Table 4-13 Groupings of 'Living Things' in Picture Sortings[1] (Continued)

Groupings Code	Membership of Group (English Gloss)	Picture Numbers[2]	Informant Number[3]	Comment by Informants
N and O	Walleye, Sucker, Sturgeon, Goldeye, Burbot, Pike	14,16,17, 18,19,36		
i		/15,18,19/	116	- fish
ii		(16,18,19)	114	- eat them sometimes
P	Whitefish, Sturgeon	15,17	55	- eat same insects at surface of water
Q	Whitefish, Sucker	15,16	55	- eat water flies
			71	- eat same thing, sand
R	Trout, Pike	35,36	114	- fish
S	Walleye, Otter, Loon	14,29,38	56	- eat fish
i		(14,38)	71	- eat fish
T	Weasel, Marten, Owl	9,10,20	56	- eat rabbit, partridge
i		(10,20)	71	- both eat rabbit
U	Robin, Whitefish	4,15	56	- eat some food, flies on water

(CONTINUED)

Table 4-13 Groupings of 'Living Things' in Picture Sortings[1] (Continued)

Grouping Code	Membership of Group (English Gloss)	Picture Numbers[2]	Informant Number[3]	Comment by Informants
V	Jay, Weasel, Crow	6,9,37	71	- eat moose meat that people and other animals killed
i		(6,37)	56	- eat meat stored on a platform

Footnotes:

1. Full results of the sorting appears in Appendix 4-3.

2. Largest groupings listed by numbers, unbracketed. Sub-groupings totally included in largest groupings listed by numbers in parentheses, sub-groupings with more than half of membership but not all of membership included in larger grouping are listed by numbers between slashes. Each picture could be sorted five times, which is maximum number of co-occurrences, except in a few cases where different interpretation of animal taxa represented by picture led to double appearance of a taxa in the same test.

3. Each informant represents a single use of the test, comprising two runs, half the pictures sorted in each, with the exception of informants #68 and 116, a mother and son, who made one run each, and whose responses are treated here as a single test instance.

4. Underlined numbers are numbers of the picture that correspond to the name an informant gave a drawing, when the picture so named intended to represent a different animal. The actual number of the drawing so selected can be found in the full data in Appendix 4-3.

and "less inclusive" categories previously identified. Thus, as I indicate in Appendix 4-6, groups A plus B correspond to the category 'large birds', C to 'small birds' and N + O to 'fish'. "Less inclusive" categories to which some groupings correspond include grouping B 'grouse', and D 'water animals'. This eliciting method also indicated several other categories, what I will call "intermediate" categories, for example Ai 'waterfowl', and Aii 'scavenger birds', and groupings that correspond to 'piscivorous fish' and 'non-piscivorous fish'. These categories are similar to "less inclusive" categories, but I would distinguish them because they do not appear to be "natural" categories, they appear to be based on a limited number of criteria of similarity.

The data from the picture sorting therefore confirm both the "more inclusive" categories and sets of "less inclusive" categories, and the data provide some further indications that the commonly used specific, "less inclusive", "intermediate", and "more inclusive" categories do not form part of a taxonomically organized set of categories. Thus both common usage and responses to a controlled eliciting framework provide evidence that Waswanipi ethnosystematic categories do not form clear taxonomic structures.

The sorting also indicated other taxonomically anomalous categories which were unlabelled. The groupings S, T, U, V, all cross-cut the "more inclusive" categories. Grouping S includes dore, otter and loon, grouping T includes weasel, marten and owl, grouping U reported by only a single individual includes robin and whitefish, and grouping V includes gray jay, weasel and crow. In the three cases of similar groupings by two individuals the reasons were identical.[6] These categories, like the "intermediate" categories are not based on multiple criteria, and the formation of these groupings indicates how the criteria used for classification can create cross-cutting categories. The "intermediate" and unlabelled categories formed in the picture sortings, while of several different degrees of inclusiveness, were explained by informants as being based on only one or two characteristics each. Indeed, there are only a limited number of criteria that could be used to group 'dore', 'otter' and 'loon'.

The fact that several informants agreed on the composition of such apparently diverse groupings is significant because groupings based on only one or two criteria each could in principle be extremely diverse. The fact that only a limited number of groupings are formed implies that while in principle the number of criteria that could be used to form uni-dimensional groups is very large, the actual range of criteria that are so used is limited. An examination of the criteria actually given by informants as reasons for some of these intermediate groupings indicates not only that a small range of criteria is used, but that the criteria used are closely related to a domain other than 'living beings', the domain of 'food', meču̲n̲.

C - The Criteria for Ordering the Domain 'Animal Living Beings'

A key to the important criteria used to organize the categories of 'animals' and an indication of the alternative kinds of data that may be relevant to the analysis is found by examining the explanations which Waswanipi informants give of the groupings of 'animals'. For example, the seven cases of cross-cutting groupings made in the picture sortings, groups S to V, were all explained by informants on the basis of the feeding habits of the specific kinds of 'animals' included. This suggests that of the large range of distinctive features which could be used as criteria for the classification of 'animals', a limited range of features may actually be selected by informants to explain and, presumably, to form groupings. This is confirmed by the classifying criteria used by individuals to explain their groupings in the picture-sorting test, listed on Table 4-14. Of the occasions on which criteria for classification were offered, the criterion that was most commonly referred to was what the animals eat and the second most frequent criterion was the related criterion of where they eat. Further, the next two most common criteria are also closely related, the quality of the 'animal' as potential human food, and where it lives. Taken together these four related criteria account for 86 percent of the explanations given.

Two groups of criteria emerge from this, one locational, and one trophic. The "more inclusive" categories are all explained locationally: 'animals' that live on land 'large mammals', 'animals' that live in water 'fish', 'animals' that live in the air 'large birds' and 'small birds', and animals that live 'underground' or 'under things', the 'bad animals'. In contrast to this is the criterion of what an 'animal' eats and what its own quality is as food for humans. These two sets of criteria interpenetrate at many points, as I will indicate.

The interrelationships of these criteria for cognitively grouping 'animals' were indicated during interviews on these and other matters. For example, on the importance of the difference between living on land, in the air and the water, criteria that distinguish 'large birds' and 'small birds' from 'large mammals' and from 'fish', one individual replied: "...They are about the same [but] they have different kinds of things to eat, [some] live in water but [they] eat different" (Interview Notes, #69; brackets mine).[7] He then proceeded to give the list of 'animals' that could be grouped without respect to the "more inclusive" categories.

As we have seen, 'large mammals', 'fishes' and also 'large birds' may be subgrouped using criteria of eating and eating locations and it is also the case that the same criteria can be used to group together 'animals' from different "more inclusive" groupings. The importance of these criteria appears to be pervasive in the classifications of 'animals', but why they are important remains to be clarified.

One reason why they are important may be because they are also important criteria in other domains. There is an indication of this because one of the criteria used, "quality as human food", appears to refer to the 'animals' being grouped not as part of the domain of 'living beings' as such, but as part of the domain 'food' for humans. Because some 'living beings' are in fact killed by humans for food such a link is in fact a practical everyday occurrence. 'Animals' are transformed into 'food' by hunting. But not all 'living things' listed so far are killed by men for food, and not all those killed or encountered dead are eaten, so that the structure of the beliefs concerning 'food' must be examined in order to consider its relevance for the domain of 'animals'. I begin with a consideration of eating.

Table 4-14 Classifying Criteria Used by Individuals to Explain Groupings in Picture Sorting Exercise and Their Frequency of Use[1]

Classifying Criteria	Frequency of Use of Criteria				
	'Large Birds' and 'Small Birds' Groupings (A to C)[2]	'Large Mammals' Groupings (D to M)	'Fish' Groupings (N to R)	Cross-cutting Groupings (S to V)	Total
What it eats	6	9	6	7	28
Where it eats	5	1	1	0	7
Where it lives		2	2		4
Quality as human food		1	2		3
Movement		1			1
Response to winter		2			2
Fur valuable		1			1
Similarity of names		1			1
Shyness		2			2
All	11[3]	20	11	7	49

Footnotes:

1 From full data in Appendix 4-3.

2. Letters refer to groupings on Table 4-13.

3. Some explanations include more than one criteria and are counted twice.

The most common occasions for eating, mičsUnanEO, are meals, of which three kinds are distinguished: tčišepananinanEO, 'morning meal', ApitAčiši An mitisUnAnO, 'middle of the day meal', and nipEkOAnEO, 'evening meal'. But meals did not occur on any strict schedule, nor did they necessarily occur three times a day. Meals, however, do contrast with nAwAčinAnEO, often called in English "picnics", which are stops made to eat something while travelling and which are regular occurrences during travel in the bush; and meals also contrast with mAkOsAnEO or 'feasts'. 'Picnics' occur in the bush and not in the camps where meals occur, although the sites for 'picnics' may be repeatedly used along well travelled routes. 'Picnics' may involve a whole commensal unit, or a sub-group of it, or, less frequently, more than one commensal group. 'Feasts' are described as occasions "when the whole people come together", when food is prepared and especially distributed and consumed beyond the limits of the regular commensal groupings (see, Tanner, 1976). Finally, meals may contrast to snAkaO, 'snacks', a form of eating which I suspect has become more common and has been given more formal status through naming since many of the children have been going away to residential schools. 'Snacks' can occur in camp or in the bush and are often individualized eating occasions usually involving groups smaller and more transient than commensal units. Meals occur in regular commensal groups, and even when more than one group live together under the same roof each will have its own stove, food supplies and meals, except if they are short-term visitors.

What is eaten at a meal, a picnic or a snack may be the same, but the quantity and diversity decrease from a feast to a meal to a picnic and then to a snack. Feasts, on the other hand, are occasions on which some foods that are not typically eaten on other occasions are consumed, and there are some foods that can only be eaten at a feast, most particularly bear and specially prepared beavers. However, the basic structure of the domain of food is best revealed in the most commonly occurring eating events, ordinary daily meals.

The food consumed at a meal is elicited by the question čEkOAn kA mičin? 'What did you eat?' A list of typical answers as outlined by a single informant includes: wies 'meat', mUswies 'moose meat', amiskwies 'beaver meat', AtEkowies 'caribou meat', mAskOwies 'bear meat', wAčAskO 'muskrat', ničUk 'otter', wApUs 'rabbit', nEmEo 'sturgeon', nEmes 'fish', maac 'loon', šišip 'duck', niskA 'goose', piAO 'grouse'. Follow-up question to the answers 'meat' or 'fish' would be čekwies "What meat?" and čekun nEmes "What fish?" The former would elicit one of the four "large mammal name plus meat" answers just listed, the latter would elicit the names of 'fish' other than 'sturgeon' such as 'whitefish' 'walleye', 'pike'. A follow-up question to any of the above would be čekoan kotač "What else?" and typical replies according to the informant would be IkOnAO 'bannock' a pan bread, patEts 'potatoes', and namOi kotAč 'nothing else'. A successive question would be čEkOAn kaminikOAin "What did you drink?" and common replies would be ti 'tea', kopi 'coffee', koko 'cocoa', nipi 'water', mUskAmi 'broth', čUčUšinApwi 'milk' and kAšiwAkamišič 'soft drink' (Interview Notes, #114). The question sequence and alternate answers are listed on Table 4-15.

The comestibles that constitute a meal inferrable from the structure of the questions and the replies is that: a meal typically consists of flesh of one of a selected number of 'large mammals', 'large bird', or 'fish' plus a drink and, optionally, a starchy food, bread or potatoes.[8] Unfortunately, I failed to ask for data in this format about where locally produced vegetative foods would be placed, such as berries. From other contexts, including their seasonal use of a pudding and in breads, I would infer that they were a type of starchy, optional food. I call the required food 'flesh food' but know of no Cree label.[9]

A further distinction made by Waswanipi should be noted, between "White-man's food" and "Indian food". The former are also called "store" or "purchased" foods in the literature, the latter "bush" food. The major "White-man's foods" for the Waswanipi are flour, lard, sugar, baking powder, and potatoes, all of which are components of the optional dishes at a meal. However, there is also a significant range of "White-man's foods" that are known and that if consumed may comprise part of the obligatory part of a meal. Thus, in natural settings I was told that dinner would be "pork chops" or "chicken", "fish sticks" or "hot dogs" which within the structure of responses to the question were equivalent to 'hare' or 'whitefish'. But they were not equivalently

Table 4-15 Sequence of Typical Questions and Alternate Answers for Information on Food Consumed at a Meal, from a Single Informant (#114)

Q1. 'What did you eat?'	
A1a. 'Meat'	
	Q2. 'What meat?'
A1b. 'Moose meat'	A2a. 'Moose meat'
A1c. 'Beaver meat'	A2b. 'Beaver meat'
A1d. 'Caribou meat'	A2c. 'Caribou meat'
A1e. 'Bear meat'	A2d. 'Bear meat'
A1f. 'Muskrat'	
A1g. 'Otter'	
A1h. 'Rabbit'	
A1i. 'Grouse'	
A1j. 'Loon'	
A1k. 'Duck'	
A1l. 'Goose'	
A1m. 'Sturgeon'	
A1n. 'Fish'	
	Q3. 'What fish?'
	A3a. 'Whitefish'
	A3b. 'Dore'
	A3c. 'Pike'
Q4. 'What else?'	
A4a. 'Bannock'	
A4b. 'Potatoes'	
A4c. 'Nothing else'	
Q5. 'What did you drink?'	
A5a. 'Tea'	
A5b. 'Coffee'	
A5c. 'Cocoa'	
A5d. 'Water'	
A5e. 'Broth'	
A5f. 'Milk'	
A5g. 'Soft drinks'	

valued foods. "White-man's food" was repeatedly indicated to be of lesser quality, poorer taste, and lower nourishment than were "Indian foods". The extent of this preference was made clear a few years prior to the commencement of the present study during the McGill-Cree Project. In one question on the questionnaire administered by the project to 101 Waswanipi adults, individuals were asked to "Name the kinds of foods you like best", the first three mentioned being listed as either "Indian" or "White". Seventy-three percent of those who responded listed as Indian food their first preference and sixty-five percent listed only Indian foods in their preferences (Table 4-16).

Within the domain food, or more exactly among the foods listed as replies to the meal question, certain distinctions are inferrable about the structure of the categories. Firstly, only animals of the categories 'large birds', 'fish' and 'large mammals' occur as food.

Thus, at the first level of analysis of the domain of 'food' there is a general correspondence between the "most inclusive" categories of 'animals' and the major categories of food which are produced from those 'animals'. And, there is also a correspondence between the specific categories in both domains, and between most of the labels in both domains.

At the level of the category 'animals' the structure of the domain of food is also revealing. There is a basic contrast between required 'flesh food' and optional 'vegetal food' in the structure of a meal. This would imply a contrast in the domain 'living beings' between 'animals' and 'plants' as the sources of such foods. Such a contrast appears to exist, but not to have distinctive labels. It will be remembered that some Waswanipi use the term <u>aoesisutč</u> to contrast with 'human beings' and to include 'large mammals', 'large birds', 'small birds','fish' and 'bad animals', while the majority of Waswanipi reject such a usage. This suggests a category of animals that is unlabeled for a majority of people. It is in this sense that we have been using the English term "animal" in the discussion above. Such a contrast is also suggested by the use of the term <u>nitaoičičikan</u>, usually translated as

Table 4-16 Preference for "Indian" or "White" Foods Among Waswanipi Adults (1965) From McGill-Cree Project, 1967

Question:

Name the kinds of foods you like best.

Distribution of Responses:[1]

Code	Code Definition			Choices made		
	1st. Choice	2nd. Choice	3rd. Choice	Three	Two	One
1.	Indian	Indian	Indian	34	24	2
2.	Indian	Indian	White	2		
3.	Indian	White	Indian	1	3	
4.	White	Indian	Indian	6	8	
5.	White	White	Indian	4		
6.	White	Indian	White	1		
7.	Indian	White	White	1		
8.	White	White	White	3	1	1
0.	No Response			10		
Sub-total				62	36	3
Total					101	

Footnote:

1. Source: McGill-Cree Project Questionnaire, 1967.

"all things that grow", but in contexts where a less general term is needed it may be translated "all things that grow in place". Thus there seems to be a second unlabelled category 'plants' as well as one 'animals' which contrast with 'human beings'. While these data are not conclusive it is in the context of meals that 'human beings' 'animal' foods and 'plant' foods occur together, and it appears that the structure of the domain of 'foods' corresponds at these most general levels with the structure of the domain 'living beings'.

It will however have been noted that the category of 'flesh food' does not correspond in scope to the category 'animal' because many specific kinds of 'animals' are not kinds of food. Furthermore, while the classification of "foods" gives some support for a category of 'foods' that are produced from 'animals' of the 'large mammal', 'large bird', and 'fish' categories, there is no evidence that all the 'animals' of these categories are in fact considered as potential sources of food. I therefore undertook to examine the boundary between food and non-food. A first step was to elicit rankings of the various 'flesh foods' recognized and valued by the Waswanipi in order to examine the criteria by which 'flesh foods' are categorized.

An examination of the criteria by which Waswanipi people rank 'flesh foods' indicates that there is an extensive use in the food domain of the criteria "what an animal eats", a criterion which was found to be pervasive in explanations of categories of 'animals', and that this criterion is related to distinctions among "more inclusive" categories.

Waswanipi have clear preferences and aversions to 'animals' as sources of food for human beings, and these are frequently revealed in naturally occurring discussions about food and food qualities. The values Waswanipi place on 'flesh foods' are not only revealed in verbal reports but in the levels of excitement, attention and action that occur during the transportation, butchering, preparation, consumption, and storage of foods, and this varies considerably from animal to animal, from season to season, from individual to individual and from situation to situation. Accounts of some of these activities will be presented in other parts of this study.[10] Here, however, the emphasis is on the cognitive ordering and relative value given to different 'flesh foods' produced from 'animals'. This was assessed by two means, a specific interview question, and naturally occurring comments on 'animals' and 'flesh foods'. The latter provides a check and basis for comments on the results of the former.

Four adult men were asked to tell me "What kind of 'animals' are good to eat?" and on some occasions they were also asked "Why?". In response they made statements about the quality of the foods they chose to list, and often, but not always, gave some reasons for their evaluations. Most also went on to indicate some 'animal' foods which were not highly valued. A numerical system of recording replies based on the structure of responses was developed. In the Waswanipi dialect there is a comparative marker and a superlative marker, very roughly glossed as 'more' and 'most' respectively. Comments to the effect that a particular 'flesh food' was eaten were given a rating of "0" if no further comment was made, comparative positive evaluations were given a rating of "1", and superlative positive evaluations a rating of "2". Negative evaluations were of two types, negative comparative, that the 'flesh foods' were not good foods, and statements to the effect that the flesh of the 'animal' was not eaten. The former were given a value of "-1" and the latter were given a value of "-2". An average rating was then calculated (Table 4-17). Because some 'flesh foods' were listed by only one informant an average could not be calculated and these values are put in parenthesis in the average rating column. These cases need to be treated with caution because it is likely that had more people been questioned the values of some of these ratings would have changed. On the basis of the other data available, I believe that muskrat and loon would probably be rated more highly were the number of respondents larger. The bear also has received a low rating, but for particular reasons cited in footnote 3 of Table 4-17. Data from a larger number of informants elicited with the McGill-Cree Project questionnaire appear on Table 4-18. They are roughly consistent with the data gathered in this study.

Table 4-17 Kinds and Ratings of 'Flesh Foods'

Kind of 'Flesh Food'	Rating by Informants #95	#81	#14	#85	Average Rating
'Large Mammals'					
"Big Game"					
'Beaver meat'	+2[1]	+2	+1	+1	+1.5
'Moose meat'	+1	-	+1	+2	+1.3
'Bear meat'	-	-	+1	+1	+1[3]
Others					
'Lynx'	+1	+1	-	+2	+1.3
'Porcupine'	-	-	+1	-	(+1.0)[2]
'Hare'	+1	+1	0	-	+0.7
'Otter'	-2	-	-1	-1	-1.3
'Marten'	-	-	-1	-1	-1
'Fisher'	-	-	-1	-	(-1)
'Skunk'	-2	-1	-2	-	-1.7
'Weasel'	-1	-1	-2	-	-1.3
'Mink'	-1	-2	-1	-	-1.3
'Muskrat'	-	-	-1	-	(-1)
'Fox'	-	-	-1	-	(-1)
'Wolf'	-	-	-1	-	(-1)
'Fish'					
'Sturgeon'	+1	+2	+1	+2	+1.5
'Walleye'	-	+1	-	+1	+1.0
'Whitefish'	-	-	-	+1	(+1.0)
'Pike'	0	+1	+1	-	+0.7
'Burbot'	-	+1	-	-1	0
'Sucker'	-2	-	-	-	(-2)
'Goldeye'	-2	-	-	-	(-2)

(CONTINUED)

Table 4-17 Kinds and Ratings of 'Flesh Foods' (Continued)

Kind of 'Flesh Food'	Rating by Informants #95	#81	#14	#85	Average Rating
'Large Birds'					
'Geese'	-	+2	+1	-	+1.5
'Grouse'	+1	-	-	+1	+1.0
'Ducks', "Vegetarian"[4]	-	+1	+1	-	+1.0
'Ducks', "Piscivorous"[4]	-	-1	-1	-	-1
'Loon'	-	-	-1	-	(-1)

Footnotes:

1. For a discussion of the rating system see the text.
2. Average ratings in parentheses are distinguished because they are not averages, but are based on only a single rating among four informants. See text for some qualifications.
3. Ratings of black bear were qualified. Both informants indicated that bears were not good when they ate around the dumps, or "not good around here, cause he hangs around dumps." Interviews in this series were conducted in Waswanipi villages and results on bears appear to reflect conditions in the immediately surrounding areas and not at bush sites. The implication of these comments was that bear meat would rank significantly higher in other geographical contexts, but I did not specifically ask a question on this. For no other 'bush food' did comments indicate a difference for the same 'living being' between quality as food near and away from settlements.
4. Informants distinguished between fish eating ducks, and ducks that eat vegetation in their replies. The labels are mine.

Table 4-18 Frequency of Choice of Specific Foods, Waswanipi (1965), From McGill-Cree Project, 1967

Kind of "Indian Food"	Choices[2] 1st	2nd	3rd	Total Rating[3]	Average Rating[4]
Moose	49	15	9	186	2.55
Beaver	10	27	10	94	2.00
Hare	4	13	11	49	1.75
Fish	2	8	2	24	2.00
Duck	1	6	4	19	1.73
Bear	1	2	5	12	1.50
Grouse	1	2	1	8	2.00
Sturgeon	1	1	1	6	2.00
Geese	0	1	2	4	1.33
Bannock	0	0	3	3	1.00

Footnotes:

1. Source: McGill-Cree Project Questionnaire, 1967.
2. Based on responses of 101 Waswanipi adults to the instruction "Name the kinds of foods you like best."
3. A first choice is 3 points, a second choice 2, a third 1. The total is listed here.
4. Divided by number of people making that choice.

The 'flesh foods' were found to be implicitly rated and classified according to the categories of animals 'large mammals, 'fish', and 'large birds'. This was revealed in the explanations of the ratings where the terms for these three more extensive categories recurred regularly, in comments such as: "sturgeon is a clean fish" (Interview Notes, #95). The use of the categories comes out most clearly however in the superlative questions, thus "sturgeon is the best fish", and "beaver is the best animal". The "most inclusive" categories of 'animals' were therefore used by informants to order responses and by implication ideas about 'flesh foods'. The data are therefore organized to show the ranking of the food values of the various kinds of 'flesh foods' within the "most inclusive" categories of 'animal'. The 'large mammals' are sub-divided into 'big game' and a residual category on the basis that most people spoke of 'moose-meat' and 'beaver-meat' in contrast to 'lynx', 'porcupine' and 'hare'. This coincides with the distinction made in the typical questions about what was eaten at a meal discussed above. Ducks were not ranked as a single group, but as "ducks that eat fish" and "ducks that eat weeds" or "grass". This distinction, which was not encountered in the data on groupings of kinds of 'large birds' and may just be used in the domain of food, or may be more common, roughly paralleling the distinction between piscivorous and non-piscivorous fish suggested in the earlier data.

A striking feature is the limited range of categories that are ranked in positive comparative and superlative terms. Within each major grouping there are but one to four kinds of foods that are spoken of in positive comparative or superlative terms, the remainder are considered as negative comparative or not typically consumed. Thus the 'beaver', 'moose' and 'bear' and possibly 'caribou', 'lynx', 'porcupine', 'hare', 'sturgeon', 'walleye', 'whitefish', 'pike', 'geese', 'grouse' and "vegetarian"'duck', stand out as positive comparative valued 'flesh foods' (greater than 0 average rating). Of these, 'beaver', 'moose', 'lynx', 'sturgeon' and 'geese' are superlatively valued 'flesh foods' (greater than 1 average rating). This is a relatively limited selection among the categories that are part of the domain 'animals'. Comparing this list with the specific categories of 'animals' identified so far, approximately forty-seven Waswanipi specific categories are included in the 'flesh food' rating list, of which 28 are rated comparatively positive and seven are rated superlatively positive (Table 4-19). The 'flesh foods' rated represent approximately two-thirds of all the specific categories of 'large mammals', 'fish' and 'large birds'. Those that were not included in the ratings include red squirrel, woodchuck, wolverine, brook trout, fallfish, perch, sculpins, other small fish, eagles, hawks, gulls, owls, crow and bunting. Two points need to be discussed here, possible omissions and the potentially ambiguous status of those flesh foods listed as "not eaten".

The eliciting procedure used here did not elicit responses that defined the full extent of the domain. Data gathered in other contexts indicate that a number of 'flesh foods' should be added to the list. These include: caribou and deer, red squirrel, woodchuck, brook trout, bunting, and some owls and hawks (Interview Notes, #114, 53, 47, 52, 97). The other specific 'animals' are not eaten to my knowledge.

An ambiguity arises with respect to the negative rating of the six 'flesh foods' that were stated by at least one person to be "not eaten" (average rating -1.0 to -2.0) and which, prima facie from this data, should not be included in the domain 'flesh food' at all. The question then would be, why were otter, skunk, weasel, mink, sucker and goldeye listed at all. Of the six 'flesh foods' said to be "not eaten", there were four cases where more than one person listed the 'flesh food' and, at least one of the people listed it as "not good" and therefore presumably eaten at least on some occasions. This suggests that these specific categories may in fact be edible although little valued. This is confirmed from supplementary data. Informant #95 reported that 'mink' was "not good" to eat but that during the decades when beaver were unavailable he had to eat 'mink'. The 'skunk' is the most negatively rated of the 'flesh foods' which were listed by more than one person, yet I was given explicit directions on the way to prepare 'skunk' so that it is edible and relatively palatable. 'Sucker' are commonly referred to today as "dog food" but are reported to have been used commonly when other food was scarce several decades ago. One informant said that some old people still do catch them for food

Table 4-19 Approximate Numbers of Waswanipi Specific Categories of 'Animals' Included in Successively More Highly Valued Groupings of 'Flesh Food'

Groupings	No. of Specific Categories
'Animals'	162[1]
'Large Mammals' 'Fish', and 'Large Birds'	67[1]
Rated as 'Flesh Foods'	47
Comparatively Positive Valued 'Flesh Foods'	28
Superlatively Positive Valued 'Flesh Foods'	7
"Big Game" 'Flesh Food'	4

Footnote:

1. All specific categories reported in the picture identifications as present excluding uncertain cases. This is an absolute minimum estimate of the total membership and is certainly less than the total membership.

(Interview Notes #53), and the same informant gave an account of the techniques for catching 'goldeye', presumably for use as human food. 'Otter' was reported as edible (Interview Notes, #56), and an 'otter' I saw being skinned was reportedly going to be eaten by the family that had caught it. My field notes include no data on the eating of 'weasels'. In summary then, I infer from the internal and external evidence that all the 'flesh food' listed in response to the rating question are considered as sources of human food.[11] The six 'flesh foods' listed as "not eaten" were presumably so listed because most individuals do not eat these animals under usual circumstances. But under unusual circumstances, or by particular individuals, they are accepted food sources.

However, while there are degrees of inedibility, there are also completely inedible animals. The ratings of 'flesh foods' indicate that most 'large mammals', 'large birds' and 'fish' are 'animals' that can be transformed into 'flesh foods' for humans. The scale of inedibility suggests the possibility of a category of 'animals' that cannot become 'flesh foods' for humans. These would be 'animals' that are not potential human food under any foreseeable circumstances. The existence and extension of such a category can be established by examining the criteria given for the ratings of 'flesh foods'.

Among the explanations given there were a number that referred to what the 'animals' being rated themselves ate. It will be remembered that what and where an 'animal' eats were the predominant criteria for the groupings made in the picture sortings, and that a secondary criterion, quality of the 'animal' as food for humans, suggested a link between the ordering of the domain 'animals' and the domain 'food'.

The predominant criterion given by informants for the ratings of 'flesh foods' was what the 'animal' ate. What the 'animal' ate was used by informants to explain over fifty percent of the 'flesh food' ratings (Tables 4-20 and 4-21). It should be noted that there is no overlap between the four individuals involved in the ratings of 'flesh foods' and the six individuals involved in the picture sortings.

Table 4-20 Criteria Used by Individuals to Explain Ratings of 'Flesh Foods'

Criteria for Evaluating Quality	Individuals #95	#81	#14	#85	Total Ratings	Percentage of Ratings
What it eats	4	4	14	5	27	59
Where it eats	2	2	1	-	5	11
Fatty/skinny	-	1	3	-	4	9
Smelly	1	1	2	-	4	9
Killed quickly/slowly	-	2	1	1	4	9
Boney/few bones	1	-	-	1	2	4

Table 4-21 Comparison of Criteria Used by Individuals to Explain Ratings of Animals as 'Flesh Food' and Groupings in Picture Sortings

Criteria	Frequency of Occurrence in Ratings of 'Flesh Food'	Frequency of Occurrence in Picture Sorting Groupings
What it eats	27	28
Where it eats	5	7
Where it lives	0	4
Quality as Human Food	N.A.[1]	3
Fatty/Skinny	4	0
Smelly	4	0
Killed quickly, slowly	4	0
Response to winter	0	2
Boney/few bones	2	0
Shyness	0	2
Fur valuable	0	1
Movement	0	1
Similiarity of Names	0	1
Sub-Total: What and where it eats	32	35
Sub-Total: All others	14	14
Total:	46	49

Footnote:

1. Not applicable.

In the ratings of 'flesh foods' however, there is an important difference between those 'flesh foods' that were positively valued because of what the 'animals' from which they were produced ate and those that were negatively valued because of what the 'animals' from which they were produced ate. In fact, there were clear-cut differences between what 'animals' that were positively valued ate and what 'animals' that were negatively valued ate. By inference the foods eaten by 'animals' that could become positively valued 'flesh foods' are themselves positively valued, and the foods eaten by those 'animals' that could become negatively valued 'flesh foods' are themselves negatively valued. There were strong indications of this in the eliciting context. Asked why a 'flesh food' was good or not good, informants would say because it ate 'hare', or because it ate 'mice' or 'moles', with obvious distaste in the latter case.

I therefore have have classed the 'living beings' that were mentioned as foods of those 'animals' that could become 'flesh foods' for humans into two groups, those positively valued and those negatively valued.

The negative group includes "bugs",'mice','moles', 'squirrels', 'sculpin' and several other categories (Table 4-22). "Underground things" refer most commonly in other contexts to 'snakes', and/or 'mice' and 'moles' and 'frogs', although not exclusively to these. The positively valued foods eaten by animals are all 'plants' with the exception of 'hare'. "Mud", listed as positively valued, referred in both individual cases to the 'sturgeon' which is said not only to eat 'plants' at the bottom of the water but "mud", which I took to refer to the sucking up of mud as the sturgeon feeds on vegetation at the bottom of a water body (Scott and Crossman, 1973:87).

The significant feature of these two groups is that all the negatively valued foods for 'flesh food' animals are themselves not 'living beings' that can become 'flesh foods' whereas the one specific positively valued source, 'hare' is itself 'flesh food'. The rule that implicitly appears to discriminate the 'flesh foods' rated negatively from those rated positively is that negatively rated 'flesh foods' come from 'animals' that eat other 'living beings' that cannot become 'flesh foods', that is they eat 'living beings' that are not fit

Table 4-22 Evaluative Comments on the Foods Eaten by 'Animals' That Can Become 'Flesh Foods'

Foods Eaten 'Flesh Foods'	Informants #95	#81	#14	#85	Total
Positively Valued					
"Underwater grass", "Weeds"	1	2	1	-	4
'Hare'	1	1	-	1	3
'Trees', 'Bark'	-	2	1	-	3
'Shrubs'	-	2	-	-	2
'Berries'	-	-	1	1	2
"Mud"	1	1	-	-	2
Negatively Valued					
"Carrion"	-	-	4	-	4
"Garbage"	-	-	2	1	3
'Mice', 'Moles'	1	-	2	-	3
"Underground things"	-	-	2	-	2
"Bugs"	1	-	-	-	1
'Squirrel'	1	-	-	-	1
'Sculpin'	-	-	1	-	1
"Eats anything"	-	-	1	-	1

for human consumption under any circumstances; whereas, positively rated 'flesh foods' come from 'animals' that eat 'plants', or other 'animals', that can become 'flesh foods'. Thus the classification of negatively valued 'flesh foods' appears to imply a category of 'living beings' that cannot become 'flesh foods'.

Some clarifications and apparent anomalies must be considered to help substantiate this claim. The negative half of the rule is inferred from the list of specific 'animals' but the meaning of "garbage" and "carrion" in the Waswanipi context needs to be explained. "Garbage" is by definition for the Waswanipi waste that is not fit for human consumption. This is because of a strongly expressed rule of conduct, enshrined in proverb, that one should not waste food, especially 'flesh food'.

Carrion is also non-food for Waswanipi because they say that they do not eat particular specimens of 'animals' other than those that have been killed by 'human beings'. 'Animal' specimens of any kind, even those otherwise highly valued that are killed by other animals or that died without apparent human intervention are not eaten (Interview Notes, #53 and #114). Therefore, "carrion", "garbage", 'mice', 'moles' 'snakes', 'bugs', 'sculpins' and "underground things" appear to all have in common that they are not food fit for human consumption.

Two apparent anomalies exist in my data: the eating of snared hare by lynx, and the listing of 'squirrel' as negatively valued food of 'flesh food' 'living beings'. 'Lynx' was rated positively because it eats 'hare' which is itself potential 'bush food'. But, one informant specified that the positive rating of 'lynx' was because he "steals rabbits from snares" (Interview Notes, #85). This may appear to be euphemistic way of saying the lynx eats "carrion" and it may therefore appear to be anomalous. I think it is not a case of eating carrion, however, because the particular 'hares' consumed were killed by men and therefore are 'flesh food' fit for human consumption, except in these cases the 'lynx' gets there first. It is therefore eating 'flesh food'.

'Squirrel' has been listed as a 'flesh food' for humans, as mentioned above, yet here it is listed as a negatively valued food for 'flesh food' 'living beings' This "dual" listing reflects the dual association of the 'squirrel' and closely related animals. As mentioned above the label <u>anekočaš</u> not only refers to the 'red squirrel', but also at a more general level, to the 'eastern chipmunk' and the 'northern flying squirrel' as well. The latter two fit the criteria for being non-food 'animals'. The 'flying squirrel' is said to "eat everything" one of the negatively valued statements on Table 4-22 and the 'chipmunk' is said to "live in a hole in winter with a snake" that is, it is an "underground thing". The 'red squirrel' itself is said to eat cones and 'plant' food (Interview Notes, #69). The 'red squirrel' I would suggest has close affinities with animals which are negatively valued, while itself conforming to conditions of positive valuation. Thus it is in the category 'flesh food' for human consumption and another 'animal' that eats 'squirrels' can become 'flesh food' as well, but it will be a negatively rated 'flesh food'.

The point of this was to argue that while the list of 'flesh foods' given in the food ratings are all 'large mammals, 'large birds' and 'fish', the reasons given to explain the positive and negative valuations of these 'flesh foods' implicitly involve a definition of a category of 'animal' not fit to be 'flesh food' for humans. This food category is related to a "more inclusive" 'animal' category.

Most of the members of this implicit category of 'non-food animals' are specifics which are members of the 'bad animal' category, as the name seems almost to imply. With respect to this classification the data suggest that at least some 'small birds' are potential 'flesh food animals'. Some men are said to hunt and eat woodpeckers and jays on occasions, but the data indicate that these are generally of low value. With respect to those specific 'large mammals', 'large birds' and 'fish' that are considered not to be potential 'flesh food' they appear to fall into two groups. Most of these specifics are said to be 'animals' that live mainly by scavenging as opposed to catching their own food: 'wolverine', 'eagle', 'hawk', 'gull', 'crow' and 'great grey owl' but not 'great horned owl'. They are therefore an extreme form of 'animals' that eat carrion.

But, some informants say that they might be eaten, if there was no other food, in contrast to the 'bad animals' which never would be. The small 'fish','perch' and especially 'sculpins' are considered to have affinities with 'bad animals'. These inedible groups therefore are explained using the same criteria that I have shown are used to rank food quality.

That the domains of 'animals' and 'foods' should be closely related in organization is not surprising. 'Animals' are killed in order to transform them into food for human beings and other products of human value. But, which 'animals' are killed makes a critical difference as to whether the carcass of the animal can become 'food' and how it will be rated as 'food'. I have shown that certain 'animals' are classed as 'non-food animals', that other 'animals' are generally, but not absolutely, 'non-food animals' because they survive predominantly on things that are not fit 'food' for humans, and that those 'animals' that are 'flesh food animals' are ranked in value on the basis of whether what they eat is appropriate food or not.

This interrelationship between the domains of 'animal living beings' and 'food' highlights the fact that the two most important criteria for relating inclusive non-"natural" categories in both domains are locational characteristics and usefulness as food. The latter may be summarized as "you are what you eat", and by the rule that what an animal is determines what use can be made of it as food for humans. The emphasis in the Waswanipi system on two major criteria to explain, and presumably to form, the relatively more inclusive categories of 'animal living beings' helps clarify why the categories are not related by strict inclusion. A specific animal can be grouped by where it lives, or by what it eats, or both. The data presented here, limited as they are, indicate that where the criteria used are different kinds of criteria, one being "spatial" and the other being a criterion of "function", it is unlikely taxonomic relationships will exist among the categories.

But, the more general issue that arises is that these two criteria are based on different principles of relationship. Many principles of relationships are possible of which class inclusion, feature identification, spatial and functional relationships are only a few. Other possible relationships include: comparative, attributive,provenience, grading and others (cf., Werner and Fenton, 1970: 563-564). Since the criteria used for classification have been found to be highly restricted, the question then would be whether the principles of relationships that are used to explain categories are also limited in range. This can be considered by examining the full range of the domain 'living beings'.

D - Extent of the Domain 'Living Beings' and the Principles of Classification

The examination of the domain of 'living beings' on the basis of illustrations is insufficient to indicate the full scope of the domain and, in order to understand the significance and meaning of 'animals' to the Waswanipi, it is necessary to examine both the broad limits of the domain 'living beings' and to indicate how the categories of that domain are interrelated by propositions, causal explanations, moral rules and value judgments. In the remainder of this chapter I delimit the broad scope of the domain 'living beings' and in the next chapter I indicate the propositions and values used to understand and respond to these 'living beings'.

It will be remembered that the specific types of 'animals' which were elicited by means of illustrations could be grouped under three labels: 'animals', 'all things that grow' and 'living beings'. The second term, nitaoičičikan could include 'animals' and other categories, or it could contrast with 'animals'.

Rather than focussing on 'things that grow' I have focussed attention on the most inclusive of the labels offered. Basic data was elicited with the questions "Is x alive?" which was later refined to "Is x a living thing (being)?" This provided a long list of names of things that were considered to be 'living beings', that were $pimat_{s}ioin$, and it also provided a variety of principles for the inclusion of those things in the broad category.

The term pimat$_s$ioin, 'living beings' refers to an extremely wide range of 'beings' including: 'water', 'rock', 'wind', 'gun', 'snowshoe', 'trap', 'spirit beings', legendary figures, 'souls' and 'God'. The inclusion of many of these kinds of 'beings' is explicitly vague according to Waswanipi individuals. As we will see below, members of some groups of things are 'living beings' while other members of the same groups are not, some kinds of 'living beings' are only 'living beings' some of the time, some kinds of 'living beings' are one kind of 'living being' at one time and a different kind of 'living being' at another, and some kinds of things are said to be "like" 'living beings' rather than being classed as 'living beings' without qualification. Under these circumstances systematic testing for categories of intermediate extension and systematic testing for inclusion and contrast did not appear to be a productive course. Instead a general and flexible classification of the wide range of things that are 'living beings' is needed. This was developed on the basis of certain distinctions the Waswanipi themselves explictly make when discussing the kinds of 'living beings'.

There is evidence that a meaningful division of the category of 'living beings' into two groupings is made by the Waswanipi on the basis of a difference in the senses through which experience of the 'living beings' is normally possible. The distinction which the Waswanipi use in diverse instances when describing how they know 'living beings' is between those 'living beings' which can normally be seen, and those which cannot normally be seen. The distinction might be described for present purposes as a difference between those 'living beings' that are visible to all competent persons during their waking lives, and those 'living beings' which are not potentially visible to all competent persons during the waking lives. The latter 'living beings' may be commonly heard by most persons, but they cannot be seen by most. There are many accounts of 'living beings' that are experientially encountered exclusively by hearing rather than by sight, both in waking experience, and even more commonly in dreams (for a similar distinction, see Conklin, 1975; and Frake, 1964). Being commonly unseeable, they do not present a form that can be touched as well. These 'living beings' are however also known by means of the ongoing consequences of their action which are visibly altering the visible world.

That the 'living beings' experienced aurally but not visually form a grouping, for some purposes at least, is indicated by an expression used as a circumlocution when refering to at least some members of the group: "the one we do not see", or "he does not see him" or just that they are "not seen". Further indications of the grouping of 'living beings' whose standard visual form is relatively inaccessible are indicated by characterizations of many of these 'living beings' as: living "far away", "at the end of the earth", or "above us" where men cannot travel; or more directly as 'living beings' that have "no bodies". Individual instances of the data supporting these characterizations will be cited in the specific instances below.

There are, however, some reported instances of personal experience of these 'living beings' that do not conform to the dual classification made here between those that can be experienced visually and those that cannot. In particular, some or all of those 'living beings' that I would list as not commonly experienced visually have been reported to me as having been seen by particular individuals. But, these reports often indicate directly that these visual experiences are not commonly available to otherwise competent Waswanipi precisely because they are described as unusual occurrences. These visual experiences occur mainly in conjuring, although they also occur in dreaming.

When 'living beings' that cannot normally be seen are said to have appeared visually in dreams they were, almost without exception, cited as visions of a human form, a "beautiful woman" or a "white haired woman" for example. On those occasions when I had the presence of mind to inquire if that form was the 'living being', the informant claimed the person seen was not the 'living being' itself but a person that "meant" that 'living being', that represented the actual 'living being'. This I understand to be an implied agreement that you cannot see standard visual forms of these 'living beings'. The exception to this agreement is conjuring in its various forms.

In conjuring the conjuror may actually see 'living beings' that do not have visual appearances for most people. For example, in the 'shaking tent' performance, to be discussed elsewhere, the conjuror sits in a specially constructed tent, and all the other 'human beings' sit outside. The conjuror is "visited" by various 'living beings' which he can see as "little lights" up near the top of the conjuring tent. All the human beings outside know of who the visitors are because they can hear them talking in the conjuring tent, but they cannot see them. Conjuring is the only recurring occasion I have encountered when those 'living beings' that cannot normally be seen are actually visually experienced by a Waswanipi. H. Christoph Wolfart, a linguist of Cree, a closely related Algonkian language, has reported to Richard Preston that a tentative analysis of the root (or term) of the word for conjuring in the dialect with which he is familiar kosapaht-, would seem to have a meaning combining 'try' with 'see, vision' (Preston, 1975:293). The Waswanipi term for shaking tent, koapskikan, contains a root that is similar. Interestingly, many of the other conjuring techniques also refer explicitly to visual experience, including: looking at water reflections; looking into eyes of certain animals; looking into mirrors; and having "visions". The shaman can "see" what other men cannot. It is one of the special, possibly defining, features of conjuring that 'living beings' that are not commonly seen become visible in that context. Even singing a powerful song is said to bring a "vision".

In general then, a separation between the categories of 'living beings' that can and cannot be visible, in principle, to all competent persons during their waking lives appears to be made by the Waswanipi.

It should be remembered however, after this discussion of the unusualness of visual encounters, that 'living beings' of this sub-category may be readily heard on commonly occurring occasions, particularly, but not only, in dreams; and that the consequences of their actions are visible to all competent individuals throughout much of their waking lives. They are known about, through frequent recurring common sense experiences.

The first grouping of 'living beings' those that are commonly known by sight as well as sound, includes in addition to 'animals', 'plants' and 'human beings' also 'stone', 'water', 'lightning', 'thunder', 'sky', 'cloud', 'sun', 'moon', 'stars', 'constellations of stars', 'fire', 'light', 'cold weather', and probably others I have not recorded.

'Stone' assini is considered by the majority of mature Waswanipi to be a 'living being' although not all adults agree. Those who do classify 'stones' as 'living beings' often make their claim tentatively, saying for example that they are "probably" alive. Nevertheless, the claim will be supported during discussions. The most frequently recurring explanation for the knowledge that 'stones' are 'living beings' is the knowledge that 'stones' walk, which informants infer, in almost all cases, from the experience of finding a 'stone' at the end of a "path" at the shore, a path made as it comes out of the water and onto the land. Informants claim they have seen this many times. I did not have occasion to encounter the phenomenon during my field work. A less frequently occurrence is the occasional discovery of a 'stone' in a fish net. One such 'stone' kept by an informant was shown to me. It was the size of a fist, dark, and had appeared to be completely penetrated by large pockets, some hollow, some filled with dirt and sand. The 'stone' felt light for its size. Informants state that all 'stones' are alive, but that they do not perform other acts besides movement.[12] 'Stones', they claim probably do not grow, and they cannot understand if they are spoken to. They are therefore 'living beings' but not 'things that grow'. Some 'stones' are large boulders that manifest special qualities. Thus it is said that if you look at one of these 'stones' in the middle of a lake it will cause a storm to come, or if you look at particular boulders, at the top of certain hills, from a lake it will also cause a storm and rough water. One particularly famous 'big stone' occurs at Lake Mistassini from whence the name comes. Finally there are some 'living beings' to be described below, that are said to live inside 'stones'.

'Water' is a 'living being' for similar reasons, because it moves, forming waves, and because it supports other 'living beings' like fish. Thus 'lightning' is a 'living being' because "it does move" but 'thunder' is "because of the noise".[13]

Movement is one basic dimension of the category of 'living beings' but the concept translated as "movement" that is used by the Waswanipi appears to imply activity more than simple physical movement.

Whereas the first group of categories classified as 'living beings' are so classified without much ambiguity, the second group, comprised mainly of manufactured articles, are said to be like 'living beings' some of the time.

> Q. "Is a trap alive?"
>
> A. "When you are ready to set a trap, when you are holding it, it seems like it is alive, but when you put it under water when it snaps, it seems like it is not alive anymore... When he puts it away it is not alive. When he takes it to use it comes alive... Sometimes trap misses beaver, [it is] as if it is dead. No use for it when it is shut. It [just] lies under water. He goes to check a trap, sees it is dead. As if it comes to life again when he fixes it [re-sets it]." (Interview Notes, #69, brackets mine).[14]

The two features of this account are that it qualifies the classification of 'trap' oianikan, as a 'living being' "it seems like it is alive", and secondly that it is like a 'living being' only when it is active, or when it has the immediate potentiality for action. It is "like it is not alive anymore" when it is put away for storage and also after it has been snapped and requires resetting before it can exhibit movement again. These examples indicate the importance not only of movement but of potentiality for action as criteria for classification as a 'living being'.

The same classification is made, for similar reasons, of pasčiekan 'gun', nakoakan 'snare', api 'fish net', amiskapi 'beaver net', toekan 'outboard motor'. However, snares and nets do not actually move, and there are other categories classified as 'living beings' in which the concept of movement clearly needs revision or expansion. Thus, informants also say that pasam 'snowshoe' otapanask 'toboggan', paštiš 'mitt', maštčin 'moccasin', maki 'tent' čeiman 'canoe', netaioiokabi 'ceremonial string', teoeikan 'drum' and šišikun 'rattle' are also said to be 'living beings'. It is said of these categories that the objects they denote are objects "we have good use for", and that "we have to take good care of them" (Interview Notes, #69). These categories of objects help men, and they must be cared for if they are to continue to do so. This dual aspect appears to be at the center of the classification of these categories as 'living beings': they are useful, they can "do" things for men, and men therefore have responsibilities towards them.

The classification of categories denoting various phenomena as 'living beings' by Algonkian speaking peoples has led some researchers to argue the parallel between this classification and the linguistic distinction, between what have been called animate and inanimate genders of nouns in Cree. The names of these two genders appear to be derived from the fact that all animals, in the sense that contrasts with plants, are in one class of nouns, which linguists have labeled animate (Ellis, 1962:12). From a Cree perspective, as well as from a Western perspective, there is no fit between the linguistic classification of nouns and the classification of 'living beings'. Thus the inanimate linguistic classification of nouns includes, for example, 'grass', 'clay', 'stone', 'fire', 'canoe', 'outboard motor', 'moccasin', 'snare', 'water', 'gun' and 'meat', whereas the animate classification includes 'animals', 'trees', 'sun', 'moon', 'thunder', 'stone', 'fish net', 'mitts', 'kettle', 'spoon', 'bread', and 'tobacco'. Ellis concluded that the gender classifications were only a grammatical classification indicating which kinds of words required certain grammatical treatment, and that any relation to biology is incidental (Ellis, 1962:13). I might add that any relation to cognitively salient Waswanipi classifications of concepts of things, as opposed to words, is also incidental, and in fact difficult to discern.

The second major group of 'living beings' are those that are not commonly seen by the majority of the Waswanipi. Because they are not normally seen I will tentatively label this category 'spirit beings'. As I have indicated above, the visual perception of one of these kinds of 'living things', is itself an occurrence that is not common.

A few words of caution are necessary here, because it would be easy to overdraw this distinction, and to separate too radically 'spirit beings' from other 'living beings'. While I think the distinction is recognized by the Waswanipi and meaningful for them, it is also clear that both kinds of 'living beings' are equally 'real' and common sensical. Experience for the Waswanipi appears to be continuous. Experience in waking life through the external senses, such as sights, sounds, and more complex feelings, will be cited in the same discussion with other types of experience, such as: experiences from sleeping life through dreams, either seen, heard, or felt; and also experiences from waking life through the mind or thought but without direct access to external senses. To hear something with one's ears, to hear it in a dream, or to hear it in waking thought (where someone else standing near one would not necessarily hear it) are all distinguished as sources of knowledge, but all are ultimately valued sources of knowledge. There is, it seems to me, no general rejection or devaluation of one or another of these forms of experience. The continuity of experience is paralleled by an assumed continuity of the experienced world. As we will see, 'animals', 'traps', 'water', 'winds', 'spirit helpers' and 'God' are all part of a single world, the experienceable world. There is therefore no strict separation of natural and supernatural phenomena or experience. The most cosmic 'living beings' are experienced as concretely as the most local 'living beings'.

When discussing the 'spirit beings' Waswanipi informants will carefully note the kind of experience they call upon as evidence of the existence of each of these kinds of 'living beings'. Three such kinds of knowledge seem common and distinctive. The resulting three-way classification of knowledge is, I think, related to at least one of the ways the Waswanipi group these categories of 'spirit beings'.

This classification of the type of knowledge to which the Waswanipi refer for evidence of 'spirit beings' is revealed when they reply to the follow-up question in the sequence: "Are X's 'living beings'?" and then "How do you know X's are 'living beings'?" or just "Why?" The question, however uncommon, is not unnatural and the ready availability of answers is indicated by the ease of response and the replicability of responses.

When asked why a category of 'spirit beings' were 'living beings' informants would reply by citing one of three kinds of knowledge, or a combination of the three: knowledge that was known to them on the basis of direct and usually frequent experience; knowledge that was known to others, who were known to them, usually on the basis of experiences that were uncommon or unusual; and, knowledge that is known to them on the basis of stories passed on as verbal traditions. The first is based on common first-hand experience, experience that is presumably available to all Waswanipi today. It is matter of fact knowledge, close to what Geertz has recently called "common sense" (Geertz: 1975). The second category is based on experiences that very few, if any, people alive today have had, and that most know at second-hand. In many cases it is exactly second-hand for adults, that is they know or have known those who experienced it first hand. The third category is based on knowledge that is known on the basis of tradition, oral tradition handed down for generations, atiokan or 'legends'.

'Legends' stand in opposition to tepačimun, or 'news', and the contrast corresponds to the difference between the third type of knowledge cited above, and the first two. Knowledge of the second kind can come from and be communicable as 'news'. Knowledge of the first kind is common sense unless it is unusual, such as in shamanism, and then it may become 'news' as well.[15]

These three kinds of knowledge are the basis for the three categories of 'spirit beings' I propose.[16] Many of the different 'spirit beings' occur as part of the 'legends' even though they are known by other means as well, and many known by common knowledge are also known by way of 'news' and 'legends'. The distinction I would make therefore is between those 'spirit beings' known directly by common sense knowledge, those known only by second-hand knowledge and those known only by 'legends'. The third category is therefore treated here as a residual category, that is, it consists of those 'spirit beings' not known by other means. The second category is treated as a first-order residual. The second category includes those kinds of 'spirit beings' that are known by most people only at second or third-hand, and possibly also by 'legend'.

Finally, it should be noted that 'legends' are considered to be "true" or at least "not false". Young people who have been to school express some doubts or qualifications about the truth of the 'legends', older people do not. If older people comment it is simply to state that things are not any more as they were at the time the events occurred. This however is a warning against overly simple efforts at interpretation, it is not a questioning of the truth or relevance of the 'legends'. The implication I get from their comments is that behind the surface the stories contain important "truths". This is indicated by the fact that I did not, in general, ask to hear stories. They were either introduced into a discussion as an explicit means of answering a question I had asked, usually about the present, or they were offered spontaneously without any specific request for information, as a contribution to my efforts to understand the way the Waswanipi live in the world. Stories were offered both orally and in written form without specific requests.[17]

Among those categories of beings which are not usually experienced visually, but that are commonly experienced, are included the winds, spirit helpers, God and the Devil, and the animal masters. Čitče manitu, translated "chief manitu", or "head manitu", 'God', is also called kotoinao 'everybody's father', and various other circumlocutions. 'God' is known through prayer, through dreams and through the workings of the world. He is commonly heard in dream or thought telling people what will happen, and explaining to people why things are as they are, and how they should act. Okosisimao, 'God the Son', Čeesus, was on earth long ago. The Waswanipi say that čitče manitu has appeared in visions, but that oemistekoču, 'Whitemen', are more inclined to these visions, and most Waswanipi have seen only the pictures drawn by 'Whitemen' of how 'God' looks. I was told that a few Waswanipi have said that a man all dressed in white comes to them and talks to them but I did not hear a first-hand claim to this effect. The few dreams told to me of encounters with čitče manitu involved descriptions of a trip to a place of great illuminating brillance, but did not describe čitče manitu himself.

Mači manitu, literally "bad manitu", "devil", is known more commonly through the consequences of his actions in the world than through direct communication. The terms 'chief manitu' and 'bad manitu' include the word 'manitu' plus a qualifier which suggests that it is a label for a class of 'spirit beings'. In my experience, this term is not commonly used and suggestions that it might be a name for the category 'spirit beings' were explicitly rejected by individual Waswanipi. When a term to refer to a category of this extension is needed, the word "spirits" is used in English, but my data on the use of a Cree label for such a concept are inconclusive. Finally, it should be noted that a relationship between "bad *manitu*" and 'bad animals' is frequently implied in conversation, and that like the 'devil', many 'bad animals' are "underground things" or have some association with the places "under" or "in" the earth.

The winds are classified as 'living beings'. Waswanipi recognize four winds, one in each of the cardinal directions. The four major winds are *čuetenšu*, the 'north wind', *nikabenšu* the 'west wind', *souenšu* the 'south wind' and *oabenšu* the 'east wind'. The four winds are 'living beings' with bodies like humans that live at the "four edges" of the world. They have never been seen by men, but men "feel" them when it is windy and also hear the wind as well. The winds appear in dreams. Those individuals who would speak about their dreams say that they do not talk to the winds but that the winds tell them in the dreams what to expect in the future. The wind may talk to them, or they may just "know" what the wind has "told" them.

I have glossed another class of categories that are 'living beings' as 'spirit helpers'. Individuals speak of the existence of many such beings, and refer to them collectively as *mistapeo* or *meteo*.

Mistapeo are beings that are closely associated with the shaking tent ceremony. Men who perform, or formerly performed, the shaking tent say that they have many *mistapeo*, but each claims to have one special *mistapeo*. They were beings that would look like human beings, but they can not be seen in that form. They were heard, both in dreams and thought and in the shaking tent itself. Not all men had *mistapeo*, but most adult men have personnally heard the *mistapeo* of other men at shaking tent ceremonies they observed. A large part of what is said during the shaking tent performance is said by the *mistapeo* of the man performing the ceremony.

Meteo are classed as 'living beings' also. Many men claim to have meteo, and to have knowledge of meteo in dreams and thoughts. The concept of meteo will be discussed elsewhere.

Another class of 'living beings' not known by sight are the očimao 'master' of the kinds of 'animals'. According to some individuals there is a 'master', "leader" or "boss" of each of the different kinds of 'large mammals', 'fish', 'large birds', 'small birds' and 'bad animals'. These 'living beings' are or were inoatč 'human beings', but each lives with the specific kind of 'living beings' over which they are master. The 'masters' formerly lived with 'human beings' but have now retired from the immediate Waswanipi surroundings to lead the 'animals'. They live far away. Men do not see the 'masters' any more, but some men say that they hear them in dreams. A few men report that they see the 'masters' in their dreams but not in his true form. One description of the 'master' of the beaver was "a lady [with] white fur on hands, feet and whiskers" (Interview Notes, #22).

The 'masters' are said to lead the specific kinds of 'living things' with which each lives. It is from the places where the 'masters' live, with each kind of 'living beings', that come those individual specimens of the 'animals' which are actually found in the Waswanipi region. The places were the 'masters' live are therefore the "homes" of all the kinds of the 'animal living beings'. There are very large numbers of the 'animals' at these places, and those specimens that live at any one time in the Waswanipi region are but a small part of the total. Those 'animals' which are part of that category of 'living beings' which are seen as well as heard, are therefore not only found in the Waswanipi region, and in surrounding territories, they are found "far away" as well.

A significant minority of informants denied knowing of the 'masters' of the species. As these tended to be younger adults, although not exclusively, it seems possible that this category of 'living being' is less commonly and less widely known at first hand, than the others listed above, and it may be a category of beings that is presently borderline with 'living beings' of the second category, namely those which are known to most people at second-hand. This marginal feature may, in fact, be of an ongoing transition. How such transitions have presumably occurred in the past can be seen below when I examine those categories of 'living beings' that are today only known at second hand.

This completes the list of categories of 'spirit' commonly known directly by first hand experience to most Waswanipi adults. As I will indicate in the next chapter of this study it is this group of 'spirit beings' that are at the center of everyday Waswanipi thoughts and activities.

I was introduced to those 'spirit beings' that are now known only at second hand by one of the first Cree words I learned in the Waswanipi settlements, Atoš. During my early visits to people's homes I was often pointed at by adults who would say "Atoš, Atoš" while alternatively looking back and forth between me and one or more little children observing me at a distance. The children often backed away, turned their heads, and occasionally cried. I was initially somewhat at a loss, although hopeful, because of the reassurance given by the adults who smiled and laughed after the child reacted.

Questioning revealed that Atoš are "big Indians who killed and ate regular Indians". Atoš would go around to the camps and kill and eat the people for food, raw or slightly roasted. I found no Waswanipi who had seen an Atoš, all agreed that Atoš were no longer in the Waswanipi region. But Atoš were dangerous when they had been present. They lived in the air, were capable of flying, and were as tall as trees. People knew about Atoš from 'news', 'news' their fathers and grandfathers had told them. At first I thought Atoš might be understood only as a character in the 'legends'. It turned out, however, that the fathers of at least two informants had encountered and killed Atoš, one gave the following account:

> "(My) father killed one, his 'spirit helpers' killed it. Gull Lake was the last Atoš, the last time they /the Waswanipi Indians/ knew it, last time they kill it. He had 'spirit helpers' and /they/ killed the Atoš. His 'spirit helpers' they took him out /of his camp/ and the next morning they bring him back. When his father came

> back, people were still there. He told people to come and see where they killed the Atoš. Those Indians see where they killed him. All the trees are down, the big ones are upside down. Atoš do that to the trees, he grabbed them to hold on when fight. Just like a big wind was there when they fight. (I) was not born yet, father told (me)" (Interview Notes, #14).

There are three points to note in this account. The first is that Atoš is known at second hand. The second is that no claim is made in this account that even the informant's father saw the Atoš. While the story is silent on this particular point, I would assume that no claim to seeing the Atoš is intended, but rather a claim to hearing and feeling it, and to seeing its consequences. I base this assumption on a parallel story by the man involved in a duel who recounted how his 'spirit helpers' after taking him out of the camp so that they could fight and eventually kill the 'spirit helpers' of another shaman, describes the experience by saying that it was as if his 'spirit helpers' put a blanket over him, and he awoke in the morning to see what they had done. The third point is that the major public evidence for the existence of the Atoš is observation of the consequences of his presence, a place in the forest where the trees are knocked down and unrooted "just like a big wind was there". Other accounts make clear that Atoš is heard, like a wind. The features described for Atoš, his size, that he lives in the sky, and that he flies can be inferred from the public but rarely available data. Similarly, the claim that Atoš eat people appears, in the stories I heard, to rest on circumstantial evidence, because there is no indication of survivors. For example,

> "Sometimes, Atoš would eat the woman of an Indian hunter when he was away hunting, and after that make a big fire. When Atoš would be finished at a camp he would go to another" (Field Notes, #114).

The burned remains of the camp and its inhabitants were presumably discovered by the hunter on his return.

Atoš are not now found at Waswanipi[18], but they are in the Waswanipi view still in existence, only far away. One informant has suggested that all the fighting that characterizes White society may be an indication that Atoš are to the south of Waswanipi now.

Another category of 'living beings' recognized widely by Waswanipi are memegueŝu. In this case there was one man whose wife had seen and interacted with memegueŝu. Memegueŝu are people who lived on 'lakes', in 'stones', 'rocks' and whose canoe has been seen disappearing into the 'stones'. They are noted for stealing fish from nets. Typically Waswanipi can hear them laughing, banging their paddles on the sides of the canoes while they do their work (Interview Notes, #80). The informant's wife was a young girl when she encountered memegueŝu with her family, her aging husband reported;

> "Saw them one time checking (her family) nets. They would hide their faces /which had/ hair like a lynx on them. (Her father) spoke to the leader /who had/ not too much hair on /his/ face. Started paddling away with /their/ heads down. Did not lift faces until far away. /This happened/ at Pusticamica Lake" (Interview Notes, #80).

The things I note in this account are that the claim to have actually seen the hair on the face of the memegueŝu is a weak one, the determination that the beings encountered were in fact memegueŝu rests more on the activities and behavior of the thieves than on morphological characteristics. The informant, a man in his 80's also commented that the memegueŝu "must be starving now", given the decline in fishing. Other Waswanipi agree there are no memegueŝu in the area today, and it has sometimes been noted that the "Whitemen" have replaced them.[19]

A large otter-like 'living being' is said to inhabit Pusticamica Lake.[20] He is known by reported sightings of his head above the water, and by observation of his tracks on land, which are said to be "like those of a large otter" (Interview Notes, #53). I did not get confirmation of these observations from anyone who had seen these phenomena at first hand. The area in which the 'large otter' is said to have been observed is reportedly an area with a whirlpool and it is said that when the 'large otter' ducks his head he brings the wind and presumably the waves.

Three other 'living beings' experienced by Waswanipi were wabant$_c$iŝ, mistipiěsu, and nodaoa. Wabant$_c$iŝ are described as 'dwarfs' who steal children from people. One man reported his son was almost taken by the wabant$_c$iŝ when he was very little, about thirty years ago. The boy did not know how to talk, or walk, or cry for a very long time. I did not get more information on this encounter.

Mistipiešu are big birds. They live on mountain tops, and when they see somebody at night they can grab them, carry them away to the mountain and kill them. One Indian found the birds sleeping, so he burned them and killed them. I was unable to date this event.

Nodaoa or nadčua were Indians who were at Waswanipi a long time ago, and fought with the Cree. They are recounted in stories as having no clothes and paint on their faces. Notaoaokipi River, Nottaway River, is named after those Indians, who are known in English as the Iroquois. In the seventeenth century struggles for control of the fur trade and fur trade routes the Iroquois are known to have raided far to the north of their homes south of the St.Lawrence River (see Chapter 2). One of the first Europeans to traverse the interior between Lac St.Jean and James Bay, the Jesuit Father Charles Albanel, passed Nemiscau as he descended the Rupert River, just to the north of Waswanipi, and found an abandoned stockade used by the Iroquois during their raids against the local people. Albanel's visit was in 1672 and he reports that in that area seven years previous the Iroquois killed or took captive eighty persons (Thwaites, 1896-1901, Vol. 56:183).

There is one 'living being' of which I am not certain whether there is second-hand knowledge or only legendary knowledge. This is memeo who occurs in a story as little boy born with long hair on his face. There may be others of which I am not aware.

The most striking feature of the 'spirit beings' of this second category are that they are all no longer active in the Waswanipi region. In this sense they are the least important of the 'spirit beings' and their somewhat unusual status will be discussed elsewhere.

Then, there are those 'spirit beings' that were on the earth before there were men. Their lives are retold in the 'legends' by which the Waswanipi know of them. Many of the 'living beings' mentioned previously also existed at the time to which the 'legends' refer, but there are also 'living beings' which appear have been alive then and that have not been known on earth since before the present Indian people and their personally remembered ancestors came.

$T_s$ikapis, for example, about whom there are apparently numerous 'legends' is now said to be "finished with the earth". He is now on the moon, and can be seen standing there with a big pot and a fire. Many older Waswanipi did not believe the live broadcast of the first 'human beings' on the moon.

Other 'spirit beings' known about only through 'legends' include various 'living beings' that were killed or otherwise have left the earth, often after transforming it in ways that are recognizable today. These include mistatum, 'big dog' who had a giant head and hair only on his head not on his body, and was "like a lion" and mistčikak 'big skunk'. These, according to some informants, lived on earth during the time when there were Indians, they killed Indians at times, but are not known now. My lists of beings in these categories is much abbreviated. There must be more 'living beings' in the reportoire that are known through the 'legends'. All these cases however are ambiguously distinguished from the former kinds of 'spirit beings' because in some sense they are experienced still today. Thus $t_s$ikapis can be seen up on the moon, and the dogs and skunks that are around today come from parts of 'big dog' and 'big skunk', at least according to some informants. This emphasizes again that there is always some contemporary experiential evidence for the existence of all categories of 'living beings'.

This is the list of 'living beings' with which I am familiar, and the bases of the knowledge the Waswanipi have of each category of 'living being' (Table 4-23). However one category of 'living being', known through everyday experience raises several questions about the meaning of the label pimit$_s$ioin.

Atčaco, the 'soul' of a human being survives the death of a man and is spoken of along with other 'living beings' although it is not said to be a "living" being as such. After death the 'soul' of the tsiboi 'dead person' departs

Table 4-23 Examples of Membership of Each Kind of 'Living Beings'

Modalities of Knowledge	Waswanipi Label	English Gloss
Known to most individuals	aoesisutč	'animals'
by visual experience,	nitaočičikan	'plants'
always 'living beings'	assini	'stone'
	nipi	'water'
	oastepaio	'lightning'
	ačnemest$_c$oač	'thunder'
	iskoteo	'fire'
	oastenamakan	'light'
	kaskaOnasko	'cloud'
	takuiku	'cold weather'
	čisuk	'sky'
	čišikaopisim	'sun', literally "day luminary"
	tipisaopisim	'moon', literally "night luminary"
	ačakosač	'stars'
	čeateko	'big dipper'
	očinanš	'little dipper'
	kon	'snow'
Known to most individuals	oianikan	'trap'
by visual experience,	nakoakan	'snare'
sometimes, or "like",	pasčiekan	'gun'
'living beings'	nemesapi	'fish net'
	toekan	'outboard motor'
	pasam	'snowshoe'
	otapanask	'toboggan'
	paštiš	'mitt'
	maštčin	'moccasin'
	maki	'tent'

(CONTINUED)

Table 4-23 Examples of Membership of Each Kind of 'Living Being' (Continued)

Modalities of Knowledge	Waswanipi Label	English Gloss
Known to most individuals by visual experience, sometimes, or "like" 'living beings' (Continued)	čiman	'canoe'
	netaioiokabi	'ceremonial string'
	teoeikan	'drum'
	šišikun	'rattle'
Known to most individuals by auditory experience, and by consequences of action in the world	čuetenšu	'north wind'
	nikabenšu	'west wind'
	souenšu	'south wind'
	oabenšu	'east wind'
	mistapeo	'big man')
	meteo	meteo) 'spirit helpers'
	čitče manitu	'God'
	očimao plus specific animal name	specific animal 'master'
	čeesus	'Jesus'
	mači manitu, kaotaokaoiset	'devil'
	atčako	'soul', (incl, those of 'living beings' who have died)
Known by most individuals on basis of second or third hand reports and 'legends' only, no longer active in the Waswanipi region	Atoš	'cannibal giant'
	memeguešu	'rock people who steal fish'
	wabant$_{c}$iš	'dwarfs who steal children'
	mistipiešu	'big birds who steal people'
	nodawa, nadčua	'Iroquois'

(CONTINUED)

Table 4-23 Examples of Membership of Each Kind of 'Living Being' (Continued)

Modalities of Knowledge	Waswanipi Label	English Gloss
Known to most individuals	$t_s$ikapis	'trickster'
on basis of 'legends' only,	mistatum	'big dog'
no longer active on earth	mistčikak	'big skunk'

this world but is not totally and irrevocably cut off from the world of the living. Some living 'human beings' dream of the 'souls' of dead relative, or encounter them in thought, and may communicate with them. The 'souls' of dead people may also, on occasion, be heard visiting the shaking tent. That is souls appear to act as if they were 'spirit beings' at least after the death of a 'human being'.

The inclusion of the non-living with the living reveals a certain ambiguity in the gloss 'living beings'. This is also revealed in the concept of the 'master' of the specific kinds of 'living beings' because he is in fact the master over those individual specimens of 'living beings' that have not yet been born in the Waswanipi region, and also those that have already died. In this sense life is not the sole equivalent to the existence of things. Things which are alive exist in some sense before and after life, and are considered pimat$_s$ioin or at least like pimat$_s$ioin. They are known to men through different kinds of experiences when they are alive and when they are dead, but the examples of deceased relatives make clear that they are the same being, that they have being in both cases, and there is a personal continuity. Clearly the initial English gloss I have been using 'living beings' is not adequate if the term 'living' cannot be said in this context to contrast with 'non-living' beings, in a sense of the latter which would include 'dead beings'. This will be considered again below.

However, it is not only the gloss for the category 'living being' that is anomalous. As I have indicated above many of the categories of beings which are included in the category 'living beings' are not simply included or excluded by the logic of class inclusion. Various kinds of principles of relationship are used which are not unambiguous assignments of members of one category to another more inclusive category. Thus members of some categories are classifiable as 'living beings' only part of the time, they move in and out of the more inclusive category on the basis of changing functionality, for example traps. These and other categories of beings are sometimes said to be "like" 'living beings' rather than to be classifiable as 'living beings' in a completely unambiguous sense, that is they are related comparatively. Other categories, such as 'souls' for example, are close to the category 'living beings' and in some senses may be included, in other senses not, they have some features on which a relationship is explained. Finally, I have argued that many intermediate groupings are formed by an experiential principle, for example 'spirit beings'. What these cases indicate is that the principles for explaining the category 'living beings' do not conform completely to the logic of rigid class inclusion.

The logic of class inclusion is basic to the unambiguous assignment of members of one category to another more inclusive category, and such inclusion is basic to the definition of taxonomic structures. An examination of the wider Waswanipi domain of 'living beings' therefore provides additional evidence that the Waswanipi categories are not organized into taxonomies.

However, it also allows the analysis to be taken one step further and to ask whether the principles the Waswanipi do use to order the domain of 'living beings' are themselves a restricted set of the many possible principles.

C. Douglas Ellis, a linguist who has studied the Cree language of the west coast of James Bay, commented on a feature of the concept of predication among Cree that I believe helps to explain the principles of relationship used to order the domain 'living beings'. Verbal constructions that predicate 'being' in Cree, and in Waswanipi, are compound words built with a predicative verbalizing affix. The area of the meaning of the concept of predication covered by this predicative affix includes four distinguishable meanings according to Ellis. One is the identity-equational, the principle of inclusion, "He/it is (a) something". A second is characteristics or quality, the principle of relationship by features, "He/it displays (the) characteristics of something". A third is use, or the functional principle of relationship, "He/it is used for something". And a fourth is "He/it is equipped with something" (Ellis, 1962:1.18-9 to 1.18-13). Thus the meaning of the use of the predicative affix by Cree speakers could include any one or more of the above principles without explicit distinction.

What I would suggest is that the Waswanipi conception of predication helps to identify the principles of relationship which the Waswanipi commonly use in category formation. Categories are not simply related by identity, nor are they related by any and all possible principles. On the basis of the data available in this study, the principles of inclusion, feature, functional, spatial, comparative and experiential relationships would appear to cover all or, nearly all, explanations of categories.

Thus, what appears ambiguous with respect to an assumed inclusive logic of predication is meaningfully ordered with respect to the relevant Waswanipi cultural logic of predication. I hasten to add that I do not imply any inability of Waswanipi to distinguish the kinds of principles they group under their concept of predication, but only that they commonly do predicate by a combination of these different logics, and the result is a different classificatory structure than would occur if the application of each logic were rigidly separated.

To summarize, the Waswanipi data indicate that the folk systematic categories are not organized into a taxonomy, and the data imply that while the logic of predication by identity may well be universal, the exclusive use of this logic to build the categories of folk systematics probably is not. Categories can be related by other logics as well, and it may be culturally relative and ordered which logics are actually used in category formation.

Footnotes for Chapter 4

1. For a discussion of some of the problems of using illustrations for identification see Susan Gal (1973) who also cites an unpublished paper by Bulmer. It should be noted that a residual ambiguity concerning identification of uncommon or culturally unimportant animals is more common in ethnozoological studies than in ethnobotanical studies, and the costs of reducing such ambiguities may escalate with declines in commonness or cultural importance. See Bulmer (1972-73, 1968) for a discussion of residual ambiguities in his intensive study of Karam ethnozoology.

2. These examples reveal one other valuable feature of the use of illustrations, it was possible to elicit identifications of animals that would probably not have been collected as specimens. For example, one informant in his sixties, looking through illustrations of birds reported that he had seen a particular bird in the region, but only once during his lifetime.

3. Mr. Philip Awashish has told me of an extra-limital record of polar bear at Mistassini.

4. I use single quotation marks, ' ', for an English gloss of a Cree word.

5. The use of the label aoesisutč for a category which could be glossed 'animals' has become more common since the end of the main fieldwork period because the consultation and discussions of the James Bay and Northern Quebec Agreement have required use of a category comparable in scope to the English category labeled "animals". Whether or not 'animals' was formerly an unlabeled category for the Waswanipi has become a moot question.

6. Note that all seven cross-cutting groupings were made by two individuals. Other data, some cited in the text, have confirmed that this cross-cutting categorization is widespread, although the test results suggest it may not be uniformly distributed among the population. Its distribution does not appear to me to correlate simply with a scale of individual age, or formal education although it may be related to these.

7. When quoting from or referring directly to field records I will use the terms "Interview Notes" to refer to notes made during an interview, near transcriptions of the English dialogue, usually translated from the Cree by a translator, and "Fieldnotes" to refer to notes of dialogues and observations written after the events occurred. The number refers to the informant.

8. The Waswanipi classification may be contrasted with the Hanunoo (Conklin, 1975 /1957/).

9. The Cree term wies, 'meat', in other contexts would refer to the flesh of the 'large mammals' and of 'large birds', but it does not normally extend to other 'animals'. The flesh of 'fish' is called nemes, 'fish flesh', not wies. There is therefore no single Cree term I know that labels the category of the required foods at a meal.

10. For accounts of the butchering and processing of 'animals' among neighboring Cree groups see Rogers, 1973; Kerr, 1950; for fish Lebuis, 1971; and for groups on other side of James Bay, Honigmann, 1961; and, Rogers, 1971 (1962).

11. It should be noted that 'marten', 'weasel' and 'mink' are regularly sought for their furs. There are other animals that are not regularly sought but that are sometimes caught unintentionally, such as 'wolf', and 'suckers', that are regularly consumed on such occasions by at least some individuals (Interview Notes, #53). Other animals unintentionally caught, such as 'mice' and 'moles' are reported to be "never" consumed by humans (Interview Notes, #53). They may however be eaten by 'dogs' on some occasions. 'Mice' may be intentionally captured to be fed to pet 'cats' (Fieldnotes, #52).

12. The Waswanipi view that stones are 'living beings' is in keeping with Hallowell's reports of Ojibwa knowledge, but it differs in that the Waswanipi say all stones are alive, and that they will not understand if spoken to. See also Wheeler and Buchner, 1975.

13. Strictly speaking thunder is not experienced visually, but I have included it in the first sub-category because it is usually associated with lightning which is experienced visually. Further, there is some doubt from my material whether these two phenomena are considered different 'living beings' or the same 'living being'.

14. "Q" indicates a question posed by me, "A" a reply by the informant. If elipses occur part of a reply, or a supplementary question have been omitted. Within the quotes from field records I will use parentheses for words I introduce to replace words in the original - usually proper names. I have put words I have added to the text in order to be sure the meaning is clear within brackets. [ ]. Finally where words appear in the text in single quotation marks they are glosses that I have introduced into the text for the Cree words that were used in an English linguistic context in the original.

15. This classification has clear parallels with the classification of narratives told by Cree peoples in nearly all communities (see Bauer, 1971:12-14; Preston, 1975:288-293). Preston notes that Cree in Rupert House, Paint Hills and Fort George distinguish two types of stories, labeled <u>tepaciman</u> and <u>AtayO(h)kan</u>. John Blackned of Rupert House distinguishes them as "story, not very long ago" and "no one here ever saw the people in the story: nobody knows how far back" (Preston, 1975:288). Preston himself comments that his ethno-criteria suggest "to me a variation in time and space " (Preston, 1975:293). Preston comments that the categories are part of a continuum. Bauer described a similar classification of folk narratives on the basis of his work at Fort George. These are legends and there are stories that describe "noteworthy experiences of his own (the narrator) or of those he knows" (Bauer, 1971:13). The two

categories are widespread among North American Indians, for example: Montagnais - Naskapi (Lefebvre, 1971:19), Ojibwa (Hallowell, 1964:56-57; Winnebago (Radin, 1972 (1956):118-119); and more generally (Boas, 1966 /1914/:454-457).

16. Preston has recently presented an alternative rank order classification of Cree "other-than-human persons" on basis of the degree of fear each class inspires for Cree (Preston, 1975:239-242).

17. It should be noted that Bauer's informants relate the types of stories to the type of truth value they attribute to the stories, a feature that is not common at Rupert House, nor among Waswanipi adults.

18. Waswanipi told me no stories of known people who had become or started to become Atoš, but such stories have been recorded from other James Bay Cree communities, see Preston (1975), and also see counter statement to usual interpretations by Preston (1977). Because of this I found no one who personally "knew" an Atoš before they had become one, which seems to be a possible mode of experience of Atoš in other Cree settlements. There may be stories of this type that I just did not hear because I did not generally solicit stories.

19. On one occasion when I joined a family on a canoe excursion to check a fish net at the mouth of a complex series of streams, we first went for a trip up some of the streams. On returning to check the net, we turned the last bend and saw a skiff with "Whitemen" from Matagami holding the net out of the water and struggling to remove a fish. They beat a swift retreat aided by their light load and large outboard motor.

20. It is notable that many special experiences and special phenomena are associated with Pusticamica Lake, and secondarily with Olga Lake. These two lakes are somewhat distinctive both being long and narrow, and aligned on a generally south-west, north-east axis. In contrast to the large open, shallow lakes generally characteristic of the region that presumably are basins left in the bed of glacial lakes Barlow-Ojibway, Pusticamica and Olga have long narrow arms suggesting control by basic bedrock conditions. The Waswanipi claim these are the two deep lakes in the region. This was confirmed at Pusticamica by a crew drilling for a water well in the bed of the O'Sullivan River, less than a mile from the outlet of the lake. At 160 feet they were still drilling through large boulders, presumably glacial debris, and had not hit solid bedrock. The alignment shape and depth of these lakes presumably give them distinctive wave formations, and freezing and break-up patterns, but I did not realize this at the time of the fieldwork and failed to pursue questions suggested by these features. I am indebted to Alan F. Penn for pointing out the distinctive features of these lakes.

CHAPTER 5 - HUNTING ACTIVITY, EXPERIENCE AND EXPLANATION IN THE WASWANIPI WORLD

In the acts of hunting 'human beings', 'animals' and many of the other 'living beings' active in the Waswanipi world today interact with one another in ways that are meaningful to the Waswanipi and that accomplish intended purposes. Hunting is one of the central human activities for the Waswanipi. I will indicate in this chapter how hunting is a multi-vocal symbol for the most pervasive propositions and values of the Waswanipi belief system, and how on the other hand the model of hunting is linked to the models of time and of the world in ways that inform beliefs about the course and meaning of human lives. I will begin with an analysis of concepts, but will extend the analysis to inferences about implicit relationships between concepts, and structures of concepts.

A - Hunting; or Asking for, Looking for, and Receiving Gifts

Many kinds of 'hunting' activities are recognized by the Waswanipi. There are several general terms for these activities, including: nitaonano 'hunting' in a sense that contrasts with oaniikaneo 'trapping', and notamesano 'fishing'. But, there is also a use of the term nitaonano in which it includes the other activities, in which it is translated into English by Waswanipi as "hunting, trapping and fishing in the bush." The term nitaonano can include trapping and fishing, but these terms do not form a simple logical structure. Whereas oaniikaneo appears to be a cognate of oanikan 'trap', and to refer to the method of capture, notamesano appears to include part of the term nemes 'fish', and to refer to the object sought. These categories are not exclusive and there are several specific terms for harvesting activities and equipment which cross-cut the distinctions between 'hunting', 'trapping' and 'fishing'. For example, pastisakaneo, 'shoot' can apply to 'moose', to 'bear' which may have already been caught in a trap but which have to be killed with a rifle shot, and to 'pike' which may be 'shot' in the spring when spawning in shallow water. A 'net', api, is the main tool for catching 'fish' but 'nets' are also used to catch 'beaver' and 'grouses' on some occasions. Similarly makonakaneo, 'catching an animal by hand' can apply to 'sturgeon' as well as 'beaver'. The list could be extended, but the point is clear, namely that techniques of capturing and killing 'animals' cross-cut categories of 'animals', and of activities.

What is significant here is that the term nitaonano can be used to refer to all these activities, involving different kinds of 'living beings' and involving diverse techniques; the concept cannot be defined either by the things 'hunted' or by the methods utilized. The term nitaonano not only refers to the general cluster "hunting, trapping and fishing in the bush", the root of the word also occurs in other terms that can refer to 'trapping' and 'fishing' activities as well as to 'hunting' in the narrow sense. Thus nitaomiskaoneo is "to look for beaver houses", and nitaopat$_{s}$itaaneo is "to go off fishing". The root nitao- therefore occurs in words associated with each kind of 'hunting' activity as well as being the root of the general term 'hunting'.

An initial exploration of the meanings the term nitaonano may have for the Waswanipi can be made by examining the range of words in which the root nitao- may be found. Four uses may be noted initially: činitaooapatam, 'he/she goes to see it', 'he/she goes to look at it'; činitaopatam, 'he/she goes to get it', 'he/she goes to fetch it'; nitaoitakun, 'it is needed'; and, nitaoitam, 'he/she wants it'. The root nitao- therefore appears to be related to concepts that may be glossed 'looking', 'fetching', 'needing', and 'wanting'. Each of those concepts is important for understanding the meaning of 'hunting' for the Waswanipi, who say in varying contexts that they: "look" for the animals they 'hunt'; they "get" or are "given" the animals they 'hunt'; they "need" the animals they 'hunt' and are 'given'; and, they "want" the animals they 'hunt' and are 'given'. These four concepts are at the core of the meaning of the term nitaonano and at the core of the meaning of the Waswanipi conception of 'hunting'.[1]

In addition, the root nitao- also occurs in nitaoičičikan 'things that grow', (but I am unsure if this term is actually a cognate). I was told by some Waswanipi that nitao- in nitaoičičikan meant "always" in the sense of continuing. There is some evidence however that it could refer in the latter instance to growth, as in the term apitaonitaoet$_s$eo, which refers to a middle-aged man or woman, and which appears to be literally "middle of growing". That nitao-, in these uses, has a meaning of "always" and of "growing", suggests the fifth concept that may be a related Waswanipi meaning of 'hunting'. I will consider these possibilities later in this chapter.

That 'hunting' involves looking is the most straight forward of the propositions. The role of signs, tracks, etc. are basic to the activity, and the end of a successful hunt always brings the hunter and the 'animal' into contact. Saying 'animals' are looked for however emphasizes, in the Waswanipi world, that only those 'living beings' whose actual form can be seen in everyday life can be 'hunted'. Furthermore, the proposition that hunting is, in one sense, "looking" emphasizes the uncertainty involved in 'hunting'; 'animals' are potentially visible, but most are "shy" and retiring, and are not seen all the time, therefore the successful hunter fulfills an anticipation, he actualizes an expectation.[2] Finally, while I will return to this point somewhat later in the discussion, the proposition that hunting is in part "looking" suggests a parallel between hunting and shamanism, in the former those 'living beings' which are potentially accessible in visible form to all Waswanipi may become actually visible; in the latter 'living beings' which are not normally accessible in visible form to Waswanipi, become visible. It is not surprising that one of the main visions of the shaman are visions of animals that are to be hunted but that have not yet been located. The shaman discovers where 'animals' can be found. It may be a commonplace that 'hunting' involves "looking" but, as I have briefly indicated, even this commonplace proposition has particular relationships with other elements of Waswanipi beliefs that give it distinctive meanings in this culture.

Hunting is also "fetching" or "getting" 'animals'. The Waswanipi say that the animals they kill are given to them, or are like a gift. This idea was elicited explicitly from individuals. A number of question forms were used: "Is what he catches (kills) given to him?"; "When a man catches (kills) a 'beaver' ('moose'), is it a gift?"; "Is what he catches a gift from someone?"; "Is there someone who gives people what they need?" All of these questions consistently elicited affirmative replies from twenty-one individuals.

People say of an 'animal' they 'hunt' that it is *čemekonau*, 'it is being given to us' or *čeašumkonanu*, 'it is given to us to eat'. The terms are cognates of *miakaneo* "to give away", which is used, for example, when one Waswanipi gives a gift of meat to another.

What Waswanipi mean when they say that the 'animals' they kill are given may be indicated first by the evidence the Waswanipi themselves offer for this knowledge. One type of comment given to support and explain the statement that 'animals' are given is that men do not always get the 'animals' they want, even when the 'animals' themselves are present. People may see signs of 'beaver', for example, or the 'beaver' themselves, but they may be unable to kill them. Even if the lodge is broken, and the pond drained, a 'beaver' may still not be caught, as will be reported in the next chapter. But this is not the most common type of evidence cited by Waswanipi.

Waswanipi individuals most commonly explain the claim that 'beaver' are given by referring to the 'animals' that men are able to kill on occasions when they themselves would not expect to kill the given 'animal' and when, in their view, the killing of that particular 'animal' is clearly not the result of their own action alone but can only be explained by including reference to the action of other 'living beings' as well. The most common example is the case of 'beaver' which have been previously caught in a trap, but that escaped from the trap on that occasion. Often such 'beaver' have lost an arm, or have otherwise been injured. Such 'beaver' "know the trap", and in the Waswanipi view the capturing and killing of these same 'animals' in traps at a later date is confirming evidence that the 'beaver' is being given to the hunter. In the Waswanipi view such 'beaver' could avoid the trap and clearly could not be caught by the unaided actions of men without the intervention of another agency. A variation on this is the 'beaver' which have clearly avoided being caught in a trap on a previous occasion, but are caught at a later date. For example, when trapping at a particular lodge a 'beaver' may spring a trap on one occasion, therefore showing it "knows the trap", but may be caught a week or two later during the same trapping sequence. The will and actions of the hunter alone are insufficient to explain the capture and killing of these 'beaver'.

There is no comparable standard explanation that 'moose' are gifts, but appropriate evidence is cited by individuals. For example, after being asked if 'animals' are gifts and affirming this one individual went on to say, "In December, he killed five moose right behind tent. He was given those moose. He was given those moose by God" (Interview Notes, #98). The 'moose' were apparently standing on a hill immediately behind and within sight of the tent; the man emerged in the morning, saw the 'moose' and shot them. I think this case is significant for the Waswanipi precisely because the killing of those 'moose' was clearly not simply the result of human knowledge, will or action.

In the case of 'moose', the behavior pattern of moose itself is evidence that they are given. When 'moose' are being looked for and the hunter comes upon them, the 'moose' typically rise and look directly toward a hunter; and during the pursuit that may follow, the 'moose' are said to stop periodically and look back toward the hunter. However, this was not voluntarily cited to me as evidence that 'moose' are given. The importance of this behavior pattern of 'moose' emerged in a number of contexts. For example, I was told that men had songs they sang for 'moose' and for 'beaver' and these songs were typically just two or four lines, repeated over and over, which conveyed an image of an important moment or an aspect of the hunt or other activity. One song I was told spoke about "how moose just stands there when he shoots." Similarly, a man who used a rattle, <u>šišikun</u>, with which he would sing every morning, was said to help his hunting by this means because when "moose stand up listening, he killed a moose." Finally evidence of this pattern was deduced from accounts of actual moose hunts. For example, the account recorded early in my fieldwork from two young men who had just gone moose hunting over a fall week-end indicates the significance of the behavioral gesture of the moose:

> "They travelled by canoe and had just set up a camp at a point when they sighted a moose about a quarter-mile away. He was swimming across the bay right towards them. (One of the men) grabbed the gun and the two hid in the bushes at the shore. Just as the moose reached the place where he could get his footing to walk ashore he looked right at them. (The one with the gun) did not shoot and the moose started to turn to swim away. (The second man) yelled for (the one with the gun) to shoot. He killed the moose. They saw no other moose or signs of moose during the next three days" (Field-notes, #48, 63).

I would point out that although the moose was turning to swim away it would at that location have been in range for a shot for some time yet. The moment the second man chose to speak-up was, I think, a response to the meaningful behavior of the moose, as well as a response to the opportunity for a good shot. These indications suggested a direct question concerning the significance of the behavior of moose, and several individuals confirmed the fact that when the moose looks at the hunter it is an indication that the moose is given.[3]

Finally, the behavior of bears was cited as evidence that 'animals' are given to 'men'. When a bear is caught in summer in a trap, and the hunter returns to check his trap and he finds the bear, he asks the bear to get up. People say the bear rises and faces the man, and then it is shot. When a bear den is found in winter the Waswanipi say that they call to the bear to wake it up, and they "tell him to come out." The 'bears' do awake, come out of their dens, and are killed. When the bear comes out he "gives himself to the man for food" (Interview Notes, #53). When 'bears' emerge in winter they are quite sluggish, and I have been told a humorous story of a young man who fumbled around trying to find his rifle for a time before he was able to kill the 'bear'. That so powerful and potentially dangerous an 'animal' can be so docile under these conditions is, I think, a further indication of the meaning of the event.[4]

What unites these examples, and what the Waswanipi mean when they say 'animals' are gifts, at the first level of analysis at least, is that the killing of an 'animal' by men is not an event that is solely a result of the knowledge, will and action of men; that things such as those described could not happen through the unaided actions of human beings. Indeed, the image of the gift places the emphasis precisely on the opposite pole, namely that the most important reasons behind events when men kill animals rest not with men, the receivers of 'animals', but with those beings which give the 'animals' to men. The killing of 'animals', in the Waswanipi view, is not simply an exercise in human intelligence and skill, it is not simply the result of the application of human labor to passive resources, it is not simply human production that transforms 'animals' into 'food'.

It is always therefore appropriate to ask the Waswanipi "Who gives the animals men catch (kill)?" or just "From whom?" The responses to these questions are diverse, and one series gave the following answers: "God", eight occasions (Indidivuals #43, 98, 15, 52, 45, 22, 55 and 3); čuetenšu, three occasions (#81, 93 and 83); "Jesus", two occasions (#56 and 42); "the one who looks after us", two occasions (#44 and 21); cimšuminao, 'our grandfather', two occasions (#37 and 34); "does not see him", two occasions (#67 and 80); "one who knows what is best for everybody" one occasion (#69); "he who gives out things" two occasions (#97 and 96); and the "winds" one occasion (#58). "God" and "Jesus" are the same, and the responses "the one who looks after us" and "one who knows what is best for everybody" are circumlocutions commonly used for 'God'. Thus on further questioning individuals #44 and 69 specified that they meant "Jesus" and "God" respectively. The phrases "does not see him", "our grandfather" and "he who gives out things" are ambiguous with respect to which 'spirit being' they refer to. Individual #37 said čimšuminao meant čuetenšu in his reply but I did not follow-up the other responses. The clear responses therefore fall into two groups "God" and/or "Jesus", thirteen responses, and čuetenšu or more generally "winds", five responses. Follow-up questioning also elicited specific denials that the two most likely other possible sources of animal gifts were in fact appropriate responses to the question "From whom?" The 'animals' were not a gift solely from the 'animals' themselves (Individuals #52, 56, 45) nor from the 'masters' of each kind of 'animal' (#42). It should be noted however that the 'masters' were said to give the 'animals' or more correctly to participate in giving the 'animals', in contexts where it was clear that they alone were not responsible. This will be indicated below.

The killing of an animal by hunters then involves not only the animal and the hunter, but one or two other beings as well - 'God' and or čuetenšu, the 'north wind' and possibly the other winds. The relationship between 'God' and čuetenšu needs to be clarified. No individual respondent in fact mentioned both, either one or the other was given. This suggests that the concepts of 'God' and čuetenšu may be alternatives in the present context. This is confirmed in other discussions. People say that 'God' and čuetenšu are about the same thing (Interview Notes, #2), or that čuetenšu is the "helper" of 'God' (Interview Notes, #69). The closeness of the concepts of God and čuetenšu, in the context of 'hunting' thought and action, may also be expressed by saying that God decides what čuetenšu should do, and in the same context that God thereby helps čuetenšu to fulfill God's intentions.

> Q. "Are animals you kill gifts of čuetenšu or God, or are they the same thing?
>
> A. I think God helps čuetenšu because when man is hunting, when God does not want him to catch much one winter, like God helping čuetenšu not to give, like God's way to tell čuetenšu. [Like what happened with sons' trapping before Christmas]. (He) did not trap, working nearby, did not feel good to go far [from town] so before Christmas (he was) here. [His sons trapped]. (One son) got one beaver [had bad hunt] made fire outside, put beaver in fire, tobacco in fire, gave piece of beaver to everyone here. Will see when they go back what will happen. Hoping will go back and have luck. If do not have luck, not our fault, given from above and čuetenšu" (Interview Notes, #69).

In this quotation 'God' and čuetenšu are closely interrelated, so that čuetenšu helps 'God' by fulfilling what 'God' has told him he wants to happen, and the failure to receive a gift is attributed to both 'God' and čuetenšu together. The association of 'God' and čuetenšu in relation to harvesting does not however extend to other activities and fields. Thus sickness, life and death are all given by 'God'. There are specific cases where čuetenšu may be implicated in the death of a human being, but these are highly specific and infrequent. It is 'God' and 'God' alone who is implicated in the birth of all people and in the sickness and death of almost all people. The association of 'God' and čuetenšu is therefore limited to, and definitive of 'hunting'.

'God' and čuetenšu give 'animals' as gifts to men who by their action kill the 'animals' and receive the food they need to sustain themselves. 'Hunting' involves three types of participants: 'spirit beings', 'animals' suitable to become food for humans and 'human beings'. This is brought out in contexts where 'animals' that are not suited to become food for humans are encountered and killed. Such kills are not considered gifts. For example, while camped for a picnic with a family on a shore during a summer excursion, a frog was seen crossing the pebbly beach and approaching the group. It was hit across the back just below the head with the edge of a canoe paddle blade, nearly cutting it in half. I asked if it was a gift, and was told laughingly "may be from that mači manitu", the 'devil'. On another occasion, when checking a beaver trap set in the summer, a decaying duck was found in the trap. When I asked if it was a gift I was told "No. He got in there himself" (Fieldnotes, #33).

In order to clarify the relationships that exist between 'spirit beings', 'animals', 'human beings' when men 'hunt' animals it is necessary to examine basic knowledge about each of the types of 'living beings' involved in the gifts. In Chapter 4 I have considered the general extent of the domain 'living beings' and have shown that it has an extent that includes diverse beings, here I will examine in more detail propositions about the general qualities and features of 'living beings'.

i) A World of Personal Causality

'Animals', 'spirit beings', and most other, if not all 'living beings' in the

Waswanipi world are not just "living", they are said to be "persons" or "like persons" in the Waswanipi view. There is a certain ambiguity in this classification, and it appears to reflect the conceptual pattern that was identified at the end of the previous chapter.

Verbs of being, i.e., verbal constructions that predicate being in Waswanipi are compound words built with a predicative verbalizing affix. In the related Cree language used on the west coast of James Bay, Ellis reports that no single construction in English adequately matches the area of meaning covered by the predicative affix. He identifies four relevant translations in English that overlap the meaning of the predicative affix in Cree and similar range of meanings appears to occur in the Waswanipi usage, so that when the Waswanipi make statements that 'living beings' are "persons", it may mean that 'living beings' "are persons" and/or they are "like persons", i.e., have the characteristics or qualities of "persons". This range of meaning is highlighted by the fact that <u>inioatč</u> means 'Indian' or 'human beings' and is the term the Waswanipi use to say it is like a "person". That is, the statement that a specific 'living being' is like a 'human being' includes the meaning that the 'living being' has the qualities of being a 'person'. I did not fully realize this difficulty when in the field and the data I have indicate the problem, but are not adequate to completely resolve it.[5]

When the Waswanipi say that 'living beings' including 'animals' are "persons" or are "like persons", they appear to mean at least in part that these 'living beings' possess intelligence and wills, are capable of independent action, and are loci of causal origins of events that can be experienced as occurring in the world.

People say that 'animals' think like 'persons'. Thus the 'bear' that comes out of its den when called is said to think like a 'person' and to understand when men speak to him (Interview Notes, #64). On questioning, all 'animals' are said to be capable of understanding but such direct communication is unusual, and the responses indicate that this is not commonly cited evidence that 'animals' have intelligent thought processes.

Three kinds of evidence are typically cited for the proposition that 'animals' think and are intelligent. The first is that each 'animal' has "its own way of living", sometimes referred to as "its own way of thinking." As winter approaches the beavers prepare their lodges and dams and collect food caches for the winter. The bear prepares a den. Each has particular responses for feeding, responses to weather and other environmental factors and responses to men. The intelligence of each specific kind of 'animal' is demonstrated in the logic of its response to its environment a logic that may be appreciated by human observers.

The second kind of evidence is demonstrated by the fact that each specific kind of 'animal' has its own ways of living with others of its kind and its own ways of teaching its own young how to live. This explicitly implies that individuals of each specific kind of animal are able to communicate with each other. The degree of communication ability varies from one kind of animal to another, and individuals do not always agree on the extent of communication possible. Thus some Waswanipi individuals, a majority, say that adult 'beaver' cannot teach the young how to avoid a trap, each must learn on its own, whereas some individuals say that the young can learn this from the old. However, the social and family life of the 'beaver' is cited as evidence by all of the intelligence of 'beaver': specifically that the 'beaver' mate in pairs, raise offspring for two years and follow a set pattern of family cycles (to be reported in the next chapter). The commitment of 'beaver' mates is reported in several forms. If one of the adult 'beaver' at a lodge is caught in winter under the ice the other adult is said to break open the dam a little at the top so that the water will drain down a bit and create an air space under the ice, "so it can look for its mate" (Interview Notes, #81). Only the adult 'beaver' couple will mate, and the offspring will usually leave the lodge in the spring when they are just two years old to form new families.

Litter mates may however form a new colony, which distinguishes 'beaver' families from human family patterns. I will review the Waswanipi knowledge of 'animal' behavior in the next chapter, here the point is that Waswanipi knowledge of the ways 'animals' behave socially is evidence that they have their own intelligence and ways of thinking.[6]

A third kind of evidence cited for the proposition that 'animals' think intelligently is that animals can respond intelligibly to 'human beings' efforts to 'hunt' them. Waswanipi hunters report of 'beaver' that will place mud on top of a trap, or otherwise spring it without risk of being caught, and some 'beaver' will then proceed to eat the poplar branches near the trap that served as bait (Interview Notes, #81). Some 'beaver' will push a net aside not to be caught in it. 'Beavers' that do this are not simply trying to avoid being caught, or at least not necessarily so. Since a hunter can catch what is given to him, an animal that avoids an opportunity to be caught may be saying it does not want to be caught, or it may be saying that it does not want to give itself at that time, or it may be saying that it does not want to give itself that way. So a hunter may continue to see what happens the next day or the next week; the 'beaver' may want to wait a week or two before being given. The hunter may change from trapping to netting or to some other technique because the 'beaver' wants to be caught another way.

> "Animals [that] ... do not go in trap. [Not] go in trap after three days, they tell me come back after five days. Go back, got catch. Same for moose. Three days hunting, no moose. After that, try again, got a moose" (Interview Notes, #14).

Thus 'animals' are capable of anticipation and knowledge of the future. 'Animals' know when they are given to men, and are giving themselves, and thus they know when they will be caught (Interview Notes, #52, 56). Animals can also gain knowledge through dreams, just as men do. Dogs that moan and growl in their sleep are said to be dreaming and have advance knowledge of the arrival of visitors or the success of a hunt. Some men learn to interpret these signs from their dogs (Interview Notes, #53).

Because the animal also participates in the decision about whether, how and when it will be given to a hunter, animals also have wills, as all their action informed by intelligence testifies. How many young an 'animal' has may be the result of a decision by that 'animal' to have a large family or not (Interview Notes, #52, 97).

'Animals' also have emotions like men. 'Animals' that do not want to be caught may be "scared", or "mad". 'Animal' emotions are also linked to intelligence, thus 'beaver' may be "scared" to be caught when they know there are fewer of them (Interview Notes, #71, 56, 43), or "mad" under the same circumstances (Interview Notes, #52). 'Animals' may also be said to show certain mental characteristics. Thus 'beaver' are said to be stubborn 'animals'. 'Bear' are especially intelligent. 'Wolves' are never scared. 'Grouse' are stupid. Hunting techniques are said, by some men, to depend on how fast an 'animal' thinks.

Because 'animals' are capable of intelligent thought and social action, it is not only possible for them to understand 'human beings', equally importantly, it is possible for 'human beings' to understand 'animals'. The acts of 'animals' are communication events because they communicate the intention of the 'animal'. The messages are standardized, and their meanings can be learned, but the messages remain open-ended and creative, just as human action is. As a result 'human beings' must constantly learn to understand the meanings and act accordingly. Waswanipi men say that what makes a good hunt this time will not another time, and that as the 'sky' changes, so 'animals' change and so they themselves have to change (Interview Notes, #56).

When the Waswanipi say that there is nothing that is alive that is not a person, or that is not like a person, this is linked to the fact that for the Waswanipi the explanation of phenomena always refers to personal causality. In my experience it is always appropriate to ask "Who does that?" rather than "Why does that happen?", and usually it is more appropriate to do so.[7] When asked for explanations of phenomena Waswanipi do not reply in terms of impersonal things, it is almost universal that explanations refer to the actions of one or more 'living beings', 'living beings' who are persons or who are like persons. Explanations refer to a *who* that is active, not a *what*. There is, in my experience with Waswanipi, no explanation that would not at the end of one or more further "Whys?" elicit a further statement of *who* is the cause. The ultimate "who" is 'God'.

An example of this is the relationship of animals to their food. Waswanipi individuals can discuss incisively the relationship of the geographical distribution of animals and particular types of vegetation. They also link the temporal distribution of animals to the temporal sequence of vegetation that follows the occurrence of forest fires. These relationships however are *not*, by themselves satisfying explanations. A particular kind of animal is not found in every location where appropriate food occurs, and forest fires themselves require explanation. Explanation refers to the actions of persons, and in this case in particular to the same kinds of persons that are involved in 'hunting', and also to 'lightning'. On one occasion early in the fieldwork, after a discussion of the relationship between beaver habitation sites and available food sources I turned to questioning if the numbers of beaver were dependent of the availability of certain tree species. The individual with whom I was speaking corrected my question by answering that the number of beaver *and* the number of trees it ate were "decided" by *čitče manitu*. The proper questions would have been to ask: Who decided how many beaver there would be? and Who decided how many trees?

Causality then is essentially personal rather than impersonal, and personal action appears to be essentially co-extensive with an equivalent to life and activity. Persons and personal action is the definitive organizing principle of the Waswanipi world. My own impressions of the consequences of this knowledge for the Waswanipi conception of the structure of their world is that the world is volitional. The perceived regularities of the world are not those of natural law, but are comparable to be habitual behavior of persons, and to the recurring consequences of that habitual behavior.

These regularities make it possible to know what will happen before it does. But, while on one hand there are fundamental regularities, on the other hand the pattern of action may be transformed at any moment, as it is subject to an intention. There is therefore a fundamental unpredictability in the world as well. There is an element of inherent spontaneity in a world of personal agency, even capriciousness.

This is not only the result of the exercise of individual wills, it is also the result of potential disagreements among the personal actors. Where there is regularity it is the result of the concerted action of several persons, synchronizing and coordinating their willful agency. Where there is irregularity there is a failure to adequately coordinate personal actions among the acting persons. The world of personal action is therefore neither a world of mechanistic determination nor a world of random chances, it is a world of conscious and intelligent order. This I think is the underlying knowledge the Waswanipi share, and to which they refer when they say that 'animals' are like persons.

ii) The Winds, Examples of the Unity of Explanation, Experience and Action

When Waswanipi individuals say that the 'animals' they kill are a gift from čitče manitu and from čuetenšu, the 'north wind', the reference to the latter being implicates not only one, but a group of four wind beings. The oldest and most powerful of four winds is čuetenšu. The four wind persons - čuetenšu 'north wind', nikabenšu 'west wind', oabenšu 'east wind', and souenšu 'south wind'- each lives at the ends of the earth in each of the cardinal directions. Some individuals speak of up to twelve winds, with eight smaller "cousins", one on each side of each of the four "brothers" (Interview Notes, #69).

Most men know the winds by the weather (Interview Notes #64, 69, 52), although they are also encountered in dreams and in shamanistic performances (Interview Notes, #64, 67). The winds are known and encountered through the daily weather conditions which they bring to the Waswanipi region. These weather conditions are conceived by Waswanipi individuals as typical associations of air movements, cloud cover, precipitation and temperature which occur in recurring sequences and that have a sequential distribution through the seasons and the year. A consequence of this association of wind beings with typical weather patterns is that the winds are accessible to and known by all men through the weather conditions they bring to the region and, as such, they are known and encountered on a daily basis, never far removed from the everyday experiences of all human beings.

The weather phenomena associated with the winds are diverse, although difficult to comprehensively define from the data I have. For example, when a low pressure system passes south of the Waswanipi region the actual direction of air movements will typically change successively from south-westerly, to easterly to north-easterly during the passage, possibly a twenty-four hour period. There will be a clouding over and precipitation, and possibly a warming of air temperatures. The Waswanipi could however say that souenšu had come, or alternatively, that souenšu was present.[8] The winds are not, however, solely associated by the Waswanipi with weather conditions, they are multi vocal and are centrally involved at several levels in the concepts of 'hunting'.

One individual, asked how the winds help him to hunt, replied "When I get up in the morning I look at the sky, see how the weather is" (Interview Notes, #67). Another man said the winds "tell him what animals he will catch" (Interview Notes, #52). These two statements, confirmed by many other hunters indicate the essence of the relationship between 'human beings', 'animals' and the winds, the latter communicate to hunters what 'animals' they will be given and they actively contribute in that giving because animals are typically hunted during seasons, and/or on days with certain preferred weather conditions. This relationship is what is meant when Waswanipi say that the winds give them the 'animals' they kill. This relationship is revealed not only in specific hunting recipes, but also in a series of typified descriptions Waswanipi individuals offer of the personal characteristics of each of the winds and of the typical relationships between winds and hunting success. The large number of more detailed propositions that the Waswanipi offer relating specific conditions associated with the winds to specific 'animal' behavior and 'hunting' activities will be reviewed briefly below and more fully in Chapter 6; the personal characteristics of the winds will be reviewed here.

A series of statements on the characters, actions, and consequences for hunting of each of the winds, which were elicited from six individuals during a several day period are listed on Tables 5-1 to 5-4. Each individual was asked to name the winds, and then to "tell me about the winds." Their replies reveal strikingly consistent characterizations, and are consistent with the views expressed by other Waswanipi on other occasions.

Čuetenšu, the 'north wind' is the oldest and most powerful wind and the most important wind for 'hunting' (see Table 5-1). He is a good wind for men, but is also dangerous, especially when it is extremely cold, but also, by implication, because he is the most powerful. Čuetenšu dominates the winter season and is infrequent in summer. He brings the cold, the snow and ice, and the cold storms and cold clear air that comes from the north and northwest.

Nikabenšu, the 'west wind' is also a good wind for men, and it is said that he is the same as the 'north wind' (see Table 5-2). It is however Čueteňsu who is said to be the "oldest", the "boss", or the "leader" of the winds.

Oabenšu, the 'east wind' is the worst wind for men (see Table 5-3). It is hard to kill much with the 'east wind'. The animals are all scared of the 'east wind', they do not move about, and they are nervous and easily disturbed. The 'east wind' does not bring cold weather, but weather that is bad - cloudy, humid, and there is always precipitation - wet snow or freezing rain.

Souenšu, the 'south wind' is similar to the 'east wind' (see Table 5-4). In winter, he brings rain, and 'animals' cannot be killed. In summer, however, souenšu is the predominant wind, bringing nice weather and all of the plants to life. In summer souenšu is a good wind, but once the 'animals' return, hunting can be done during the summer during days with any wind present.

Table 5-1 Waswanipi Individuals Comments on Čuetenšu, the 'North Wind'

Individual No. and Interview Date	Comments of Individuals
67, 10/14/69	- tells him the most about people and hunting; the top hunter is person from the north - others are all his friends - the person who brings the snow
52, 10/16/69	- northwind same as west wind - he blows the trees down, good wind for man, he brings a lot of snow - dangerous sometimes when it is real cold - most powerful wind
52, 9/27/70	- when čuetenšu blows it is easier to get moose
93, 10/18/69	- he was here first - he gives him the animals he catches - dangerous sometimes when it is really cold, may freeze... very cold, hard to get animals - he protects animals, he also helps men
81, 10/17/69	- he is the boss of the winds - just meat in fire for čuetenšu - it is čuetenšu who tells him what he will catch, he gives animals - best time to hunt when wind comes from north, rabbit run around, not scared, fish eat, catch on hook - south wind blows, then turns to north, snowstorm, but then clears up, nice day - puts a piece of meat in fire ... before he eats... for čuetenšu
64, 10/18/69	- we think of čuetenšu as a person, like our own grandfather telling us what to do - that is why we put food in fire, so we hope we can get more in the future - in summer do not dream, or talk to čuetenšu

Table 5-2 Waswanipi Individuals Comments on <u>Nikabenšu</u>, the 'West Wind'

Individual No. and Interview Date	Comments of Individuals
52, 10/16/69	- northwind same as west wind
93, 10/18/69	- get a lot of game with west wind
81, 10/17/69	- about the same as north wind, but not many days in winter
74, 10/18/69	- about the same as the north, rabbit does not hide and partridge you can see it

Table 5-3 Waswanipi Individuals Comments on Oabenšu, the 'East Wind'

Individual No. and Interview Date	Comments of Individuals
67, 10/14/69	- [means] 'tomorrow', or 'in the morning' - person who traps in this direction is the stingiest; he is the one that will starve him - cannot get too much from him - when stranger come to see wind [usually he] give cup of tea, bannock; east wind eats from his own hand, eats before the stranger can.
52, 10/16/69	- worst wind, you cannot kill anything when it is windy because the game are scared - not very cold wind, snowing and warm
93, 10/18/69	- all game are scared of east wind
81, 10/17/69	- east wind cannot get nothing; the animals are afraid, rabbit, partridge - when wind comes from east partridge sleeps under snow, comes back when there is a north wind, but it (may) go very far (and then it) does not come back[1] - bad weather... never see a nice day with east wind; always snowing, windy - never go moose hunting, can catch beaver in a trap, cannot catch lynx - keeps moving, fish do not bite, just when there is a north wind.
74, 10/18/69	- eastwind is about the same [as south], rabbits do not run around, cannot get any fish or partridge - in [late summer] they never see a beaver when east wind blows; moose stays among the thick bush where he cannot be seen, he hides, he feels when somebody is looking for him

Footnote:

1. This is a reference to the habit of the grouse to dive under the snow in inclement weather, and stay there for up to several days, coming out ot its "snow nest" only with improving weather. If there is freezing rain,

(CONTINUED)

Table 5-3 Waswanipi Individuals Comments on Oabenšu, the 'East Wind'

(Continued)

Footnote:

or rain that freezes quickly when the weather turns colder, the grouse may not be able to break through the ice crust and free themselves. The Waswanipi phrasing that the bird may go very far and not come back is a reference to the departure of the soul/spirit of the animal from the immediate spatial world upon its death. This knowledge will be discussed later in the present chapter.

Table 5-4 Waswanipi Individuals Comments on Souenšu, the 'South Wind'

Individual No. and Interview Date	Comments of Individuals
67, 10/14/69	- the south is not too good, brings rain[1]
52, 10/16/69	- good, brings the ducks; he shows all the animals, like in springtime, see all the ducks - not dangerous
93, 10/18/69	- kill a lot with souenšu[1]
81, 10/17/69	- best in summer, not a cold wind, nice day too sometimes - good for fish; good for duck, geese, birds of summer - does not matter very much which wind is blowing [on a particular summer day]
64, 10/18/69	- sometimes souenšu is talking to him when summer is drawing near, seems that he tells him that now it is his time to be here, we are going to see all animals alive again, all plants and leaves
74, 10/18/69	- in winter, when there is a big south wind the animals are all afraid, they just hide; cannot even catch any fish in the net or on the hooks - sometimes it gets mild and starts to rain, sometimes it rains for two or three days - it is like a person who is stingy, who does not want to give out anything; east wind is about the same

Footnote:

1. As the following comments indicate souenšu gives 'animals' in summer, is "stingy" in winter. The seasonal references are not explicit in the comments of informants 67 and 93, but are explicit in comments of the other informants.

In the Waswanipi view then, each wind is associated both with particular seasons and weather patterns on the one hand, and with typical hunting conditions and success on the other. Here I will review more briefly some of the specific realtionships documented in detail in Chapter 6 as examples of the relationships between the winds and 'hunting'.

In winter, 'moose' 'hunting' is preferred after čuetenšu has brought sufficient snow, and the frequency of snow helps to judge age of tracks. The preferred days for 'hunting' are days when there is a light snowfall, and a light wind usually brought with 'north winds' and 'west winds'. In mid-winter, extreme cold sent by čuetenšu may make 'hunting' difficult because travel becomes noisy, and rain and wet snow brought by souenšu may make travel too difficult, so 'hunting' is best on typical 'north wind' or 'west wind' days. Later in winter the crust that assists the 'hunting' of 'moose' forms when weather sent by čuetenšu or nikabenšu returns after 'south winds' or 'east winds'. In summer however 'moose' may be 'hunted' on any day, but especially on hot days typical of souenšu.

The 'hunting' of 'beaver' is less critically tied to daily weather conditions, but it is closely related to longer term weather patterns. 'Beaver' are mainly 'trapped' after čuetenšu and nikabenšu begin to increase the frequency of their visits in late summer. At this time, 'beaver' establish winter habitations, repair lodges and dams, store winter foods, and generally adopt the readily predictable habits that facilitate the systematic 'hunting' of beaver. As reported above, when beaver are being 'trapped' under the ice the beaver traps may not get anything the first three days they are set, but the 'beaver' may be willing to be caught later in the week. This period is explicitly related to the weather changes, that is, one week is said to be typically enough time for a change from one wind to another. If 'hunting' is not good in one season, it is expected to change in the next, when the predominant wind changes. In mid-winter, when čuetenšu is most forceful and cold, 'beaver' trapping is less intensive because the 'animals' are not caught at this time, but when more mild cold weather returns the 'beaver' are again active and are 'hunted'.

Similar examples of the relationship of 'hunting', animal behavior, weather conditions and the actions of wind beings could be cited for the other 'animals'. The data in Chapter 6 provide examples of Waswanipi knowledge that link harvests of 'bear', 'hare', fur-bearers, 'grouses' other 'large birds', and 'fish' to weather conditions and wind beings.

These associations are daily, weekly, seasonally and annually affirmed and reaffirmed in the experience of the hunters, and it is this knowledge that forms the explanation of the proposition that the winds give the 'animals' to men. When young Waswanipi who return from residential schools and do not believe in wind beings ask why the hunters say that the 'animals' they kill are given to them the hunters often answer that the young person must come and live in the bush to find the answer. The answer is found, in part, in the daily experience of the men who 'hunt' 'animals'. The hunters know that it is an experience that can be shared by anyone who will come to the bush. Those young people who do go to the bush and 'hunt' appear to be convinced by sharing the bush experience. Several confided that indeed there are links to be found between 'animals' and winds and men, and that what the older people had told them was indeed true.[9]

The winds then give to 'human beings' the 'animals' they hunt, and this proposition is confirmed repeatedly, and learned at first hand through daily experiences of the hunters.

iii) 'God', čitče manitu, and the Hierarchy of 'Living Things'

'God' is the ultimate explanation for all that happens on this earth for the Waswanipi, but that does not mean that 'God' is the immediate cause of all that happens.

It is 'God' who puts the animals there, not the 'devil' (Interview Notes, #69), and all the animals are said to be čitče manitu otaokan 'God's pets' (Interview Notes, #114) so that it is 'God' who ultimately gives the 'animals' to hunters. But while 'God' has ultimate responsibility for what happens, it remains a world populated by persons, persons who are characterized by intelligence, thought, intentions, wills, and personal idiosyncrasies. Thus, while 'God' is ultimately responsible, the 'living beings' of the world, including the winds, the 'animal masters', the 'animals', and 'human beings' each act out of their own intentionality, and they are capable of following 'God's way' or of abandoning it. If they abandon it completely they may be following mači manitu, the 'devil'. 'God' alone gives life to beings, and 'God' takes life away, but beings are free, and ultimately responsible for their actions.

There are many terms that indicate the central role of čitče manitu. For example, čemekonau and čeašumkonanu, the terms for "it is being given to us", and "it is given to us to eat", are said by some Waswanipi to mean "he is giving it to us" and "he is giving us to eat", the "he" implying čitče manitu (Interview Notes, #114). People report they say this whenever they catch an animal. Thus, the terms for 'giving' imply 'God'.[10]

In the context of an analysis of the meaning of 'hunting' for the Waswanipi there is one feature of Waswanipi knowledge of čitče manitu that is particularly important to the meaning of 'animal' gifts. This is the implicit hierarchical order of the domain of 'living beings'. Examination of this order also helps to clarify the model of that domain which was not made clear in the previous chapter.

The Waswanipi say that čitče manitu is the "boss" of all the things of the world, the 'trees', 'land', 'water', 'stars', 'sun', 'moon', 'winds', 'animals' and 'human beings', and these are variously called his "helpers", his "pets" or his "children". In this system čitče manitu is conceived as the first "boss", "master" or "leader" of a descending series of leaders.

Ot$_{s}$imao the term glossed 'boss', or 'leader' is used in a wide variety of contexts for a person who leads others, or is responsible for a situation. The term is used for social roles in Canadian society, but not for roles in the Waswanipi society. A minister is *aiemieot$_s$imao* or "prayer boss", the engineer of a train is *otapanot$_s$imao* or "vehicle boss", the Hudson's Bay Company manager in a city store is *kompaniot$_s$imao*, and the bank manager is *soliao okanekot$_s$imao*, or "money house boss". The pervasive concept of the *ot$_s$imao* is glossed by Ellis for the Cree dialect of the west coast of James Bay as 'leader' (in any enterprise) (1962:v15) and this gloss will be used here.

Čitče manitu is the leader of all things, and he is helped by the winds. The 'north wind' is the 'leader' of the four winds. The four winds are leaders of the eight smaller winds. The winds are helped by the animal 'masters' (Interview Notes, #93, 52). The animal 'masters' are the 'leaders' of each specific kind of 'animal'. The old adults of each kind of 'animal' are the 'leaders' of the younger individuals of that specific kind of 'animal'. These relationships form a ranked chain of leadership.

This hierarchy of leaders extends over a significant part of the domain of 'living beings'. The frequent use of the term *ot$_s$imao* in naturally occurring settings however suggests a more extensive application for the concept.

There is some evidence that the Waswanipi domain 'living beings' is ordered by ranking classifications throughout, although I did not gather systematic data on the ranking of specific kinds of 'animals' as such. I have presented in the previous chapter data on the ranking of the closely related domain of 'flesh foods'. That the domain of 'animals' is also probably organized by ranking is indicated by the kinds of treatment afforded different animals. For example, the "meat animals" are regularly feasted. Each bear killed is feasted. The first beaver killed each year is feasted, and one may occasionally be feasted during the year. And, some men give a feast with the head of the first moose killed during a year. In addition, a kill of an exceptionally large and old sturgeon, the most valued of fishes, may be an occasion for a feast. The general treatment of the 'animals', the careful disposal of the bones, the feeding or restriction of specific parts of an 'animal' that can or cannot be eaten by dogs, and various other behavior patterns all distinguish highly valued 'animals' from less valued 'animals', and generally distinguish the four "meat animals". That these specific rules for treatment of the bodies of 'animals' are related to a hierarchical ordering is indicated by the fact that many Waswanipi say that they follow these rules in order to show "respect" to the 'animals', and that some animals have to be shown more "respect" than others. This is also brought out in several stories about the origins of the animals. For example, during a picture sorting, one informant responded to the illustration of the squirrel by reporting that:

> "He wanted to be a bear, but whoever was giving out the names said you cannot be a bear because there will not be enough meat to pass around to the people. So the squirrel cried and cried, and that is why he looks like that around the eye" (Interview Notes, #56).

The story emphasizes the size of the squirrel, referring to the fact that bears are eaten at communal feasts. However it also should be noted that this story implicitly makes clear that the ritual feast given to bears is not a consequence of their size or body form, but that the ritual would apply to any 'living being' with that name, or to any 'living being' so classified. The story contrasts what are probably the highest and the most lowly ranked of the 'large mammals'. More data than I have at present would be necessary to see if the ranking classification of the 'animals' was comprehensive and consistent. An appropriate model for the domain of 'living beings' might therefore be a ranking rather than a taxonomy.[11]

For present purposes it is clear that the 'spirit beings' are rank ordered as 'leaders' and that the other 'living beings' may also be rank ordered, and that *čitče manitu* is the highest ranked of the 'living beings'.

This is implied when the Waswanipi say that the 'animals' they 'hunt' are given to them. The 'hunt' depends not only on the activity of the hunter himself, and not only on the action of the hunter and the 'animal' given, the hunt depends on an integrated chain of leaders and helpers working together to give and receive 'animals'. This point was made explicitly to me at the end of a long interview in which I consistently frustrated an informant by my slow comprehension of what he was trying to say. Asked if the hunt depended on the game, he said:

> "It cannot be game. It is not animals that make good season, but how to think of game and of God too at the same time. This is what he teaches his sons" (Interview Notes, #52).

His wife said for further clarity that there are "three different things, čuetenšu, God, and the animals, this makes [the] difference in hunting." This then is the fuller sense in which the 'animals' men 'hunt' are said to be given to the hunter.

The term nitaonano also implies, in addition to receiving and looking, the concepts of wanting, needing and asking. The significance of these concepts may be elaborated by examining the place of 'human beings' in the order of 'living beings' and in the activity of 'hunting'. This in turn will require an examination of the criteria by which the rank ordering of the domain of 'living beings' is explained.

iv) 'Human Beings' and the Hierarchy of Power

Inioatč are 'human beings', or 'Indians'. At a general level inioatč are considered to be more powerful than 'animals' and less powerful than 'spirit beings'. This is indicated by the fact that the weakest of the 'spirit beings' are beings that were formerly said to have been 'human beings', for example the 'animal masters' and the 'Atos'. But, men are also not far from the animals in ranking because it is also said that the 'animals' used to be "like us". In the 'legends' the 'animals' could talk with one another, and with the 'spirit beings' and 'human beings'. 'Human beings' therefore fit into the ranking, but they are close to both those above and below them. Human beings are difficult to place with precision because 'human beings' vary among themselves in ranking.

The ranking of a person varies, with age and marital status. The main categories of the human life cycle are: a married woman skueo, and a married man napeo; a middle-age married woman českueo, and man čeonapeo; and old woman čiskuiš, and old man čenu; kids, awašiš; young girl iskueš, and young boy napeš, and young unmarried women, and young unmarried men, called <u>osčeskueo</u> and <u>osčeničeo</u> respectively. These categories can be ordered simply by age of the individual and by marital status, but an important criterion cited for the ranking is the degree of knowledge about the Waswanipi way of life (Table 5-5). Young boys and girls are said to become 'young unmarried men' and 'young unmarried women' when they just begin to learn how to hunt and to treat and process 'animals' and food. Young men and women change categories at marriage, but marriage is said to put new responsibilities on them. They are said to already "know how to hunt" and do the women's work, but now they "start to think" about their activities. People say they can learn the techniques of 'hunting' before marriage in one to three years. But, as one man described, when he was married and had a family he had new perspective on his 'hunting' activities and new learning:

> A. "That is the best time to learn."
> Q. "Are there special things to be learned at this time?"
> A. "Lots of things have to be learned at this time. How to shoot, for example; always wanted to shoot only once and save all the bullets I can. Another thing, not to be lazy, if lazy starve to death or freeze to death; to start something and finish it. Don't be lazy and leave it alone."
> Q. "When a young man is living with his parents he is not responsible for getting things done?"
> A. "The reason a young fellow lives with a family is that he is taught, but no one forces him to learn or to keep a schedule. He is shown what a married man does, but when he is a married man, then he will do it" (Interview Notes, #56).

The transition to 'older men' and 'older women' comes as they "know" and then "know a lot", especially when they have developed close relationships with 'spirit beings' they are said to "understand" things that younger people do not. It is said that they now know to "think" about 'God' and <u>čuetenšu</u> and 'hunting'. The 'older men' and 'older women' typically use what they know to help the younger men and women learn to 'hunt' and to treat the 'animals' and the 'spirit beings' correctly (Interview Notes, #83, 17, 64, 69). One young hunter reported that:

> "Old men know things, even know what is going to happen.
> Old man tells me where to go, and I go and I get something.

Table 5-5 Age and Sex and Marital Categories of Human Beings

Name in Cree	Criteria of Categories	English Gloss	Typical Ages at Transition to Next Older Category
čenu	R,K,A,M	Older married man	55-60
čiskuiš	R,K,A,F	Older married woman	55-60
čeonapeo	R,G,A,M	Middle-age married man	35-40
českueo	R,G,A,F	Middle-age married woman	35-40
napeo	R,T,A,M	Younger married man	20-25
skueo	R,T,A,F	Younger married woman	20-25
osčeničeo	S,L,A,M	Young unmarried man	12-14
osčeskueo	S,L,A,F	Young unmarried woman	12-14
napeš	S,N,J,M	Young boy	3-4
iskueš	S,N,J,F	Young girl	3-4
awašiš	S,N,C,D	Little kids, children	-

Key to Criteria:

- Marital Status: R = Married, S = Single
- Knowledge Related to Hunting: K = Knows a lot; G = Knows things; T = Starting to think; L = Just beginning to learn; N = No special knowledge
- Responsibilities: A = Adult responsibilities; J = Given responsibilities by adult; C = Not given responsibilities
- Sex: M = Male; F - Female; D = No distinction.

> Last year's hunt was good. I was with a *čenu*. This year was not so good, I was with a man my own age" (Interview Notes, #68).

'Human beings' then are ranked by life cycle categories and also, although I will not discuss it here, by individual reputations. The relative ranking of 'human beings' can be clarified by first describing the essence of 'human beings' lives.

The Waswanipi say that a 'human being' has a 'body', a 'soul' and a 'mind'. The majority of informants also say that 'animals' and all 'living beings' probably have 'souls' and 'minds' as well as 'bodies'. There are however some Waswanipi who indicate that 'animals' and other 'living beings' do not have 'souls', but this is the less common proposition.

All 'human beings' and 'animals' from birth until death have *mieo*, a 'body'. The flesh of the bodies of some 'animals' becomes meat for other beings, usually through the killing and butchering of the 'animal'. 'Human beings' in the time of the 'legends', that is the Indian people who were here before, were also killed by other 'animals' and eaten and this continued up to the time of the parents of some of those who are alive today in the person of the *Atoš*. Today there is a vestige of this remaining in the form of the fleas and insects, for example, black flies and mosquitoes that suck blood and eat minute quantities of the bodies of 'human beings'. The 'wolverine', 'wolf' and 'bear' are all considered dangerous animals that are capable of attacking 'human beings', but the first two are uncommon, the latter more understanding, and no deaths or attacks were reported to me from within memory.

It is the body of 'human beings' and 'animals' that binds them to life and to death.

All human beings have an *atat$_s$ako*, usually referred to in English as a 'soul', but also called the 'spirit of a man'. The 'soul' of a 'human being' is "fed" and "nourished" by direct analogy with the 'body' and its care and condition represent the ultimate condition of the 'human being'. Asked "What are the few things that humans want to make a good life?" one reply, paralleled by others, was:

> "They are supposed to take care of their souls, that is the most important thing. It is like when starving when do not have food, /that is/ like people who do not go to church. We do not go to church much, but remember to pray at night for school kids and everybody. /If a person does/ not pray /their/ soul, like a person, is thin" (Interview Notes, #69, 114).

The 'soul' is the essential part of 'human', 'animal' and other 'living beings'. It is the 'soul' that transcends the life and death of the person.

In addition to a 'body' and 'soul' 'human beings' also have a 'mind', mitonetsikan. The 'mind' is also mamitoneitam, which can be glossed as 'thoughts' or 'thinking'. The thoughts of a 'human being' are constantly changing and developing throughout their lives, and old men and women know how to 'think', or just "know a lot". The 'mind' and the 'soul' are closely related. Parallel expressions are namatocoan tsi mitoneitsican, translated by informants as "you do not have a mind" and, the negative of otatsako "you have no soul"; both of which are used "when people do things they should not do" like children who light matches in bed, or break a window or throw rocks or sticks at each other, or a man who puts an axe through a canoe (Interview Notes, #114). The link between 'mind' and 'soul' is also indicated by the concept of prayer, which feeds the 'soul' and which is said to be the same as 'thought', thought addressed to God.[12]

'Thought' and 'prayer' link 'human beings' to 'God' and establish important bonds between the differentially ranked 'living beings'. These differences and links are spoken of as degrees and exchanges of "power" in English. In the hierarchy of 'spirit beings' the different ranks of leaders are distinguished by their degrees of "power". Thus, 'God' is more "powerful" than Čuetenšu, his helper, and Čuetenšu is the most "powerful" wind, and the winds are more "powerful" than the 'masters' of the 'animals' and the 'masters' are more "powerful" than the 'animals' and the 'bear' is the most "powerful" 'animal', and the older individuals of each kind of 'animal' are more "powerful" than the younger.

What "power" is can be approached by examining how it is manifested and explained by informants. When Waswanipi explain the power of 'God' they explain his knowledge and the relationship between his thought and action. When a man wants to explain his own or another man's power he most often explains the relationship between his thought and happenings in the world, and the relationship between himself and one or more 'spirit beings'.

Waswanipi individuals explain that 'God' looks down on the earth from above and sees everything. He sees every person and he knows everything that will happen. When a person is born he knows all what will happen in their lives. His knowledge is total and complete over both spatial and temporal dimensions. 'God' is superlatively knowledgeable. It is only 'God', for example, who knows when 'human beings' will be born, and when they will die, and when they will be sick, and whether they will suffer. 'Spirit beings' participate in this knowledge to a lesser degree, they know what is happening at places away from where they themselves are and they know what will happen in the future, but only in part. Thus, these beings that are not seen but may be heard and thought, may communicate their knowledge to men in dreams and thought, but they do not tell men all that will happen, nor all that men would like to know.

What is unique about 'God's' knowledge is also the way knowledge, thought and action are one. It is said that what 'God' thinks or knows happens. Because of this 'God' is all powerful, and it is he who relinquishes power to other 'living beings' and makes them powerful in varying degrees. Thus, 'God' gave Jesus the power to do what he wanted when he was on the earth. And he gives powers to those 'living beings' who are his helpers, pets and children.

The meaning of power is revealed in the explanation of the "powers" of 'human beings'.

As the discussions of the categories of the human life cycle and the conception of human thought have already indicated human thought links men to the 'spirit beings'. It will be remembered that 'spirit beings' are not normally seen, they are heard or known in dreams or thought. 'Older men' and 'older women' know how to think and communicate with the 'spirit beings'.

A major concern with the thought of 'human beings' is the link, or lack thereof, between what is 'thought' and what is actually experienced to happen in the world. In the context of 'hunting', when the things a 'human being' thinks about are actually given to him, it is said to be miopaio, "something good" or to have 'luck'. When you have miopaio you are misat$_s$iseo "never short of anything what you want" (Interview Notes, #114). And when a human being is t$_s$itimatišio "cannot have what [they] want to get", "poor" it is mat$_s$ipaio, "something bad", 'no luck' (Interview Notes, #114). When a hunter gets 'animals', is given the 'animals' he wants or needs he has 'luck', and when he is not given the 'animals' he wants or needs he has 'no luck'.

'Luck' and 'no luck' are concepts that link the thought of 'human beings' to what actually happens in their world. That is, 'luck' in 'hunting' is not random chance for the Waswanipi, although they use the English word "luck" for translating their conception. 'Luck' and 'no luck' are concepts which are reserved for 'hunting', and do not refer, for example, to health or sickness. 'Luck' in 'hunting' is a congruence of the thought of a 'human being' with the experienced events in the world, and in particular those thoughts concerning the 'animals' he wants or needs, and the actual 'animals' he is given.

The first thing I want to note about this link is that, unlike 'God' whose thoughts happen, 'human beings' never expect to have 'luck' all the time. Asked "Do you always have 'luck'?" twelve men replied "no", or "sometimes". Asked "Do you always get what you want?" eleven men including eight of the twelve said that "sometimes" they get what they want.

The importance of this conception of 'luck' is reflected in a series of proverbs which indicate the pervasiveness of the proposition that hunters cannot always have 'luck'. It is said that both a husband and a wife do not have 'luck' together. If the wife is getting 'hares' by 'snaring', the husband will not have 'luck', and if the wife does not have 'luck' the husband may set snares for 'hare'. It is also said that if a married couple both have 'luck' they will not be together long, but if they do not both have 'luck' at the same time it will be a long marriage. Another proverb says that when three or four families live together there has to be one that does not have 'luck', and one that has 'luck' so they can help each other out (Interview Notes, #68). Another saying is that if a hunter does not have 'luck' in the early seasons of the year, he will have 'luck' when the season changes. Another saying is that a man cannot have 'luck' at all 'hunting'. One hunter will have 'luck' with 'beaver' another with 'moose' or 'fish'. Each man has 'animals' with which he has 'luck' and these are the animals to which he has special relationships. Finally, it is said that a hunter who has 'luck' every year will not live long. Examples were cited to me of men who died in their early 40's, men who were just becoming čenu, who were said to have had too much 'luck'. In short, as people said: "It is not good to have 'luck' all the time" (Interview Notes, #69, 67).

This is said to be 'God's' way (Interview Notes, #69), the "way it should be, the way he put it" (Interview Notes, #37). Another hunter explained that it is "just like when two bosses come, one says different than the other" (Interview Notes, #67). The proposition that 'human beings' do not always get what they think reflects the difference between 'human beings' and 'God' and the dependence of 'human beings' on the different categories of 'spirit beings'.

What is different here is the degree of "power" of the different 'living beings'. While 'God' is superlative "power" and what he thinks happens, 'human beings' have lesser "power" and what they 'think' sometimes is given, and sometimes not. The power of 'human beings' happens when hunters think as the 'spirit beings' do, when the hunters and the 'spirit beings' all agree.

This dependence of the power of 'human beings' on the thought and actions of 'spirit beings' is reflected in the focus of concern with "power" on particular kinds of thought. Discussion of "power" and thought tends to focus on anticipation of the future in thought and its fulfillment in actuality, which are taken as indications of power.

I did not do a comprehensive study of the ethno-psychology of the Waswanipi, but I did discuss the basic terms for human mental functioning and the descriptions of the meaning of those terms. The mind and thinking include concepts for several mental functions, among them three temporal linked functions, immediate experience, memory and future thought. The first aspect attentiveness or presence in the immediate situation is revealed in several expressions that describe a lack or loss of presence. OanaikočekAio was explained as when you have "something in your mind, in the way", an example given is "when you are trying to make something and something else is in your mind, or you're thinking about something else and you cannot seem to do things" (Interview Notes, #114). The same idea can be conveyed by an observer who sees "someone is doing work and they are not doing what they should, you tell them this, they are thinking about someone else" (Interview Notes, #114). These negative examples convey a lack of "presence of mind", a lack of focussing of the mind on the immediate situation. The mind then as well as the body link the human being to the environment in which he lives. It is assumed that human beings will be attuned to the actions and events of the situations in which they live, both immediate situations and those at some remove. A second thought function is memory or rememberance. To forget something is oanit$_s$ist$_s$iseo, for example to start saying something and then to forget what you want to say; oačičisčišian is "I just remembered". Two kinds of learning are distinguished, čiskotamaso, when someone is learning for themselves what to do or how to do things. Typically, this applies when you watch somebody, but they do not instruct you and you try to know how to do it. By contrast, čiskotamak refers to when someone has instructed you, typically both showing and telling the person who is learning how to do it. As the examples suggest the terms appear to apply to knowledge that is learned more than to act of learning. Thus namakastitao applies to a lack of knowledge, it was explained as applying "when you think you know how to do it but cannot do it" (Interview Notes, #114).

The general word <u>čisteitam</u> is 'to know'.

A third knowledge is anticipatory, <u>nikančisčeitam</u> literally "future thought" but explained by people as 'he' or 'people can see ahead' or 'knows ahead'. This knowledge of the future is distinct from what Westerners mean by knowledge of the future, at least in part, because for the Waswanipi knowledge of the future may not be simply expectation, or speculation, it can be knowledge that has varying degrees of certainty for the knower, because of its sources. That anticipatory knowledge can, in the Waswanipi view, have a quality of certitude is indicated by the term <u>čestinao</u> which is used when you know for sure what is going to happen, or what is happening even though you cannot see it. One example is when "a man goes out hunting and he does not come back for a while and his wife says 'he killed a moose, or a bear, for sure'" (Interview Notes, #114). Thought can of course be believed or not believed. <u>Tapoetam</u> is 'to believe' and <u>namoitapoetam</u> is 'not believing'; for example White people and school kids who do not believe when Waswanipi people share their knowledge with them. Not believing is said to be the same as <u>nanoipapiskatam</u>, or "not bothering about that".

As was mentioned previously, dreams are distinguished from waking experiences, but dreams nevertheless are mind and thought related. People speak about dreaming, and they also speak about thinking during the night, both appear to occur when the individual is asleep rather than awake. Dreaming and thinking are particularly linked to anticipatory thought. Men get knowledge of the happenings that are distant in time and space by thinking or dreaming of 'spirit beings'. As men who know how to think mature, they learn how to cultivate and interpret such communication and much of what they come to know is knowledge of future events, knowledge which they say comes from 'God', <u>čuetenšu</u>, <u>mistapeo</u> and other sources. Men who have such knowledge are said to be "powerful" or to have "powers". There are a wide range of sources and means of getting such knowledge, but the common point is that knowledge that is said to come from 'spirit beings' can anticipate the future with some degree of certainty, and such knowledge is the most commonly cited evidence of the powers of a 'human being'.

Almost all men who have reached the life stage where they have "started to think" report some ability to "know what will happen for sure". One source of such knowledge is from bodily feelings. A pain in the hip for one man indicates he will not catch anything, a twitching eyelid for another means he will find an 'animal'. Many men report that a pain in their back has a meaning, one knows that someone in the camp will kill something, another that he himself has a 'beaver' in his trap, another that someone will visit, another that he will not get anything. One man says that when he wakes up in the middle of the night and wants a smoke he has a 'beaver' in his trap. Another source of such knowledge is seeing 'animals' themselves. If 'beaver' are seen in summer it may mean the men are going to get many 'beaver' the following winter.

The most common means of gaining knowledge of what one is going to get is through dreams or thought during sleep. Men say they dream of a 'moose', or a woman, and then they are sure to get a 'moose'. Some dream of the 'animal' they will get, some of the place, some of the direction.

Future thought has several features that are like both hunting and shamanistic performances and, in some senses, it might be appropriate to say it stands between them. All three involve the idea of looking. Thus future knowledge was explained to me as "looking to find what one knows" (Interview Notes, #114). An example given to me was of a man who dreamed the kind of place where he would kill a 'bear', but not its location, and who was said to have "found his dream a full year later" (Interview Notes, #53). Future knowledge is fulfilled in the hunt, and is thereby also critically linked to action. The close link between shamanism and future thought found through dreams was indicated by the example of a čenu who had a dream, during the fall when there was ice on the shores of the rivers, in which čuetenšu told him that he had not yet come to stay. The man was told in his dream that the lakes would freeze up, but that then there would be a thaw and the ice would melt, before čuetenšu returned to stay. This dream was publicly announced in the settlement along with čuetenšu's warning for everyone to be extremely cautious on the ice. Several days later the dream message was confirmed by the same man in a shaking tent ceremony in which čuetenšu was a visitor. This important and unusual knowledge indeed accurately reflected the course of events over the following month, as revealed by reports of informants and weather records. Such information is a demonstration of the "power" of the man who learns and communicates such knowledge.

But, certain knowledge of the future is not only linked to action after the dream or thought, the dream or thought is itself often a response to a request for what a man wants and needs.

The majority of men who are old enough to have started to "think" about their hunting say they think about what they want in order to help them. This is what they learn as they get older how to think in order to help themselves to dream and know. They also learn how to find what they know will happen. They say they "know how to ask" for what they want and need.

> "When he wants to get a moose, he thinks about it, and then it is as if somebody is telling him about it: where to go and what to do. And then he is sure to get it... Sometimes he dreams it, but sometimes he hears it, as if somebody is talking to him, telling him where to go... It seems like it is 'God' who tells him...
> It is like when we want something. We ask him for it and he tells us what to do to get it... He knows what is good for us. When he asks 'God' for what he wants, and 'God' gives it... When somebody does not have luck, he asks 'God' for what he wants. Even though he thinks 'God' says no, he keeps on asking 'God' for what he needs and finally he gets what he wants... It is like a little kid, he comes and asks, you say no. He comes again. Finally you give him" (Interview Notes, #69).

In this quote all the meanings of nitaonano are brought together. What the hunter wants and needs he asks for and what he finds is knowledge of the future, knowledge that is powerful because it comes from 'God' or 'spirit beings'. And, he knows he will be able to "find such knowledge" in the world through his own looking and action and in the end he will be given what he needed and wanted.

The nature of power itself becomes clear in this formulation. When what a man thinks, dreams, wants, and knows happens it is a manifestation of the power he may have. Men cite, as examples of the powers they have, occasions when they have had knowledge of the future and they have "found it". The key feature of such stories is a stress on the fact that what was foretold came to happen. While the knowledge may have certainty for the receiver, I think that power is only actualized publicly in this view when anticipatory knowledge is actualized, when it is "found". This is suggested when men say that they are receiving help from other 'spirit beings' when that help is actualized in harvest. "He [spirit being] helps them [i.e., Indian people] when he [informant] catches more, when he [informant] does not [catch more] he [spirit being] cannot help them" (Interview Notes, #58). Similarly at those legendary times when men were most powerful "what they asked they got" (Interview Notes, #67). Today men do not always get what they think, not until they are told so by a 'spirit being' and they look for it. The power of 'human beings' therefore depends on the help of 'spirit beings' and also on an active participation of the 'human being'.

We can now infer some aspects of the Waswanipi concept of "power". "Power" is the actualization of thought, it is a coincidence between an internal state of a being, thought, need, want, and the configuration of the world, a congruence which is anticipated in the innerstate and which it helps to actualize. Thus "power" in the Waswanipi view implies not so much an individual ability to bring one's thought to actuality, nor primarily an ability to manipulate 'spirit beings' to fulfill human needs and wants. "Power" is mainly actualized in human life in the intimate linking of human thought and action to the course of the real world produced by the causal action of all 'living beings'. All 'living beings' actualize their understandings in action and sometimes successfully integrate their thoughts and action with those of others in a way that each participates in the "power" of making the world. "Power" does not control things and make them happen, "power" is a relationship between 'living beings' such that thought and action are one and so that something happens whereby potentiality becomes actuality. Hunting is an occasion of "power" in this sense.

This suggests a fundamental point about the domain of 'living beings', namely that all 'living beings' are personal centers of causality, because each participates in relationships of "power" in the world. And, since the gloss 'living beings' is patently anomalous, it may be better and more consistent to gloss pimat$_s$ioin as 'powerful beings' in the sense of power defined here.[13]

B- Hunting as a Model of and for the World

The Waswanipi conception of 'hunting' has been explored up to this point by considering each of the meanings associated with the root nitao-. There remains however the possible association of nitao- with "growth" and "always". I propose to explore these alternative meanings within the context of a discussion of how the model of hunting itself serves as a model for living in the world. I begin with an examination of the conception of čuetenšu, the most powerful 'spirit being' specifically and uniquely associated with 'hunting'.

i) The Winds as Multi-vocal Symbols of the Order of the World

The concepts of the four winds are central and complex concepts in Waswanipi systems of knowledge. Various aspects of the relationships between the winds are analogous to the relationships between the categories that give order to the everyday world, and the concepts of the winds therefore enter a wide range of relationships, and have a diverse range of meanings, which makes them central concepts in Waswanipi thought about the world. The concepts of the four winds are related to many of the basic spatial and temporal categories and they serve to link and integrate the various spatial and temporal categories by which the Waswanipi conceive of and find order in their world.

The concepts of the winds also serve to link the concept of 'God' to the concepts of the world. The winds are part of ispimič, the "up there", and all that is there, including the 'sun', 'stars', 'clouds', 'God', and other 'spirit beings' but the winds are known on a daily basis by what happens as a part of tapašiš, the "down here", and all that is here, including asči - the 'earth island' and the surrounding tsisikami, 'big lake' (Interview Notes, #114), asči, the 'land' and nipi, the 'water'. The winds are related to these macro-world concepts because the winds are said to live at the ends of the earth in each of the four primary directions and it is the winds that bring the ice and snow that transform the surface of the land and the water. The winds both define the limits of the earth and provide one of the major systems of spatial orientation of the earth.

The four winds define both a four-pole and a two-pole spatial classification system. The four-fold classification of winds corresponds to a four-fold directional classification, čiewetan, nikabeian, souenian and oabaniao, used to communicate about orientation. When the north and west winds, which are said to be about the same (Table 9-2) are merged, and the south and east winds, which are also said to be about the same are merged, the winds divide space into northwest and southeast hemispheres. The hemispheres correspond to the rising and setting sun.

Men say that in the morning they wake up and see the sunrise, and they know what kind of a day it is, they see the weather, and they know what they will do and get that day. Oabenšu, the name of the 'east wind', is therefore said to be related linguistically to oaapan, 'morning' (Interview Notes, #67). There is also a body of knowledge concerning the sunset which involves predicting the weather for the following day from the configuration of the sky at sunset. The two-fold classification of winds corresponds to a two-fold directional classification - 'towards the sun' (south east) and 'away from the sun' (north west). This system is not only used for communication but to orient human habitations and activities in space. The preferred locations for camp sites are on the north west shores of lakes or rivers, because it is said that the higher land behind the camp will offer protection from the cold 'north winds'. When the camp is so located the door faces the water and morning sun to the south-east. Animals orient themselves by this classification according to the Waswanipi; moose yards are said to occur frequently on south-west facing slopes of hills especially in late winter and 'hare' and 'grouses' may also be similarly oriented. There is a story in which a man finds his direction on a cloudy sunless day by examining each of a certain kind of tree and noting the moss which grows only on the south-west exposure of these trees. Men and animals are said to favor a southwest orientation in order to be protected from the danger of the 'north wind'.

The concepts of the winds therefore are related to the horizontal classification of the earth, its limits, and its divisions.[14]

The concepts of the winds also are related to the major temporal concepts of the Waswanipi. The relationship of the winds to the daily cycle of the sun has just been mentioned. The relationship of the winds and time was implied by an informant who reported that the four main winds are each associated with two smaller cousins, one on each side, forming a twelve wind group "just like a clock" (Interview Notes, #69).

Waswanipi explicitly report the association of the winds with the seasons. The simplest temporal classification of the year is into two seasons pipun and nipun respectively 'winter' and 'summer'. The separation occurs at break-up and at freeze-up, so that winter is the period of ice cover, and roughly of snow cover, and summer is the ice free period, and roughly the snow free period. The distinction is, of course, critical for many everyday activities, especially those involving travel and 'hunting'. The association of the two-fold division of the winds with a two-fold classification of seasons is indicated on Tables 5-1 to 5-4.

The temporal organization of the earth is also closely related to the classification of the winds. The year is subdivided into six seasons, sometimes five, as listed on Table 5-6. In this classification the terms pipun and nipun refer to the central portions of the respective halves of the year, the typical divisions. Two additional seasons are defined at each of the transitions - from summer to winter and from winter to summer. Thus when the first snow falls

Table 5-6 Waswanipi Classification of Seasons

Season Name In Cree	Criteria for Determination of Commencement[1]	English Gloss	Approximate Dates
takuačun	begins to snow, plants dry	'late summer'	Oct. 1 (?)
miskodin[2]	freeze-up	'early winter'	Nov. 15
pipun	high snow	'winter'	Jan. 1 (?)
sikun	wet snow, snow starts to melt	'late winter'	March 15 (?)
mioskamin	break-up	'early summer'	May 1
nipun	last of snow gone, hot weather	'summer'	June 15 (?)

Footnotes:

1. Combination of data from: Interview Notes, #114; Fieldnotes #115.
2. Sometimes not included in list of seasons.

nipun, in the narrower sense, becomes takuačun. After freeze-up miskodin, begins and becomes pipun, in the narrower sense, when the snow is high. Pipun becomes sikun when the snow begins to melt. And, after break-up is mioskamin which becomes nipun when the last snow is gone. In this model then, the year is still divided by freeze-up and break-up, but there are also seasons defined by snow conditions: by the first snowfall, the arrival of high snow, the beginning of the snow melt, and the last of the snow. It should be noted, however, that this set of criteria were not given by a single individual and that other criteria were offered as well. This model is a composite of statements of two individuals, and other criteria occur in my notes, as well as other labels for time periods. For example, mekoapipun, said to mean "mid-winter", was used in one discussion as the coldest part of "pipun" (Interview Notes, #114), but it did not appear to contrast with the terms on Table 5-6. I only noted the term once, it may have been used more, but the criteria used to define this period on that occasion were referred to often in other settings.

The main features of the winter season are all associated with čuetenšu, and those of summer with souenšu. Čuetenšu is said to bring the cold, the snow and ice, souenšu to remove them. There are a large number of examples that affirm this link. For example, men say they ask čuetenšu for snow when they want moose, and the cracking of lake or river ice at night is said to be the cold, or čuetenšu, speaking (Interview Notes, #52). In dreams of čuetenšu in late summer and in late winter, when he says he is coming or going away from Waswanipi, it is also said that it "seems as if he tells everybody not to try to walk on ice when it is not thick enough" to wait until it is safe or to wait until it breaks-up, the latter is "the last thing he says before he leaves" (Interview Notes, #64). Mekoapipun refers explicitly to the period when čuetenšu is at his strongest in mid-winter.

In addition, the Waswanipi classification by months refers to phenomena that are closely related to the winds. The Waswanipi names of the months are said to refer to the appearance of summer birds in two cases, the appearance of vegetation in two cases, and to particular animal behavior, fish runs and bear activity in three cases, all of which are associated with souenšu, and to the falling of the leaves, starting to freeze and the cold, associated with čuetenšu in these cases. Only December and February have associations not immediately related to the winds (Table 5-7).

The pervasiveness and importance of wind categories in the Waswanipi world are indicated by the fact that many terms associated with travel and hunting are seasonally specific, and descriptions of hunting and many of the activities either include information on seasons, or indicate distinctions made on the basis of seasons. For example, in several terms for various travel and hunting activities, there is a seasonal difference in the terminology: to move from one camp in the bush to another in summer is called ataonaneo, while a move from one winter camp to another in winter is called atsipikinaneo, and to hunt moose in summer is called nanitaomUsikateo, in winter nanitaomUsAneo. When asked "How do you catch (kill) x?" where x is the name of any 'animal', Waswanipi usually provided an extensive description of activities, and they often organized these activities by introducing a classification based on temporal periods of the year. The 'hunting' methods consistently vary with the period of the year in which the activity takes place. The initial eleven interviews in the series including the question "How do you catch (kill) x?" provided answers that included following temporal references (the number of interviews in which the phrase occurred appears in brackets): "freeze-up" (6), "break-up" (6), "high snow" and "deep snow" (2), "hard snow", "hard crust" or "snow melts" (3), "snow goes down" (1), "mating time" (1), "fall" (5), "spring" (3), "winter" (1), and a number of references to the names of specific months (5). References to "freeze-up" and "break-up" most frequently were of the form "before freeze-up", "after freeze-up" and "after break-up". There were also references to "during freeze-up" and/or "at freeze-up" i.e., the "time of freeze-up" and "time of break-up". "Fall" and "spring" most frequently occurred along with "freeze-up" and "break-up" in the form "fall, before freeze-up" or "fall after freeze-up", and "spring, after break-up". In all cases, the contrast was not between fall and winter, or winter, or winter and spring, but rather before freeze-up with after freeze-up and before break-up with after break-up. "High snow" or "deep snow" and "hard snow" or

Table 5-7 Waswanipi Names of the Months of the Year, from One Individual[1]

Waswanipi Month Name in Cree	Informants Comments	English Name
kat$_s$inosetpišem	- long month (cold)	January
oaiouikanopišem	- new year month	
katakosetpišem	- short month	February
mitisiopišem	- eagle (appears) month	March
šišippišem	- ducks (appear) month	April
nikpišem	- geese (appear) month	
oaapikunpišem	- flowers (begin to grow) month	May
namiopišem[2]	- fish run month	June
oteiminpišem	- strawberries month	July
atiteominpišem	- bears are about month?	August
atikamekpišem	- whitefish (run) month	September
pinašit$_s$eopǐsem	- leaves start to fall month	October
maskaoatinopišem	- starts to freeze	November
makošet$_s$isikanpišem	- Christmas month	December

Footnotes:

1. Interview Notes, #114.
2. 'Sturgeon month'.

"hard crust" were referred to primarily as "when there is high snow" or "after the snow starts to melt". These references establish a series of before-after contrasts, such as: before the snow is high contrasts with after; before hard crusts form contrasts with the period after. Taken together, these contrasts sub-divide the period between freeze-up and break-up into sub-periods. In each case the latter part of each contrast overlaps completely the former part of the next contrast. The total classification thereby divides the year into five periods: before freeze-up, after freeze-up, after snow is high, after snow is hard or after snow starts to melt, and after break-up. This coincides with the criteria for determination of the commencement of the four seasons from miskodin to mioskamin presented in Table 5-6, and it indicates the implicit use of the seasonal classification and with it the classification of the winds in the knowledge of 'hunting' activities.

The major temporal classifications of the year are systematically related to the categories of the winds, and similarly, the shorter-term temporal classifications are also related to the wind categories. We have already seen the association of the dual wind categories with the daily rising and setting of the sun and the course of the day (Table 5-8).

Each day is associated with the presence of one or more winds, and the activities of the day adjusted accordingly. This is not only the case with respect to hunting activities but also with respect to dreams and to other communication with or about the winds. Thus, I became aware intuitively during fieldwork that the discussions of čuetenšu and the beings involved in 'hunting' were most extended on cold days. The comments of some people implied this. For example, after a particular useful discussion of the relationship of men to beings that are not seen, I was told by a man who was scheduled to leave for his early winter camp the next day that it would be cold and windy because I asked him about those things (Interview Notes, #67). He had to wait five days to leave for his camp because strong northwest winds kept the planes grounded. During those five days I gathered most of the data reported on Tables 5-1 to 5-4.

With respect to spatial and temporal classifications the concepts of the winds,

Table 5-8 Waswanipi Classification of Periods of the Day and Night from One Individual[1]

Name of Period	Informant's Comments	English Gloss
oaAseApan	- dawn, first light, no sun yet	dawn
oaipač čečišep	- early in the morning before the sun rises	early morning
sAkastaweo	- sunrise	sunrise
oaapan	- morning	morning
apitačišikao	- middle of the day	mid-day
čišikao	- day	day
otakošeo	- evening, sun setting, 3 to 4 /in the/ afternoon	evening
pačišimupišem	- sunset	sunset
tipiskAO	- night	night
apitatipiskAO	- middle of the night	mid-night

Footnote:

1. Interview Notes, #114.

not only link the various classifications for orientation in earthly space and time, they also link earthly space and time to a wider frame of concepts of what we might call world space and time; they link space and time 'down here' with space and time in the 'up above'. It has already been suggested that the winds mediate the 'up above' and the 'down here' by their classification as 'spirit beings' that continually affect the face of the earth and by their association with the limits of that earthly plane and the sky beyond. The temporal association is however more elaborate.

The structure of time is revealed in one of the meanings of term *čuetenšu*. The root *čue-* or *čioue-* is explained by informants as meaning 'to return', 'to go' or 'to come back' (Interview Notes, #114). The same root appears in several other words, and can be seen in the terms for going to town and bush respectively. To leave the bush and hunting and go to town one can say *poninitaoonaneo* 'stop hunting' or *čišinitaoonaneo* 'finished hunting' depending on whether it is a short visit or a completed hunting season. To go from town to the bush however one says *čioaneo* 'to go back'. The seasonal alteration of hunting and settlement living is here spoken of as a break in 'hunting' activity and a return to the activity, a sequential alternation. Similar uses of the stem *čioue-* will be given below, but this may suffice here. The example suggests, for the moment, that in so far as *čuetenšu* may stand for the group of concepts of the winds, and so far as these are related to the classification of time, time may be conceived as a recurring alternation between parts of sequences: day is both day and night recurring, and year is both summer and winter recurring. Time is thus a recurring alternation of distinct periods, even contrary periods in some cases where one period is a break or stoppage in the other. But time is also an alternation in which one alternation leads to another, and after the break there is a return to the former.

The winds themselves are beings that occur in the stories of long ago, so that the winds themselves have existed since the time before the earth was as it is now, before it was inhabited by men as it is now. There is a legend of how the summer birds were brought from the south for the first time, and it is said that before that time there was only winter, but since then there has been a continual alternation of summer and winter. The relationship between the winds and temporal categories would then imply that the temporal categories themselves are thought to extend beyond the temporal limits of the earth as it now is, into what we might call cosmological time. The concept of the winds, however, not only implies a longer duration of time, it implies a particular structure of time, a cyclical structure.

The winds then are central concepts in the Waswanipi conceptual organization of the spatial and temporal categories of the earth, but they also link earthly categories to frames that transcend the world in which men live out their lives. The winds link the categories of the world of men's daily lives to the categories of men's knowledge of the ultimate order of the world.

ii) 'Animals' as Links Between the Cycles of the World and of Life and Death

In addition to the winds, another major link between the conceptions of the earth and the conceptions of the wider world in Waswanipi belief is the conception of 'death', ponipimatiseo.

At death the soul leaves the body here on earth and is awakened in another part of the world. Informants say that tsiboi, 'dead people', go to the 'place of the dead', oakive, beyond the earth to the east, while other people say the souls of at least some people go to "heaven", above (Interview Notes, #52).

Thus, death itself, the departure of the soul from the earth, and the leaving of the earthly body behind is, in some sense, a metamorphosis after which "life", or participation in the determination of the world through "power" continues so long as 'God' wants the world to be ordered this way. 'God', through 'Jesus' has both lived on earth and existed in the 'up above' and there are important interactions between those on earth and the beings above, as I have indicated.

This includes dead 'human beings' who are not entirely removed from earthly affairs. After death a person is said to sometimes stay around the place he is buried and to visit it later on occasion (Interview Notes, #52, 93). Living people also have contact with 'dead people' through dreams (Interview Notes, #52, 93). For some people such dreams are bad luck (Interview Notes, #52), but others report extensive and positively valued contacts. One man said his father told him before he died "once in a while you will find me" and that since his death he thinks of what his father told him and his father still helps him to find what he wants (Fieldnotes, #27). Another said that it is like 'dead people' telling him stories in his dreams, they "tell him what to do to get what he wants to give his children... they tell him where to go to get what he is looking for" (Interview Notes, #64).

The assistance offered by 'dead people' to some of the living is an extension of the help given by 'older men', <u>čenu</u>, to 'younger men' who have less power. 'Old men' transfer their power, in part, during their lifetimes, and use their power to help others, but at their death, their power can be inherited by a 'young man' with whom they have been closely associated in harvesting activities. The son who "finds" his father as a 'dead person' is using dreams and thought the same way a person discovers what an older living person meant when the latter gave him advice. One 'old man' said before he died that he would think about the people after he died, and they would have luck. And people said they did (Interview Notes, #114).

The relationship between 'dead people' and living 'human beings' also closely parallels that between other non-visible beings and 'human beings'. Both are known through dreams and thought, both help or hinder harvests, and both exist beyond the spatial and temporal limits of the earth. Ultimately, in the Waswanipi view, it is 'God' who decides the life and death of all 'living beings', it is 'God' who gives life to babies and it is 'God' who wakes the 'dead people' in their new land (Interview Notes, #69).

'God's' intentions with respect to the life and death of people can however be known in advance, at least on some occasions. 'Older men' sometimes say that they know they are going to die soon and begin to make arrangements, they may say to whom they will pass their power relationships with 'spirits', they may say where they want to be buried. There are many stories of men who predicted the winter they would die, they did not feel well, or they had a foreboding of an accident. People may have said I will not "see open water again" (Interview Notes, #27), or "I may be dead this winter" (Interview Notes, #14). During the period covered by this study a man reported to his family a dream in which he saw himself in a place where it was light starting to go toward a place where it was pitch black and where he could not make out anything. Two days later he died in an accident trying to shoot a rapids.

'Older men' can also anticipate the death of other people as well. In a dream one man reported to me, the sun set into a black mist instead of into the trees and the individual knew something would happen. A short time later he heard that his mother had died (Fieldnotes, #27).

Death however is not only anticipated in dreams, it is also known by signs, particularly signs brought by birds or by flying animals. Men do not kill the 'robin' because he is said to bury 'children' who died. The death shooting the rapids reported above was said to have proceeded by the calls of a bird like an 'owl'. The bird called every night for a month until the fatal day, and then was silent (Interview Notes, #53, and Fieldnotes, #115). Two days before the fatal trip, the three men who were to travel together the day of the death were together visiting the same rapids where one of them was to die, one told me what happened:

> "... a lone goose landed nearby. (The man who died) told the two young men to wait and he went to get the goose. When he was out of sight (the two young men) heard a strange call and [one] asked 'What is it?'. (The other) said 'a goose'. (The first) said 'that doesn't sound like no goose', to which (the second) commented 'That's what I was thinking'. It did not even sound like a baby goose, it sounded like a baby. (The two young men) looked for the (other man). He was able to crawl right up to the goose, it was not even a yard from shore, and it did not fly away. That is where he shot it. That place where he shot it is the very place where (one of the young men) brought the canoe to shore after the accident [two days later]" (Fieldnotes, #63).

Flying animals not only serve as omens of death, they are omens in shamanistic duels when one man tries to bring hardship or death to another. These duels, which are said to be less common or less important today, will be discussed elsewhere in a historical study of Waswanipi. For present purposes, it may be sufficient to note that in the accounts given to me, the shaman may be seen as a 'bat', an 'owl' or a 'flying squirrel'. One such story told to me from a second-hand account, was of a duel that involved a woman, her husband and her son. She, her husband and her son were living in the bush when they saw a man outside the camp, circling, who they knew wanted to hurt the boy. Her son shot at the man and, after a moment, an owl fell just in front of the door. Later that year the man who conjured her son died (Fieldnotes, #114). People say "something is going around, like flying round" and "we know something is going to happen". Something was reported to have been "going around" sometime before several children from Matagami were drowned in the rapids one summer. Another time hummingbirds near human habitations foretold of the drowning deaths of two relatives.

During the period of this study, I heard of only a few deaths that were attributed to the actions of other men, 'God' was the common cause of death. But as the above examples indicate, dreams and flying animals are the means by which men know and anticipate deaths. There is a suggestion that such anticipation is linked in some cases to the death itself.

In the case of the death at the rapids during the period of this study, but at a time when I was not in the field, several 'older men' who had dreams and heard the birds calling, publicly stated that they thought they were going to lose a friend soon (Fieldnotes, #63). During the late winter the man who died took several risky skidoo trips on the thinning ice. At the time of his death there was still ice on the lakes and in the bays along the river, but the river was cleared. Travel required a combination of canoes and sled, alternatively using one and carrying the other. The day of his death the man asked one of the young men he was to travel with who had been staying part-time in his house, to get his things and move into the house with his family. He then put his camping gear in to the canoe to leave on the trip. Stopped at the rapids, much of the gear was portaged, as the canoes could have been; but he did not portage the canoe to the surprise of his companions.

> "At one point (he) approached (the young man who) said he could see he wanted to talk. He said to (the young man) 'Everything will be alright. You will see what will happen and you will know what to do'. He then got into the canoe with (the other young man) and shot the rapids to his death. They (had) crossed the shores, and then they headed down the rapids (the man on shore) had not even known they would try to shoot the rapids" (Fieldnotes, #63).

Standing in the front of the canoe to direct the young motorman through the rapids high with the spring flood, the canoe apparently hit a rock head-on, and the man flipped out and drowned (Fieldnotes, #62). The young man recovered control and brought the canoe to shore. When the body was found some time later, the forehead was bruised and had bled. Some of the Waswanipi people I spoke to believe the man knew he would die, and his behavior was a fulfillment of that knowledge. The knowledge of death that men get through dreams and flying animal omens is real and powerful for the Waswanipi.

For the Waswanipi the death of 'animals' closely parallels the death of 'human beings'. Thus men know of the 'animals' they will kill through dreams, and the 'animals' are ultimately a gift from 'God'. Flying animals also serve as omens of the death of animals as they do of men. Thus a small 'owl' is said to call at night sometimes before a man kills a 'bear'. 'Canada jays' are sometimes said to travel silently in front of a hunter leading him to the 'moose', and more commonly are said to come out in numbers after the 'moose' has been killed (Interview Notes, #53).

Death is also associated closely in the Waswanipi view with birth, and the loss of life with the re-creation of life itself. This is implied in the image of old age, the role of flying animals and especially birds as omens of death, and in the content of omens.

When old people begin to loose their full mental capacities, when they forget things easily, repeat themselves frequently, and can no longer address themselves fully to adult discourse, it is said that they are becoming like 'children' again. This passage from one generation to the next is expressed in much of the knowledge associated with old age and death, the passing on of old people's powers to the young both before and after death, the reawakening in the land of the dead, and the naming of 'children' after 'older men' and 'women'.

The images of death are often mixed with the images of birth and of babies. Thus, in the account of the goose that was an omen of the death at the rapids, the bird was said to have a strange call, not like that of a goose or even like that of a baby goose, but like that of a human baby. In another dream which foretold of the death at the rapids a man said,

> "... he saw a vision of himself carrying a baby. His wife was calling to him to come back, but he did not, and he dropped the baby. It was not his baby, and he know it 'belonged to the mother of the drowned man', and he was afraid for her. This was before /the death/, and he told his wife what he had seen" (Fieldnotes, #27).

The association of birth with the future knowledge of deaths indicates again the link of birth and death and the cyclical view of time which extends to life and death. This is a theme implicit in the images of birds and winds as omens of death.

Flying animals are omens of death, but 'flying squirrels' and 'bats', both classed as 'bad animals', are omens only in contexts of shamanistic activity. Birds are the main omens of natural death. Birds are appropriate messengers from 'God' because they are animals that are not entirely bound to the earth and all that is 'down here', they also come closest of the earthly things to the things that are 'up there'. But while that explains why they are appropriate messengers, that does not fully convey the significance of birds as messengers of death. The seasonal departure and arrival of the summer birds is also significant. Shortly after the new hunting season begins, in late summer, the summer birds depart for the south. The departure of the birds is, I think, like the departure of the 'dead person' to another world. This link was not ever explicitly stated to me, but in a closely related saying about the death of young babies, this death is said to be like the "loss of a little flower" which dies and is reborn each year (Interview Notes, #59). Flowers also figure in dreams of dead people (Interview Notes, #114). Flowers and summer birds are associated with death because they die and are reborn or return to the Waswanipi region each year. The birds return again only after the hardest part of the year and near the end of the main hunting season. The 'snow bunting' is one of the first to return so its arrival indicates that summer is coming and "all the animals will be alive again." The summer birds return to mate and raise their young before again departing for the south. The departure and arrival of the summer birds is not only symbolic of death and departure, but of return and rebirth. The annual cycle of bird migration and reproduction is a model of death and birth that links death and birth to the cyclical model of time.

All these relationships re-emphasize the cyclical model of time, with life and the 'dead people' in alternative periods and death and birth the transitions between them. The critical point here is that in the Waswanipi view these are linked in a cyclical chain, so that summer leads to winter which leads to summer, dusk leads to dawn and to dusk, north-west to south-east to north-west, death to rebirth to death, and 'hunting' to reproduction to 'hunting'.

The association of hunting and reproduction with the model of death and rebirth is critical, both because 'hunting' and reproduction provide a clear model of the Waswanipi view of the cyclical relationship between life and death, and because it suggests that for the Waswanipi the model of the 'hunting' of animals is used as a means of thinking about the cycles of the life and death of both 'animals' and of 'human beings'. I must therefore return to the model of 'hunting'.

iii) Hunting as a Cycle: Receiving, and Giving in Order to Receive

I have previously argued that saying the 'animals' people kill are a gift from 'God' and čuetenšu places the activity of 'hunting' in a spatial and temporal context that is wider than the earthly frame, and simultaneously links 'hunting' to the main symbols that are used to explain the Waswanipi world, and that are manifested in the daily features of that world. Now I can add that 'hunting' is also linked to the cycles of life and death of the individual beings that hunt and are hunted.

The links between life and death and 'hunting' activities are, at one level, beyond the need for comment, hunters take the lives of the 'animals' they kill. But, at another level, the Waswanipi conception of the act of 'hunting' places it in a context of death and rebirth, growth and harvest, that requires elaboration.[15]

These elements of the Waswanipi view of 'hunting' were first suggested to me by responses to questioning about the reasons why animal harvests may decline. As reported above, harvests decline when čuetenšu and 'God' do not want to give 'animals' anymore, or when the 'animals' do not want to be caught. I asked whether there were fewer 'animals' when harvests declined and responses to this question were essentially unpredictable, some individuals responded yes, others no. "No" was the more puzzling response, and some individuals insisted that there are not fewer 'animals' when fewer are caught, it is just that they do not want to be caught. The significance of this claim lies in the concept of the cyclical and reciprocal death and birth of 'animals', and the relative permanence of their souls.

Earlier I indicated that the root of the name čuetenšu, čue- or čioue- means 'return' or 'bring back'. This root appears in several of the key words that describe the process of hunting and the most commonly reported ritualized practices surrounding the distribution and use of animal foods.

If the hunter goes out to "see" or "fetch" animals and he is successful he will _čiouetaakaneo_, 'bring back the whole animal' if it is small, or _čiouetatakaneo_ 'bring meat back' if it is 'bear', 'moose' or 'caribou', or _čiouetaakoneoats_ 'bring back two or three animals'. Hunters go to "see" and/or "get" animals and then they "bring back" the animal gifts they receive. But this is just the first reciprocal step in the process of bringing and giving back animals and food.

Meat of the animals brought back is distributed to others in the camp or settlement, and this is called _matinaoaneo_. A companion term is _čioemiskam_, which describes "what happens to Indians who know how to give to those they are with". Those who give meat to other people are said to find more animal food in return for what they give to others. "When we have food, and we are living with others, we give them half our food, and it seems we find more to replace it" (Interview Notes, #114).

The same model of giving away what has been brought back in order that more may be harvested is found in several of the ritual performances that accompany the post-harvest distribution and consumption of animal foods. The most common of these is the burning of small portions of the meat or fat of an 'animal' in the fire, before each meal at which the meat of the 'animal' is consumed by 'human beings'. All of thirty men asked if they put a piece of the meat or fat of the 'animals' they kill in the fire before they eat the meat or fat of the 'animal' said they did so. Most informants perform this offering only for the category of "meat mammals", 'bear', 'moose', 'beaver', plus the 'lynx', but one informant reports doing it for all 'large mammals' (see some of reported results on Table 5-9). Most men say they put the meat in the fire for _čuetenšu_. The meat in the fire is burned and the smoke goes up the chimney into the winds. Some Waswanipi people call the meat that is put in the fire an "offering" in English. The small portion of the meat is thus "given back" to _čuetenšu_ as a _mačtemeanu_, 'offering'.

But the focus of the offering is not only return for past gifts of 'animals', although it includes this aspect, it is an offering for _future_ gifts of

Table 5-9 Kinds of Animals which the Waswanipi Put Pieces of in the Fire as an Offering Before Consuming the Animal

Kind of Animal English Gloss	Individual No. #52	#79	#81	#74
Bear			+	+
Moose	+	+	+	+
Beaver	+	+	+	+
Lynx		+	+	+
Rabbit		x	x	
Otter		x		x
Marten		x	x	
Mink		x	x	
Weasel	+			
Sturgeon			x	

Key:

+ = put in fire

x = not put in fire

'animals'. When Waswanipi people are asked why they put a piece of meat or fat in the fire the most common answer is that it helps to kill more 'animals' in the future; "so we can catch more" (Interview Notes, #71), "so we can get more in the future" (Interview Notes, #64) or it "tells čuetenšu they want better hunting" (Interview Notes, #52) or in an implicit form "something will happen", implying there will be a good hunt in the future (Interview Notes, #55). Other respondents simply say that it was done in the past so they do it now (Interview Notes, #68, 45). Sometimes it is also said that the 'animals' would be mad if it were not done (Interview Notes, #71). The latter may imply a past reference to the 'animal' just killed, but the most common answers clearly refer to future harvests. In the Waswanipi view then the 'animals' are given to the hunters by čuetenšu, a piece of the edible portion of the 'animal' is given back to čuetenšu to "tell" čuetenšu to give them back more 'animal' in the future.

The 'souls' of the 'animals' survive and the bodies, or portions thereof, are given as gifts and offerings back and forth between the beings that have power in 'hunting', between those who give 'animals' and men who receive the gifts and give away meat and offerings.

The same cyclical conceptual structure is reflected in other common practices surrounding the use and disposal of the 'animals'. Most informants, 24 of 27, report that they burn the fur and have a feast with the first 'beaver' killed at the beginning of a hunting season, 'year', in late summer or early winter. Most men, 21 of 24, say they do this every year, but some say they do it only every few years. The first 'beaver' caught is first put in a fire so that the fur is singed off of it, then it is boiled and it is eaten, skin and meat and fat, in a feast that involves all the people living together at the camp or settlement. People say they burn the 'beaver' for čuetenšu so that he will help the Indians to trap, to "tell him they want better hunting" (Interview Notes, #52, 27, 7). The 'beaver' burning is usually performed by one of the čenu in the camp. This performance combines the two elements previously mentioned, the offering to čuetenšu in the fire, and the giving away of meat to other human beings, in this case at a feast, both of which are linked to continued future successful 'hunting' of 'animals'. During the course of the winter some men will burn a 'beaver' and hold a feast if they are not having a good hunt. The <u>čenu</u> hold the ceremony for 'younger men'. It is done only infrequently in mid-winter, and some men report they will not do so. Those who do say that after they burn the 'beaver' and hold a feast they "can start killing beaver again" (Interview Notes, #52) or have 'luck' again (Interview Notes, #17). I have seen a similar 'beaver' burning and feast performed after the death of an 'old man', so that the hunting would be better and the deceased man would pass on his power to others.

Other first kills of the year may also be feasted. The head of the first moose killed may be boiled, a part is thrown in the fire, and the head eaten at the feast. Each bear that is killed is also feasted. All feasts are said to have the general structure of giving away to others in order to get in return in the future.

The other common practice concerning the use and disposal of the 'animals' killed is the disposal of the various inedible portions of the 'animals', particularly bones. The bones of 'moose', 'beaver', 'bear', some individual large fish specimens, and some 'hare' and 'partridges' are said to be disposed of carefully. Some additional species may also be so treated, but 'marten', 'otter', 'mink', 'weasel', small 'fish' specimens are said not to be carefully preserved. The head and arm bones of 'beaver' are thrown in the water, all the bones of 'bears' are put on platforms in the bush and the head, neck bones, ribs and leg bones of 'moose' are similarly stored on platforms. Skulls of 'beaver', 'bear' and sometimes of large fish and 'hare' are placed on tree poles stripped of branches. It is said that this is done to keep the dogs from eating these bones and that if they did eat them hunting would be hard in the future. Bones are the part of the bodies of animals which last longest after their death and dogs are scavengers of human wastes. What these practices appear to mean, in part, is that the death of 'animals' properly killed and respectfully treated is followed by rebirth and that the proper 'hunting' and respect of 'animals' is followed by renewed successful 'hunting'.

The poles on which the skulls of the animals are hung, and the water to which bones are returned, are typically immediately in front of the winter camps, which face south-east, and would be readily seen from that direction by oabenšu, the dead, and by those that are to be born.

These elements of 'animal' death and rebirth are exemplified in an otherwise enigmatic explanation the Waswanipi give of the cycles of 'hares', the most variable of all sub-arctic animal populations.

> "Some years there is no rabbit. This is when the wind does not blow in the good direction. If the wind blows from the good direction [pointing east] the rabbit flies and jumps into the area where the Indians are. The wind has not blown in the good direction since two or three years" (Fieldnotes, #114).

This quote brings together the rebirth of an animal population with the effects of the winds, the direction of rebirth in the east, and the flying animal as a link between the 'up there' and the 'down here'.

That 'hunting' is conceived as an ongoing cyclical process is also revealed in the terminology for the break-down of the process. The term pAioakaneo is used to describe conditions when people cannot 'hunt' the 'animals' they need. When 'beaver' cannot be caught, when they do not want to be caught in a trap, or when a 'moose' does not want to be caught, for example when old tracks are found but the 'moose' cannot be located nearby, this is pAioakaneo (Interview Notes, #114). The root pAio- was explained as:

> "if you went to Val d'Or [a city 140 miles from Matagami] and could not come back, got stuck without money. Like if someone went under something and got caught there, like under a house or a fence" (Interview Notes, #114).

The root then is said by a Waswanipi to mean blocked, stuck, possibly unable to continue or return. It will be remembered that to go to town is to 'stop hunting' or to 'finish hunting' and to go back to the bush is čioaneo to go back to 'hunting'; when you do not get animals something is keeping you from continuing to hunt. To not get animals then is to find the cycle of hunting stuck, to cease movement or process momentarily. The assumption is of a continuing cyclical process during which failure to harvest is a temporary blockage. This is revealed explicitly in Waswanipi discussions of shamanism.

Many men who are mature hunters say that several times in their lifetimes they had had 'bad luck' and it was sent by another 'human being'. The questions I asked were "Does one Indian ever try to keep you (alternatively: another Indian) from getting what he wants?" and if the alternative was used and answered affirmatively, "Did it ever happen to you?" Six out of eight people asked answered affirmatively to the questions (Interview Notes, #58, 28, 37, 34, 69 and 57), two negatively for themselves but said it happened to others (Interview Notes, #74, 52). Other men have confirmed the experience in other interview contexts (Interview Notes, #64, 67, 62, 81, 47).

Asked "What do you do when this happens?" most replies stressed that the hunter kept trying to catch what he wanted and the 'bad luck' would go away. "Does not do anything, just gets after what he wants. (He) just stops him [other man] what he wants to do" (Interview Notes, #37). "Just lets it go, still tries to get it" (Interview Notes, #57). Another said it makes his 'hunting' harder but "he works harder and it passes, he kills beaver still so the [other] man quits" (Interview Notes, #34). Men say it is hard for them to get what they want for two weeks to a month (Interview Notes, #28, 57), then the 'bad luck' goes away. In short, when one Indian gives another 'bad luck' the cycle of harvesting is partially blocked for a brief period, but then the blockage passes and the cycle continues. In the words of one individual:

> "A trapper also knows when things are not going good for him. Like another power... but he keeps trying until it passes over, this streak of bad luck...
> "When he goes somewhere something wants to stop him but he keeps doing it, like hunting moose. It is sent by other human beings.
> "If you have this power you use it for good, because sometimes [at sometime?] the good will overcome the bad, that is why he keeps trying.
> "It stops when you reach a meeting point and you cannot move, then you go your own way again.
> "He knows how its been used. You think about someone you do not like, that something is going to happen to him and finally it does."

> "He was on the definsive, he knew someone was after him. He did not do anything /aggressive/. He just tried to stop him..." (Interview Notes, #69).

'Bad luck' then is blockage that passes when men stop the other men who want to give them 'bad luck' and they do this continuing to try to get what they want.

'Bad luck', whether originating with other Indians or with 'God'/<u>čuetenšu</u>, is a recurring break in the recurring cycles of 'good luck' and harvests, that at one level reaffirms the underlying long-term continuation of harvests. 'Hunting' is fundamentally secure in the long run if, however, subject to short-term disruption. This, it seems to me is the fundamental model underlying Waswanipi hunting knowledge.[16] And this model links both the process of receiving 'animal' gifts and the life history of individual hunters to the cyclic temporal course of their world.

iv) The Cycle of Hunting and of Growth, A Model for Living

For the Waswanipi the cyclical model is not only a model <u>of</u> the life and death of men and 'animals' and <u>of</u> the relationships of hunter, hunted and powerful beings, it is also a model <u>for</u> hunting and for living. The Waswanipi are not only concerned to understand their world but to live and act in it, and in action, as I have already indicated, the goal is to integrate both one's own thought and action and that of the world. The implications of this are that human life itself should reflect a cyclical course of recurring phases in which the goal is the long-term participation in power of the world.

Waswanipi models for action are made explicit in several contexts and I will begin by referring back to the series of proverb-like statements discussed previously about 'God's' way and how human beings should follow it in their own action. Starting with a brief analysis of these propositions I will bring together in this last section of this chapter the basic standards for 'hunting' activity, and also, I infer, for living in general. This forms the final link I will explore between 'hunting' and living a human life as a Waswanipi hunter.

Hunting has been called a holy occupation for the Montagnais-Naskapi-Cree (Speck, 1977 [1935]), and this is so it seems to me, first because the kills a hunter makes are, in the Waswanipi view, not solely the acts of a man, but also the acts of 'God' and his helpers; and, secondly because harvesting activity is conducted according to a moral code given by 'God' to men. One example is that animals are not to be wasted. Others have been cited previously. 'Animals' shorten their own lives so that men may extend theirs. 'Animals' sacrifice themselves for men, and men must respect the 'animals' and 'God'/ _čuetenšu_ by using the gifts fully, and preparing bones and other remains properly. Men should respect the remains of the animals they kill, men should offer part of the remains to _čuetenšu_, and men should share what they have killed with other men.

The moral order is rooted in the very structure and order of the world, an order that is benevolent, supportive and even protective of men, but that is ultimately not of men's own creation.

The most powerful of these moral rules is the one that is linked to the life and death of the hunter himself. It will be recalled that a hunter does not expect to have good 'luck' every year, that 'luck' alternates with 'no luck', and that a hunter who has 'luck' every year will not live long. I will discuss in detail the signs of 'no luck' and the appropriate responses in Chapter 6. Here, I will just briefly note that when signs of 'no luck' are encountered they apply normally to particular kinds of 'animals' in a specifiable geographical area, and that the appropriate response to such 'signs' according to the Waswanipi, is to leave those 'animals', or that whole area, unhunted for a time, usually one or two years. The point to be made here is that the proposition that a hunter cannot have 'luck' every year, and that 'luck' is cyclical, is linked to a model of 'hunting' activity, and to a proposition that the hunter himself should leave certain 'animals' or certain areas unhunted for a season or a few years whenever he has 'no luck'. Thus having 'no luck' is not just a model of a situation, it is a prescription for responding to that situation. And, the implication of that model for 'hunting' is that 'hunting' activity will itself be cyclical in the short-term, from the point of view of the 'animals' hunted or the hunter. Thus the course of 'hunting' over time will be one of alternating activities, 'hunting' one area one year another the next, 'hunting' one 'animal' intensively one year and another the next, and possibly not 'hunting' one year or another.

These alternations, however, will take place in the context of the benevolent and supportive nature of 'God's' world, in the long run. Indeed, the cyclical alternation of 'hunting' activity is itself a vital part of that long-term continuity, the periodic change in part of a longer-term process. That short-term periodic change is part of a longer-term cycle can be indicated by returning to the meanings of the term 'hunting' for the Waswanipi and examining the criteria according to which personal respect is accorded to hunters.

When a hunter has 'no luck' and he decides not to hunt a given kind of 'animal', or he decides not to hunt a given geographical area, for a year or more, he says that he is letting the 'animals' "grow". This is linked to the fact that many of the signs of having 'no luck' are of decreasing numbers of 'animals' or of increasing "shyness" of 'animals'. One reason why this happens is because the hunter has killed "too much", more than the 'animals' and the 'spirit beings' wanted to be killed. If "too many" animals are killed, then, a hunter will have 'no luck' and will reduce or stop his 'hunting' in order to let the 'animals' "grow". After a year or several years the 'animals' will have "grown", in numbers, age and calmness, and they may be 'hunted' again. 'Hunting' therefore leads to a stop in 'hunting' which in turn leads to 'hunting' again. This cyclical alternation of 'hunting' again is based on a model of alternating periods that form part of a longer integrated cycle.

This alternation of periods of 'hunting' and breaks in hunting within a longer-term cycle is implied in the very meanings of the term 'hunting'. It will be recalled that the root nitao- was found both in the general term nitaonano, 'hunting' and in the term nitaoičičikan 'things that grow'. Now, when a man changes, ceases, or limits his 'hunting' for a year or two, he does so in order that the 'animals' may "grow". One of the meanings of 'hunting' for the Waswanipi, I would suggest, is the alternation of periods in which gifts are received with periods in which a man does not get gifts but in which the animals can "grow".

This contrast between short-term periodically variable 'hunting' activities, and the longer-term cycle of 'hunting', is reflected in the criteria the Waswanipi use to rank hunters.

In everyday conversation people speak extensively about the qualities or reputations of men as hunters and some men are known as better than typical hunters. What concerns me here are the criteria that distinguish these especially good hunters from other hunters. There was basically one type of explanatory statement that was given to me of why a particular hunter is considered a good hunter. Evidence a hunter is good is primarily that he has, over the long term, good harvests of some animals, relatively more consistently than other hunters. There are two variations of these statements, a man may have consistently good harvests not only of one important animal, but of several important food animals, and/or he may have consistently good harvests of particular kinds of animals that are considered hard to kill.

One comment about good hunters is that they are good at 'hunting' certain 'animals' that are highly valued. The 'animals' most often cited in this context are the 'bear', 'lynx', 'sturgeon'. The feature that appears to be distinctive of these three animals is that they normally do not die in a trap or net, they are all "hard to kill" (Interview Notes, #114). The 'lynx' and 'bear' usually do not die when caught in a trap, the hunter must kill them when he checks the set and 'sturgeon' do not usually die in the net. These animals are therefore highly valued precisely because they are long lived, and therefore powerful.

When speaking of good hunters men also commonly say that a particular individual kills a certain number of 'moose', 'bear' or 'beaver' every year, or they may say of an 'older man' that he killed many 'moose', 'beaver' or 'bear' during his lifetime. Thus the individual who was spoken of most highly was said to catch seven or eight 'moose' every year, and an 'old man' was said to have killed over 100 'bears' in his lifetime, and so many 'beaver' that they were like his "pets", an analogy with 'God' of whom it is said that the animals are like his pets. The emphasis in these cases is not on any single large catch. People commented as well on very large catches, but these were not spoken of as indications that the hunter was superlative, unless they were part of a longer-term success.

Good hunters have demonstrated their exceptional 'hunting' by alternating periods of 'luck' and 'no luck' in such a way that the 'animals' "grow" well during periods of 'no luck' and the hunter has relatively longer and more continuously productive periods of 'luck'. Good hunters say they have 'luck' because they think of 'God'/čuetenšu and animals, and they guide their lives accordingly. According to one highly respected hunter, quoted earlier, he thinks "of game and of God too at the same time" (Interview Notes, #52), according to the most respected hunter he "thinks animals all the time" (Interview Notes, #34).

Good hunters are consistently attuned to the cycle of 'hunting', they are men who do not take chances (Interview Notes, #56), who do not "fool around" with animals (Interview Notes, #52), who do not "spoil themselves" and seek self-aggrandizement (Interview Notes, #52, 56). They are men sensitively in balance with the world in which they hunt, with the powers behind the recurring death and rebirth of 'animals'.

The good hunter is personally powerful because his thought and his action are linked to the courses and causes of events in his world. The good hunter personifies nitao-. His 'hunting' is reciprocally balanced with the "growth" of the 'animals', and in balance with the essential personal powers that are the Waswanipi world. Through 'hunting' men are linked to the totality of their world.

The model of the good hunter serves I think as a model of the good life. The things a good hunter does to fulfill good hunting are, I infer, for the Waswanipi, the things a man should do to fulfill a good life. The ultimate aim in 'hunting', as implied by the characteristics of a good hunter, are to maintain a long-term, life-long sensitivity and balance with the world around him. A good hunter has neither self-aggrandizement, nor short-term interests as primary goals. His aim is the continued participation in thought and action with those powers and beings that extend beyond the immediate frame of his life in the perpetuation of an ordered, meaningful and bountiful world. We might say his game is to participate in the perpetuation of the game, and in this way to participate as a hunter in the cycle of life. In this process men are active participants, responsible for their acts, responsible for the consequences of their acts, but ultimately only participating in the total responsibility for all that is.

'Hunting' then is not just a central activity of the Waswanipi nor a central portion of their cultural knowledge. The Waswanipi understanding of 'hunting' is a central part of their knowledge of their own being and place in the world. The cycle of 'hunting' is a model of the cyclical passage of time in which human lives are lived and made meaningful.

Footnotes for Chapter 5

1. Adrian Tanner has recently analyzed the two most common terms the Mistassini people use to refer to hunting, natwa:whow and ma:ci:w, which he indicates do not distinguish hunting from trapping activities. The former, close to the Waswanipi term, he translates as 'he sets out to... (understood) do something', the latter which is less common he says also means 'he goes away', implying some purpose which context indicates when hunting is inferred. Tanner indicates that the central explicit notion of hunting is a journey, beginning from the camp and going to where game is obtained. He distinguishes these terms from na:hci:wanhi:ce:w 'he checks his traps', which has the preverb na:hci: 'to go and fetch from', which can also be used for checking hare snares, fish nets or gathering firewood (1976:110-111). While these terms appear to vary somewhat from the Waswanipi usage I have recorded, the same basic group of meanings appears to occur in both sets of terms. I however treat this as a single set.

2. Tanner has said that the fundamental mystery of hunting for the Cree resides in the fact that men and animals should meet, and that men should kill the animals in that encounter (in Tony Ianzelo and Boyce Richardson, 1974).

3. Because the reader may not be familiar with this aspect of moose comportment it may be appropriate to summarize Western scientific observations of this pattern. When disturbance is detected by moose, usually by smell or hearing, moose habitually orient themselves towards the source of the disturbance to investigate it by sight (Denniston, 1956:114; and Geist, 1963:405), and they take flight after scenting the disturbance. If they are lying down they first stand up. It takes moose an average of four to five seconds to stand up, and individuals may take as long as eight or nine seconds (Geist, 1963:385). Because ungulates in general keep their heads and/or sides into the wind, which minimizes penetration of the wind under their hair (Nasimovitch, n.d.:215), this means that if a hunter approaching from downwind is the source of the disturbance, the moose will rise, then turn towards the hunter, before turning again to flee. Among the ungulates this delay in taking flight is unique to the moose (Denniston, 1956:114). Once the moose do take flight they do not run for long distances, they stop and stand at alert and look back periodically (Geist, 1963:406).

4. Because it is commonly thought by Westerners that bears hibernate in winter, it may be worth noting that on the scientific evidence bears enter a state of dormancy in winter in which the metabolic rate is decreased and breathing is slow, but the heart rate and body temperature rise during the daylight hours of most days, in contrast to true hibernators (Rausch, 1961:15; Peterson, 1966:221; and, Folk, 1967:84). Bears remain conscious, at least part of the time, while in this dormant condition, and apparently may rouse themselves during mild periods and even leave the den to feed if foods are readily available (Matson: 1954:32). It

has been noted that bears may be roused by human activity during this period, and it is said that they show neither fear nor animosity if approached judiciously (Matson, 1954:32).

5. It would be interesting to fully explore the implications of such a conception of predication for any attempt to fully and systematically test ethnoscientific categories for inclusion and exclusion. It might not be possible to completely separate class inclusion from metaphoric relationship, at least certain types of metaphoric relationships. This might also add another dimension to the conclusion that strict taxonomic structure do not appear to be common in Waswanipi thought. In short, it may be significant for ethnosemantics to examine the ethnoscience of predication. For a discussion of denotation and metaphor in a somewhat different context, see Michelle Rosaldo (1972).

6. For an interesting parallel use of the evidence of beaver behavior, extensive discussions of beaver intelligence, and an argument that such intelligence has significant parallels to that of human beings see Lewis Henry Morgan (1868) The American Beaver and his Works. Alexander H. Leighton has also made studies of beaver behavior and intelligence, and has reported on the mental characteristics and individuality of these animals (1932, 1933, 1935). One of Morgan's main conclusions may be cited at length because it is at some remove from the usual anthropological discussions of his work:

> "Finally, is it to be the prerogative of man to uproot and destroy not only the masses of the animal kingdom numerically, but also the great body of the species? If the human family maintains its present hostile attitude toward the mutes, and increases in numbers and in civilization at the present ratio, for several centuries to come, it is plain to be seen that many species of animals must be extirpated from the earth. An arrest of the progress of the human race can alone prevent the dismemberement and destruction of a large portion of the animal kingdom. Domestication or extermination is the alternative already offered not alone to species, but to families and orders of animals. It may be that this result was never intended in the councils of Providence. It is not unlikely that God has adjusted a balance among the several orders of animals which cannot be overthrown except at the peril of the agressor; and that in some mysterious way this balance is destined to be preserved. The present attitude of man toward the mutes is not such, in all respects, as befits his superior wisdom. We deny them all rights and ravage their ranks with wanton and unmerciful cruelty. The annual sacrifice of animal life to maintain human life is frightful, if considered only with reference to its excess beyond our reasonable

wants. When the Creator made man omnivorous, He designed his use of animal food. It is not sentimentalism but rather sense to say that he should exercise the right with reason and forbearance. When we claim that the bear was made for man's food, we forget that man was just as much made to be food for the bear; and that our right to eat the bear rests upon no higher sanction, than his coequal right to feast upon our flesh if he overcomes in battle. Man's dominion over the mutes is in virtue of his superior endowments; but it is equally clear that the great Author of existence designed the happiness of the smallest and least endowed of all His creatures as completely and as absolutely as He did the happiness of man. If we recognize the fact that the mutes possess a thinking, and reasoning, and perhaps an immortal principle, our relations to them will appear to us in a different, and in a better light" (Morgan, 1868:282-4).

7. Hallowell has formulated personal causality as a fundamental part of the world view/belief system of the Ojibwa, an Algonkian speaking people to the west (1960a).

8. There appear to be several levels at which the Waswanipi use the concept of winds. At one level the Waswanipi usage grossly approximates a classification of the typical types of storm systems, lows and highs, that occur in Eastern Canada. These types defined by Hare and Thomas (1974) and reported later in this study appear to roughly correspond to Waswanipi conceptions of the short-term actions of the winds with respect to typical weather patterns. Thus arctic lows appear to be associated with the 'north wind', Alberta lows with the 'east wind', central U.S. lows with the 'south wind', Atlantic coastal lows with the 'east wind' and arctic highs with the 'north wind'. The general features of the Waswanipi wind types, their reported frequency of occurrence, their typical directions of movement, and the precipitation and cloud cover associated with their presence and passage generally correspond with the storm types outlined. A detailed quantitative analysis would be necessary however, to determine the degree of correspondence on these particular variables between the Waswanipi classification of wind types and the classification of storm types used by Hare and Thomas. A detailed analysis cannot be undertaken here, for lack of adequate quantitative data on both classifications. Such a correspondence of certain variables described for the two different wind classifications would not, of course, reduce the Waswanipi classification to the scientific classification, nor to any non-symbolic level of reality.

9. Examples of parallel set of views of the relationships between men,

animals and weather can be found in the literature written by non-Native trappers in the north. Examples, partially relevant to the Northern Quebec setting, are the books by "Grey Owl", the name used by Archibald Stansfeld Belaney, an Englishman, who passed himself off as an Indian in the 1930's and gained a reputation in Canada and England for his conservation crusade. However fictitious his assumed identity, and however fictionalized his accounts, Belaney's books and articles often accurately reflect the knowledge of a trapper, knowledge he presumably gained both from Native acquaintances and from years of experience as a trapper in Northern Quebec and Ontario (cf., Belaney, Moltke, 1972, and Dickson, 1939, 1973).

10. It should be noted that in the Waswanipi dialect there is no grammatically imperative linguistic identification by sex, so that *čitče manitu* is spoken of unsexed. In English however, Waswanipi individuals use "he" most commonly, but "she" may occasionally be used. Nevertheless, *čitče manitu* is also called by various circumlocutions, one of the most common being *čimšuminao*, 'our grandfather'.

11. Black has shown that such a ranking structure better fits the Ojibwa domain 'living beings' than does a taxonomy (1967).

12. There is a distinct term for prayer *aiemieo*. The stem is from the word for "speech", the model here being the spoken prayer, praying in church. Thus *aiemieotšimao* is the 'prayer boss' or 'minister' and *aiemieokamek* is the 'prayer house' or 'church'. The Waswanipi however speak of an idendity of prayer and thought not prayer and speech. The terms for prayer, minister and church presumably were introduced to the Waswanipi by the early missionaries.

13. Black has concluded her analysis of an Ojibwa domain of 'living beings' with a similar gloss (1967), but the definition of "power" she has found appropriate for the Ojibwa is linked to control, the ideal being not to be controlled (1977). While such a definition would make sense of power when it is described by the Waswanipi in the context of conflicts among men, which I hope to describe elsewhere, this is a more limited and derivative sense for the Waswanipi. For an alternate discussion of power in an *Indian* belief system see Robin Ridington and Tonia Ridington, 1975 [1970].

14. For an analysis of Mistassini terminology and spatial orientation see Tanner (1976).

15. The lives and deaths of 'human beings' and 'animals' are explicitly linked in a number of propositions and reports of events that I intend to analyze more fully in a discussion of shamanism, but that I will just note here. The link between the death of a *čenu* and the successful hunting of 'animals' has already been mentioned. In the instance of the man killed

at the rapids it was said that because he drowned "some Indians have trouble to get something from the water before it happen/ed/" (Interview Notes, #13). Conditions that winter were such that it "should have been easy to get beaver" but some men did not (Interview Notes, #13). Not only does the death of men affect the death of 'animals' but the death of 'animals' is associated with the death of men. It is said that if a 'mouse' dies on the path of a man in winter the man will die. And, when shamans visit in the form of 'bats', 'owls', or 'flying squirrels', the death of the animal form foretells the death of the shaman.

16. Tanner analyzes the Mistassini image of hunting as a journey, an interpretation that would also probably make sense of the Waswanipi data, precisely because of the terminology reported for 'bringing back' animals (1976).

CHAPTER 6 - HUNTING RECIPES - DECISIONS AND STRATEGIES FOR HUNTING

The Waswanipi use their beliefs to meaningfully act in their world, and they have available a set of cultural models for appropriate courses of action. The basic models for action that are part of Waswanipi culture incorporate the categories, propositions and values outlined in the previous two chapters. In this chapter I describe the basic Waswanipi models for hunting the highly valued animals of their world.

I have started by asking Waswanipi individuals to tell me how to hunt a particular animal and their answers revealed a set of clear recipes and plans for action. The focus of this eliciting was to establish the basic structure of the plans, or decision models, the Waswanipi themselves explicitly refer to for hunting. The models both describe how a hunter should proceed to hunt in the world and they also explain how people have acted and the results they experience.

For the Waswanipi, there are explicitly a series of alternative actions possible at many of the stages in the course of action and choices have to be made consecutively and systematically during hunting activities. In order to describe the specific plans and decisions I specify the culturally recognized alternatives for harvesting various animals and the principles for choosing among them (cf., Keesing, 1970:994), in terms of the unique sets of purposes, procedures, instruments, time and space requirements, personnel requirements, and occasions for performance (Goodenough, 1963:331).

It needs to be stressed that for the Waswanipi these plans and decisions, however specific the models, are not mechanical programs for action. As I will show, there are extensive culturally encoded plans for hunting, but these by themselves are not sufficient to actually hunt. The Waswanipi explicitly indicate that there are many areas of decision not covered by the plans, action presupposes skills as well as recipes, and also each situation in which a hunter must actually choose and act is unique. Although the recipes include general statements on the situational appropriateness of certain choices, it is impossible to simply link recipe and actual hunting activity, the former is a generalized decision model, the latter a situationally located decision.

A - Beaver Hunting

i) Kinds of Ways to Capture and Kill Beaver

The Waswanipi 'kill' nipAkaneo (nipeo, 'dead') the animals that are destined to become food, fur, medicine, and parts of their technology.[1] The ways of hunting and of killing beaver were determined in two ways. First, a list of names of the distinctive activities recognized as part of beaver hunting was elicited in the course of work with a linguistic informant. Then, a series of questions were asked in open-ended interviews, in which the individual was asked initially "How do you hunt (kill) beaver?" A long exchange of answers and new questions might follow this lead, or just a few brief comments. The analyses in this chapter are based primarily on these data.[2] The analyses are presented here discursively, and they are then given formal graphic representation where appropriate.

Three methods of killing beaver were mentioned in linguistic interviews 'catching it by the tail and hitting it', makonakaneo, 'shooting it', pastisAkaneo, and "drowning it", for which I failed to record a term. The first of these normally involves picking up the beaver by the tail, with the belly of the beaver facing away from the person, and striking the beaver at the base of the skull with a pole or the back of an axe. Shooting involves using a .22 calibre rifle, and aim is taken for the ear of the animal to try to avoid an extra hole in the pelt. Drowning involves immobilizing the beaver underwater by some mechanical means, trap or snare, so that it cannot reach the air and breathe.

Discussions with individuals revealed a fourth possibility which I will call dying by exhaustion and /or shock. This latter category occurs when a beaver immobilized mechanically on land dies slowly in the trap or snare. It was acknowledged as a method of killing beaver used by some men, but also occurred as one outcome of a failed attempt at drowning. People said that traps on land should be set near the water in such a way that the beaver returns to the water when captured and is drowned. The set will be described below. Here it is important to note that death by exhaustion is not an accepted method of killing beaver.

This valuational aspect of the discussion of methods of killing was repeated frequently. There was a negative valuation placed in general on any performance of an accepted method that did not kill the animal effectively and rapidly. To attempt to kill a beaver by any of these methods and injure it, but not kill it,was negatively valued. For each method of killing beaver there is a specific performance failure that is commonly cited in discussion. If a beaver is shot in the body as opposed to the head it is said it will not be caught. If a beaver is missed by a trap or snare and loses an arm, leg or fur, it is said it will "know the trap" and generally will not want to be caught. If a human being tries to grab a beaver, but does not hold it correctly, it may bite him and then it usually gets away. The human being feels pain in his hand or leg, but only at night, when the beavers are active.

In the positively valued accounts of the means of killing beaver, the animals are killed relatively quickly and without suffering. In all good performances the beaver is given to the hunter, and both fulfill their plans; in imperfect performances human beings, beaver or both may suffer. In all the cases of improper efforts to kill the beaver it is human beings who ultimately suffer. The acceptable means of killing beaver are clearly delimited, as are acceptable standards for performance. This was brought out in a hypothetical discussion of the possible use of poison to kill animals. Poison is known as a means by which White trappers have killed animals in the past. While the use of poison is illegal now, the Waswanipi do not use it also because it is morally offensive to them, it kills animals indiscriminately whereas they try to only kill animals that are given to them. Poison also may make animals inedible.

Killing beaver requires that human beings and beaver, or the tools of human beings and the beaver, meet; and there are a specifiable number of ways by which beaver and human beings can meet so that human beings can be given beaver.

The first thing is that men must look for beaver, and usually that means looking for beaver houses, or beaver habitation sites. The problem of finding beaver is relatively simple, see below. However, once a habitation site is found there are two problems inherent in human beings and beaver meeting. The first is that beaver are active mainly at night while human beings are active during the day. The second is that throughout winter beaver live entirely within habitations and under the ice cover.

Responses to the question "How do you catch beaver?" revealed three strategies for establishing human being-beaver encounters. One is to look for beaver during the brief daily period of mutual activity, early in the day at dawn and late in day at dusk. These are the times that beaver are looked for along the streams and ponds. At these times a beaver is seen usually when he pekapeo, sticks his head out of the water, or when he is swimming. The second method of encountering beaver is to set a device to capture beaver during the night when they are naturally active and men are not present. Traps are commonly used, oianikan, snares only occasionally, nakoakan. In these cases men return to look at, check, the traps and to surmise the nature of the meeting from the evidence available at the trap set. Finally men may meet beavers by arousing them during the daylight hours. This may involve breaking the beaver lodge, pikoikateo wist, breaking the beaver burrow, monAkaneo, and letting water out of the dam tatakaikaneo. The awakened beaver are usually caught by hand, sometimes in a net first, eskaneo (which may be a cognate of eskan, 'ice chisel', which is used to make the hole in the ice through which the net is set). These three methods of capturing beaver have in common that by these means men find what they are looking for, they meet the beaver that may be given to them.

The methods by which men encounter beaver and capture the beaver are paired with the methods by which they kill beaver. Beaver that are seen at dawn and dusk are killed usually by being shot, beaver that are trapped or snared at night are appropriately killed by drowning, beaver that are roused during the day are caught by hand in the lodge, the burrow, or at a hole in the ice and are appropriately killed by being hit with the blunt end of an axe; except after break-up, when roused beaver are shot. The discussions of how beaver are caught included cases that do not fit this pattern. Thus, some men shoot beaver even before break-up, after they have been aroused during the day, and some men set traps for beaver to catch them at daylight and dusk. Typically however, accounts such as these included explicit references to the fact that this was not common practice. Thus when describing breaking a lodge and then shooting the beaver, a young man speaking of the activities of other young men said "Shoot them with .22, should not use a .22 when you hunt, but most of the guys still use a .22" (Interview Notes, #68). An older man reporting that he traps when his son and other people shoot beaver, at the time of the year when they are encountered at dawn and dusk, said he "sets traps along the shore, sometimes up on beaver house where beaver goes up, (his son) shoots beaver, but (he) cannot see well enough" (Interview Notes, #95). These comments state both the accepted form and the deviation, in both cases related to age and capabilities.

Methods of capture and methods of killing are not only distributed in relation to one another, they are adjusted to seasonal conditions. The great majority of accounts of how to capture beaver refer to the season at which a particular practice is followed. The practices are altered to take account of changing environmental conditions and of the seasonal variations in beaver behavior. In general each of the three ways of capturing and killing beaver is adapted to each season, but this is not possible in one case. After freeze-up, when the ice cover is complete, it is not possible to naturally encounter beaver at dawn and dusk because activity is restricted to under the ice. Looking for beaver on streams and ponds, and shooting beaver are therefore not practiced from freeze-up to break-up. All other methods can be used in each season although they are not used with equal frequency.

In each season there is one preferred choice of methods for capturing and killing beaver, with options and choices within each method. The key problem on any given occasion is to choose the method of capturing and killing the beaver to be used. There are definite criteria for the appropriateness of this choice. The methods are distributed non-randomly with respect to each other, with respect to a number of contingent circumstances and with respect to the goals and values of the hunter. In order to discuss the choices that are culturally identified as appropriate among the alternative methods it will be necessary first to discursively describe the various methods, and how each is applied in particular seasons. This will require a brief account of the relevant parts of Waswanipi knowledge of beaver action. The following discussions will include references to appropriate Waswanipi concepts of geographical features, some of which are listed in Appendix 6-1.[3]

ii) Aspects of Waswanipi Knowledge About Beaver

There are two commonly discussed unique features of beaver, their constructions and their family groupings. Nearly all beavers build *wist*, 'lodges'. Lodges on streams, *šikapiši*, are most common, and these lodges are also accompanied by *oskotem*, dams, across the streams. On the rivers, *šipiš*, or along the shores of lakes, *sakahikan*, beavers dig *wat*, large burrows, into the banks sometimes extending and covering them out into the water somewhat like lodges on the streams. Some beavers find suitable banks for tunnelled living quarters and do not build extensions at all. On the rivers and larger lakes beaver do not build dams. Around the beaver lodges or large burrows are a number of recurring identifiable locales: the dam (if it is a stream lodge), small burrows, the food cache, and food cutting areas.

Beaver build dams in order to block the flow of streams and assure a relatively stable water level high enough throughout the winter so the pond does not freeze to the bottom. Dams are usually formed of large tree trunks, branches, sticks, rocks, and mud, at well chosen points in the stream. After a year or so, the dam will be covered with shrubs and vegetation. The dams are of varying length and height. Each dam forms a pond behind it which floods a portion of the land, and newly formed ponds can be recognized because the trees flooded by it are still alive or have just died.

The beaver lodge is located in the pond either at the shore or in the middle, and is built of branches, twigs and mud. It varies in size, and number of rooms, but is always dome-shaped, and has entrances only from underwater. There are usually two entrances. Inside there are several levels, and the lodge is kept clean - all the wood protruding into the rooms is broken off and the wood is cleaned of bark. Dug in the shore of the pond or lake or river are a number of burrows, also wat, with entrances underwater. They normally have only one entrance and vary in length up to thirty feet. The beaver often eat and rest in the burrows, and the number of burrows varies.

Cutting areas are never far from the lodges or living burrows, and there may be several. Beaver never locate in an area unless there is food for them nearby. Within the feeding areas there are usually well defined muddy trails where the beaver have dragged tree branches to the water. Such paths may cut across small points in a winding stream. Sometimes they are deepened by the beaver into canals so the wood may be floated to the pond. Beaver also build mounds around the pond with scent on them.

In summer beaver eat almost anything among the plants in and around the pond. At the end of summer they collect together a pile of food for the winter which is struck in the bottom of the pond. In winter they eat mostly willow and poplar - bark, twigs and small branches or trunks that they have stored underwater. They do not eat coniferous species.

On the bed of the pond itself several locales are distinguished by the depth of the water over them and the softness of the bed. These are the former bed of the stream before the pond was formed, and the ground immediately in front of the entrances to the house and the burrows. Here the ground is packed firm, and the portion in front of the burrows is said to be firmer in front of the larger and more regularly used burrows, typically associated with the larger beaver.

From freeze-up to break-up the water is covered with ice as are the entrances, and a layer of snow covers the lodge, and any of the food pile extending above the ice. Under these conditions the beaver pond is recognized by the dam and the lodge which appears as a mound in the pond, or along the shore.

Most beaver occupy their lodges or burrows for two or more years. Some lodges are used four or five years consecutively, but men generally do not know lodges that have been lived in ten years consecutively. Where food is abundant, beaver will move their lodges a short distance along the stream to be nearer to food. Otherwise they may move further.

Beavers live in family units that inhabit a lodge and surrounding locales. "Beavers like Indians here, keep their children" (Interview notes, #69). The family is composed of two adults, and usually their offspring. The adults are a nabemisk, 'man beaver' and nosemsk 'woman beaver'. Only they mate and have offspring. Four age classes are typically recognized: first year of life, oetč, second year, poewesk, third year, potemsk, and fourth and later years čemisk. Age classes are related to a set of size classes recognized by the Waswanipi and also can be related with size classes used in the commercial fur trade of beaver pelts, Table 6-1.

The Waswanipi size classes are related by the Waswanipi both to the number of meals or days that they can feed a family with a beaver, and to the sale price of the fur pelt. Large beaver are considered to feed people for three to four times as many meals as does a small beaver, see Table 6-2, although small beaver are said to have tender meat. Numerical variations between the estimations may be due to differences in family sizes of the hunters responding, but I failed to check this at the time. Medium sized beaver pelts are considered to have typically one half the cash value of large pelts, and small pelts are considered to be typically 1/6 to 1/15 of the value of large pelts (Table 6-3). These values are culturally established ranges based on discussions of the general cash value of pelts and do not necessarily reflect the actual prices being paid at the time of the study.

Table 6-1 Age and Sex Classification of Beaver (Amisk)

Name of Sex Class	Sex Category
Nabemisk	Male
Nosemisk	Female

Name of Age Class	Age Category	English Gloss	Waswanipi Size Class[1]	Fur Trade Size Class[1]
oetč	First year of life	Kit	Small	Small, extra small
poewesk	Second year	Yearling	Medium	Medium, large medium
potemsk	Third year	Two-year old	Large	Large
čemisk	Fourth and later years	Adult	Large	X large, XX large, XXX large

Footnote:

1. There is some ambiguity in these classifications because differences in the time of birth of the beaver, and more commonly, differences in the date of killing may affect classification. For example a beaver killed late in the spring may be beginning its third year, potemsk, but it will still be medium size. The "fit" between age class and size classes work with least ambiguity for the most common situation, spring born beaver killed in winter. For example, a beaver born in the spring and killed in the third winter will be a potemsk and will be large size. If it were killed in the second winter it would be poewesk and would be medium size.

Table 6-2 Food Quantity Ratios for Large and Small Beaver

Individual Number	Number of Meals from a Small Beaver	Number of Meals from a Large Beaver
81	1	3
43	1	4

Table 6-3 Typical Price Ratios for Large, Medium and Small Beaver Pelts

Individual Number	Time of Year	Typical Sale Price Large Beaver Pelt	Typical Sale Price Medium Beaver Pelt	Typical Sale Price Small Beaver Pelt
13	Before Christmas	$ 25	$ 12	$ 4
14	-	$ 29	-	$ 2.50
55	Before Christmas	$ 50	$ 25	-
55	After Christmas	$ 30	$ 15	$ 2

The age categories typically distinguished by the Waswanipi are directly related to the Waswanipi model of the developmental cycle of a beaver family. Beaver are said to mate in couples that stay together, like a human family. When a new family is formed it is done in summer or early fall by a couple, and they build a new lodge, or occupy an uninhabited lodge. During the first winter they mate in February and in May will have offspring varying in number from two to six. They continue to mate each successive year as long as they remain together. The first year, however, most individuals stated that the commonest number of baby beaver born is two, if the female is mating for the first time, while in successive years four is the most common number of young. The kits stay with the parents in the lodge during their first year. They will stay within the lodge throughout their second year of life as well, but do not stay close to parents as in the first year. In the spring, at the end of their second year of life the offspring usually leave the lodge to set up new families in separate lodges in separate locations. If there is enough food they may establish a new dam and lodge nearby, otherwise they may go far to look for another place. It is typical for brother and sister to mate and form a new family. Sometimes the beaver in their third year of life will stay at the lodge and pond of their parents and not go away until they are beginning their fourth year of life. This is less common. See Table 6-4.

The developmental cycle is the basis of a set of Waswanipi models of typical beaver family composition. Since a new family is founded in summer by a pair of male and female beaver the first winter they are the sole members of the family and inhabitants of the lodge. The second winter the family typically consists of two adults and two kits. The third winter the family typically consists of two adults, two yearlings, and four kits. In the fourth year and after the family typically consists of two adults, four yearlings, and four kits, assuming the three-year olds have left the lodge. A less common, but not infrequent family composition develops if some of the three-year olds stay at the lodge. In this case the family consists typically of two adults, plus two, but not typically four, three-year olds, plus four yearlings and four kits. In terms of size classes there are four to six big beaver, four medium and four small. The Waswanipi recognize that considerable variation can exist

Table 6-4   Waswanipi Ethnomodels of Composition of Beaver Colonies Over Time

Winter Since Colony Established	Individual Nos. #69	#25	#81	#71
First:	2 beaver	2 beaver	2 medium	2 beaver
Second:	2 big 2 small	2 big 2 small	2 big 2 small	2 big 4 small
Third:	2 big 2 medium 4 small	2 big 2 medium 4 small "medium may leave"	2 big 2 medium 4 small	2 big 2 medium 4 small "2 medium out"
Fourth:	2 big 4 medium 4 small "2 big out"		2 big 4 medium 5 small "2 big out"	2 big 2 medium 4 small "2 big may go"

in family composition, especially as a result of their own harvesting activities. Nevertheless, informants provide accounts of these typical types of beaver families. The models recognize four basic types of beaver families ranging in size from two to twelve in size. The types and their compositions are summarized on Table 6-5. This classification is important for hunting decision-making, as I will show below.

iii) Finding Beaver Families and Identifying their Composition

Because beaver leave the parental family after two, or at most three years, because established families stay in the same lodge for several years and then move, and because relocating beaver may establish new lodges or reoccupy abandoned lodges, a man must find each year the new lodges and which of the existing beaver lodges are occupied in order to hunt at them.

Locating beaver lodges is, in the Waswanipi view, relatively easy as long as travel conditions are good, and as long as beaver populations are relatively high, as they have been for the past two decades.[4] Locating river or lake beaver which have not built dams or visible lodges requires more searching, but the nearby feeding areas, and at certain times of the year food piles indicate the presence of a family. A key question is to determine if the lodge or bank burrow is inhabited or abandoned.

During the summer the Waswanipi know if a lodge is inhabited by seeing if it is in good repair, and by looking for fresh signs of tree cutting and/or eating along the shore. In the fall, the same signs can be seen as well as indications of trees being cut and a food cache being collected and of the lodge and dam being repaired. In the winter, when the landscape is covered with snow there is either a breathing hole through the snow at the top of the lodge, or an air space under the surface of the snow where the heat of the occupants has melted the snow closest the lodge itself. Since beaver establish their new lodges and food caches in late summer, before freeze-up, a search for active lodges just before or after freeze-up can establish those that will be occupied

Table 6-5 Waswanipi Types and Compositions of Beaver Families

Family Type	Composition by Age Classes (and Sex When Specifiable)	Composition by Size Classes	Total Number in Family
F1a	Tm,Tf	L,L	2
F1b	Am,Af	L,L	2
F2	Am,Af,K,K(K,K)	L,L,S,S(S,S)	4-6
F3a	Am,Af,Y,Y,K,K,K,K,	L,L,M,M,S,S,S,S	8
F3b	Am,Af,Y,Y,Y,Y,K,K,K,K,	L,L,M,M,M,M,S,S,S,S	10
F4	Am,Af,T,T,Y,Y,Y,Y,K,K,K,K,	L,L,L,L,M,M,M,M,S,S,S,S	12

Key to Age Classes[1]

A = čemisk, 'adult'

T = potemsk, 'two year old'

Y = poewesk, 'yearling'

K = oetč, 'kit'

Key to Size Classes[1]

L = large

M = Medium

S = Small

Key to Sex Classes[1]

m = male

f = female

Footnote:

1. From Table 6-1.

throughout the winter.

Once an occupied lodge is located men are concerned to assess the composition of the family inhabiting the lodge. The actual number of beaver involved is not known definitely at the time the lodge or burrow is located and may or may not be discovered later. The number of beaver present is however provisionally evaluated. This evaluation utilizes the ethnomodel of the growth cycle of beaver families so that the evaluation is in fact made by choosing among the limited number of alternatives formulated in that model. The ethnomodel not only gives an estimate of the number of beaver possibly present but also of the ages and size classes of those beaver.

The Waswanipi point out that they can learn something of the beaver family type present by finding evidence of the presence, or possible absence, of beaver of a given size class. All family types have large beaver, but small and medium beaver are not found in all family types. Thus, evidence of the presence of small beaver eliminates the possibility that family types Fla or Flb occupy the lodge (Table 6-5). Evidence that medium beaver are present eliminates the possibility that Fl and F2 family types are present. And, evidence that there are more than two large beaver means that at a F4 type family is present. In more formal terms the Waswanipi system fits a scale by which each of the major family types is distinguished from the others by possession of one or more particular features, and the non-occurrence of one or more others. Table 6-6 presents the scale model. Waswanipi individuals explicitly use this distribution of features, size classes and numbers, to help them decide on the type of beaver family present at a particular habitation site. The key problem is to find the evidence that there are small or medium beaver or more than two large beaver present. This evidence varies in quality, and therefore there are also different degrees of conclusiveness of decisions about beaver family types.

Information on the age-size classes of beaver present in a colony comes from a number of sources and during a number of occasions in the course of conduct of hunting activities. The first occasions are from observations of the lodge

Table 6-6 Scale of Distribution of Features Characteristic of Each Beaver Family Type

Major Family Types[1]	Features				Total Number in Family
	L	S	M	L3	
F1	X				2
F2	X	X			4-6
F3	X	X	X		8-10
F4	X	X	X	X	12

Key to Features[1]

L = Presence of large beaver

S = Presence of small beaver

M = Presence of medium beaver

L3 = Presence of more than two large beaver

Footnote:

1. See Table 6-5.

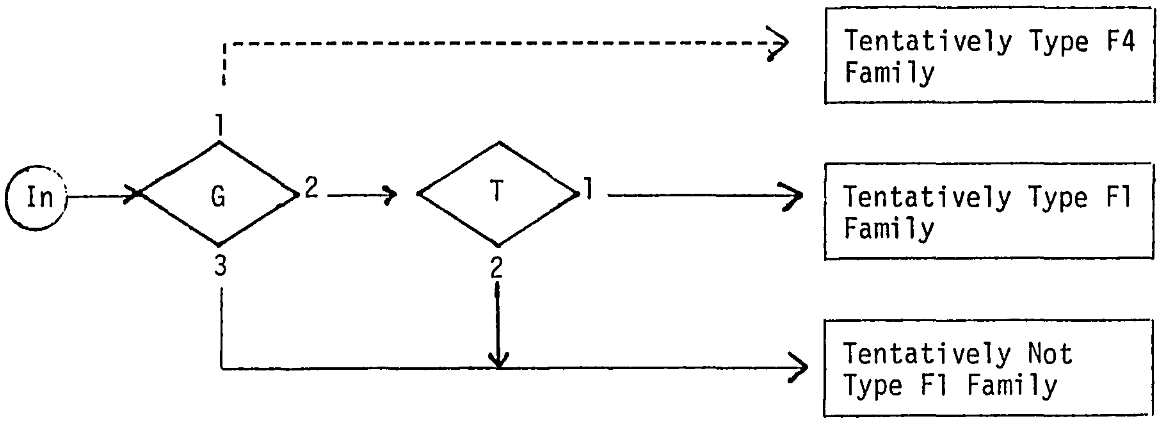
or burrow and the surrounding locations, prior to any direct effort to capture the beavers. In the feeding area and around the shore near the habitations branches and twigs cut by the beaver can be found. The tooth marks of the beaver that made the cut are often clearly visible on the stumps of the cuttings. These marks clearly distinguish the small beaver from larger size classes by the width of the teeth marks. The marks are not normally adequate to distinguish definitively the age-size classes above one year old. Examinations of the cutting or habitation areas therefore allows an initial evaluation of whether small beaver are present. If the tooth marks of small beaver are found it means that it is not a type F1 family but it does not make clear which other type of family it is. If tooth marks of small beaver are not found, this indicates they may not be present, but it is not completely conclusive evidence. Twigs are carefully examined, and some of those with marks of larger beaver may be taken back to the camps by the hunters, because they are indications that the beaver may be given to the hunter.[5]

A second source of information useful in the decision rules is the size of the lodge. It is said that when there are the two beaver plus offspring the lodge is bigger than when the lodge is made by a new couple. Some men also claim a lodge that is especially large may indicate the presence of more than two large beaver, but this was not consistently reported. However, because a family may inhabit an already existing abandoned lodge a large size lodge is not a sure indicator of family size.[6]

The type of beaver family is therefore not conclusively known from observation at the habitation sites, but the people can have a tentative decision about whether it is a type F1 family or others, and some men may tentatively decide whether it may be a type F4 family. The first of these tentative decisions is diagrammed on Figure 6-1, which indicates the relationship between the outcomes of the two contingent conditions on the decision.[7]

Men do not normally observe any beaver themselves prior to the effort to capture and kill them. The process of deciding the type of family inhabiting a site therefore continues through the process of trying to capture and kill the

Figure 6-1. Tentative Decisions on Probable Beaver Family Type Based on Evidence from Observing Beaver Habitation Sites



Key:

G - Evidence from size of lodge

1. Big lodge
2. Small lodge
3. Other

T - Evidence from Tooth Markings

1. Marking of small beaver not present
2. Markings of small beaver present

----- Dotted line indicates a decision-link that only some individuals indicate making beaver. Killing or sighting beaver may provide conclusive evidence of the existence of the various size classes in the family. As harvesting activities proceed the number of observations increases and the residual uncertainty of the cases of negative occurrence are reduced.

When activities intended to capture and kill the beaver begin, a definite assumption appears to be made about the family type being harvested, but my data are not entirely clear on this point. The decision is then constantly reviewed whenever new evidence is available and the classification of the family type changed whenever the new evidence so warrants.

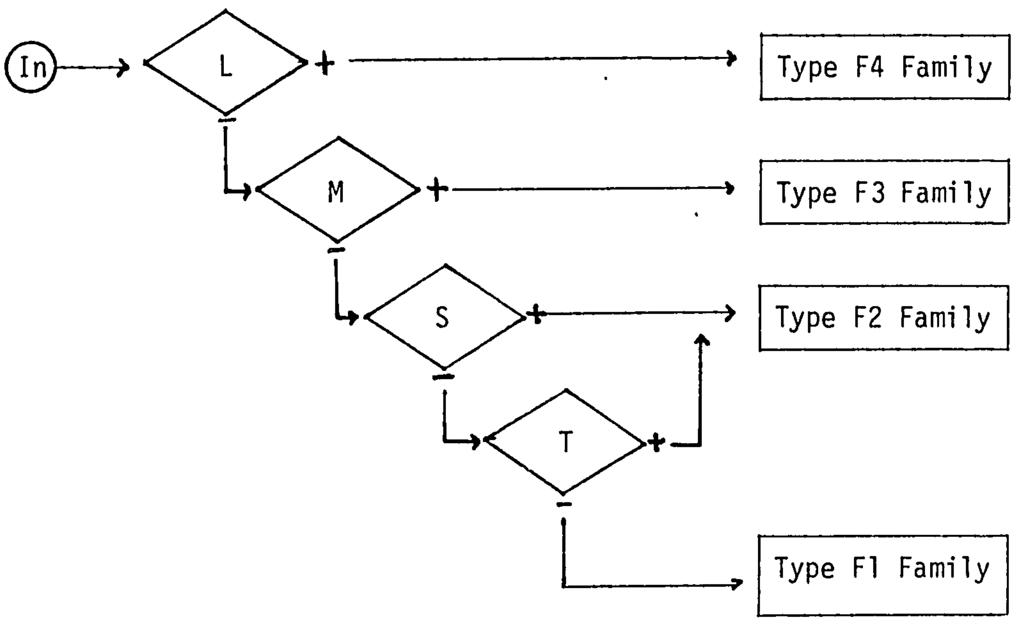
The decisions can be formulated as a series of successively ordered choices for deciding on beaver family types; the relationship between these decisions and information is diagrammed on Figure 6-2.

iv) Recipes for Capturing and Killing Beaver

a. Winter Trapping Under the Ice

Between freeze-up and break-up the beavers leave the lodges regularly to feed and defecate. They go from the lodge to the food cache and then back to the lodge or a small burrow. They follow regular paths under the ice. The traps are set to catch beaver during the night when they are moving between these points. It is common, according to informants, to initially set two traps to a lodge site, although one or three traps may be set. If two men are trapping at a lodge together, each will typically set one trap. The proper locations for trap sets are at the entrances to the small burrows, on the paths between the lodge and food cache or burrows and at the entrances of the lodge. The sites are preferred in the order listed, the most preferred is listed first. This is because small beaver travel less far than medium and large beaver. According to some informants small beaver do not use burrows, according to others they only use burrows close to the lodge. In either case, the three types of locations for sets are preferred in the order of their ability to discriminately not catch small beaver. In general, traps set at or near the entrance to the lodge will catch any size animal, those further away only

Figure 6-2. Decisions of Beaver Family Type Based on Evidence During Hunting Activities



Key:

L - More than two large sized beaver, evidence of presence of
M - Medium sized beaver, evidence of presence of
S - Small sized beaver, evidence of presence of
T - Teeth markings of small sized beaver, present
+ = present
- = no clear evidence of presence

the medium and large beaver. Men say that most of the time they prefer to catch large and medium beaver, but if they want small beaver they know how to catch them.

Setting the traps requires locating the burrow entrances, paths and entrances to the lodge. Burrows may be located with dogs. There are special "beaver dogs" that are trained to find beaver burrows by smelling the beaver. Such dogs are usually, although not exclusively, small in size and not generally used to haul toboggans. Dogs may or may not be used to locate burrows.

The ice is thinner over the entrances to the lodges and burrows and over the paths than is surrounding ice, and there are usually pockets of air under the ice at these points. By tapping the ice with an ice chisel or long pole and listening to differences in the sound of the ice, it is said to sound hollow by some people, the thinner ice and/or air pockets over the entrances and paths can be located by a hunter.

Once a burrow is located the ice is cut with the chisel, the ice is cleared with scoop and depth of water is checked. If sufficient for trap operation the bottom of the pond in front of the entrance is checked for hardness. Hard bottoms are associated with bigger beaver and frequently used burrows. Traps are set in front of hard bottomed burrows. If only medium and big beaver are desired traps are set farther from the house than if small beaver are desired.

The traps are set on the bottom of the pond through holes cut in the ice. When leg-hold traps are used with double-springs, a dry pole of wood not eaten by beaver - for example spruce, is driven into the bottom of the pond to anchor the trap. The ring, attached to the trap by a chain is slipped over the pole. A stone is attached to the chain or pole above the ring to weight the trap down. A freshly cut poplar branch is then stuck into the bottom and the trap is set at the base of the branch, so the beaver will step on it when it tries to grasp the branch.

"Square traps" or Conibear body-gripping traps were just coming into use at the time of this study. When body-gripping traps are used an anchor pole is placed on either side of the trap, bait wood may be placed near the trap, and small poles and branches may be placed to prevent the beaver from passing under or to the side of the trap, and to direct the beaver through the trap, if needed.

During the night it is expected that if the beaver wishes to be caught he will go in the trap. The poplar stick may attract his attention and call him to the trap, it is an offering to the beaver. If the beaver gives himself the trap will catch a leg or the body and the beaver will be partially immobilized by the anchored trap. With the leg-hold trap the weight stone keeps the beaver from rising to the top of the pond where, if the ice were thin as in early winter, it might break through the ice or onto land. On the ice or land the beaver could get adequate leverage in time, to break its leg off, leaving it in the trap and escaping, alive but maimed. Held underwater by the weight however the beaver will be unable to free itself and will drown. If the pond bottom is sloping away sharply the end of the anchor pole may be driven into the bottom of pond in deeper water at some distance from the trap. Caught in the trap the beaver will attempt to flee to deeper water, dragging the trap down along the pole and the heavy weight stone down the slope and thereby assuring that it drowns in deep water unable to return up the slope and to reach the ice and possibly air. In body-gripping traps the anchor poles hold the beaver underwater.

Most men say that they return to check their traps after three days although times vary and some men report that they usually check their traps after two or four days. If traps are left longer the beaver may be frozen into the ice and damaged, if left shorter the traps may not "have had time to work". Body-gripping traps work more quickly and surely. It is said that they should be checked every second day, occasionally every day. It is said that these traps catch beaver more frequently and that they are sprung by the beaver without being caught less often than leg-hold traps.

Upon returning to check the traps the men establish whether or not they have killed anything. The recognized outcomes of the checks of the traps may be (assuming two traps at the pond) that: no beaver is caught and the traps are undisturbed, no beaver is caught and a trap is sprung or disturbed, one beaver is caught, two beaver are caught. If a beaver is caught then the traps will be reset again until the desired number of beaver are caught. This may require several resettings. Typically, if people have 'good luck' they expect to keep their traps at a lodge for seven to nine days (two periods of 3 or 4 days) and then remove them. With body-gripping traps they are typically expected to be used at a lodge for three to five days (two periods of two days). How people decide when enough beaver have been caught, and therefore when to remove their traps will be discussed below.

If no beaver are caught, men distinguish between those occasions when the traps are found as they were set and those on which they were disturbed. If the traps are found unchanged it is said "the beaver do not want to be caught yet" or "the beaver does not want to go in trap yet" (Interview Notes, #14, 52) and the trap is reset, renewing the offering. Alternatively, the trap may be disturbed in a number of ways - it may be snapped and beaver fur or some other part of the beaver left in it, it may be pushed aside and sprung and the poplar pole removed, it may be covered over with mud. In all these cases, it is said that "the beaver knows the trap" (Interview Notes, #34, 45, 87, 28). There is disagreement over whether beaver can tell each other about the traps, but general agreement that a beaver gains knowledge of a trap when the trap misses. If a beaver sets off a trap without being caught he will not go back to it. If the trap is moved other beaver may be caught in. If a trap is found sprung then, it is best to relocate it at another site in the pond.

If no beaver are found when the traps are checked the first time they are reset and under certain conditions relocated. The men return after two to four days to check the sets again and the same sequence is followed if beaver are caught. If no beaver are caught then it is said that the traps should be moved if this was not done on the first check. They are reset in new locations and left for three or four days. If beaver continue not to be caught in the new trap locations people eventually say that the beaver don't want to be caught in traps. People say they know this after about two weeks, i.e., typically on the fourth check of the traps.

A variation on the method of trapping beaver in winter is to snare the beaver. Most Waswanipi individuals know how to snare beaver but few say that they do snare beaver, and my notes on this are brief. Wooden poles are sunk in the bottom of the water body, with two cross bars forming a roughly square opening. A circular snare wire is set in the opening and the end is tied securely to the poles. It is held in place by lightweight threads that break when the beaver is caught. When the beaver is caught in a snare he circles the poles trying to escape, wraps the wire around the pole and drowns. Snares can be set by a single man or by a pair, but they are always set near the lodge and preferably in front of one or more entrances. Waswanipi individuals say they they do not like snaring because snares that are the right size to catch big beaver around the neck will also catch little beaver around the body instead, which they do because they are set close to the lodge entrances. Snares are also said to take longer to set than traps.[8]

b. Waking the Beaver in Winter

An alternative means of killing beaver during the winter is to wake them up and catch them in the lodge, the burrow or at a hole in the ice. This can only be done at beaver lodges on streams with ponds, and it can only be done when the stream feeding the pond becomes relatively narrow and shallow about 100 to 200 feet upstream of the lodge. The site for the hole near the mouth of the stream must be a minimum of 75 to 100 feet from the beaver lodge so that the noise of the preparations do not disturb the beaver before the net is set. The stream is blockaded with a series of stakes that are set across it through small holes in the ice. One or two gaps are left in the blockade where the stream channel is deepest. In these openings a beaver net is set, so that its mouth fills the gap in the stakes. The beaver net is a three to four foot long bag, with a neck a couple of feet wide. It has a draw string that runs through the leading edges of the net opening so that when they are pulled the net forms a closed bag.

In place in the blockade, below a large hole in the ice, the net is watched over by one man, the leader of the netting activity. When a beaver enters the net the man pulls the draw strings and captures the beaver in the net bag. He then hauls the net and beaver from the water and kills the beaver with a blow to the base of the skull. He returns the net to the water as soon as possible. Usually several people, three or four, work as a team when netting beaver, often a family. The usual minimum is two. When the barricade and net setting have been completed one person goes to the lodge to "wake the beaver up" by making noise and poking sticks into the lodge and breaking open the top of the lodge. Driven out of the lodge some of the beavers go to the burrows others try to escape up the stream and are caught in the net. Some beaver may be caught in burrows. Some beaver may be caught in the lodge by hand, and killed, but this does not appear to be common. Dogs are important when netting because they smell out the burrows where the beaver are taking refuge. They may also be placed in a lodge to drive out the beavers. When a burrow is found the ice over the entrance is quickly cut. If the water is muddy it is a sign that a beaver has recently entered. If the water moves it is a sign of breathing of the beaver in the water further up the burrow. If there are signs of a beaver in the burrow the entrance is closed with stakes. The individual then attempts to drive the beaver to the mouth of the burrow with noise on the ground near the chamber usually at the end of the burrow. The direction and form of the burrow may be felt with a stick at the mouth and if necessary a hole cut through the ground on the top to drive the beaver forward with poles. When a beaver is seen at a hole it is hauled out of the burrow by the tail and killed. If a big burrow is found, but it is empty it may be set with a stick put in a hole in the ice in front of the burrow and packed around with snow so it does not freeze solid quickly. If in the course of working at other burrows a beaver enters the marked burrow, the stick is moved indicating the beaver's presence.

This process of locating and killing beaver will be continued all day. Whenever a beaver hits the beaver net the leader of the team calls out to others "stop a while". All noise and activity cease while the beaver is dispatched and until the net is set back in place. Small beaver usually do not go in the net. If they do some individuals say they may let the small ones go, others say they do not.

When darkness approaches traps will be set over night at the gaps in the barricade and at the big burrows that have been found. Square traps are preferred at the barricade. Sometimes only one day is needed but usually three or four days are required to catch all the beaver and more than that may be required.

Waking the beaver up is sometimes accompanied by breaking the dam. Shortly after freeze-up this is still relatively easy to do, but it becomes more difficult as the ice thickens. If the dam is broken, the water drains and the ice caves in making noise and scaring the beaver out of their burrows. It also makes it possible to see the entrances to lodges and burrows and sometimes the footprints can be seen where beaver entered a burrow. A few individuals say it is possible to crawl under the ice after the beaver, but it is considered very dangerous because the ice is subject to further collapse, and may trap a man under it.

c. Variations for Before and After Freeze-up

In the late summer before freeze-up the methods of capturing and killing beaver are by setting traps in the open water, and by breaking the lodge and the dam. These techniques are similar to the trapping and waking the beaver up in winter. Shooting can also be done before freeze-up but people say it is uncommon. The beaver are woken up before freeze-up by breaking the dam and the lodge. If the dam is small it may be easily broken away at its bottom and the pond drained completely in 2 or 3 hours. The dam must, in this case, be broken at just the point where the stream formerly flowed, the lowest point of the surface contour under the dam. The stream leading into the pond is staked closed. When the pond is drained the dogs are untied and the lodge broken open so the dogs can chase the beaver out. The dogs then also chase them from the small burrows. Beaver are caught by the tail. They may also less commonly be shot with a .22 calibre rifle, but men disapprove of shooting beaver with this practice, see above. When the pond is drained completely this way, and the house broken into, all or nearly all the beavers are usually caught, and the location cleaned out. The location will be abandoned by any beaver that survive the hunt, and their chances of surviving the winter are severely reduced. It may take two or three days to complete a lodge but it may also take only one day. At least two people usually work together, one at the house and around the pond and one at blockade. They may set a net at the blockade to catch the beaver.

The other major pre-freeze-up practice is trapping. Trapping is often combined at this season with breaking the dam partially, from the top, so that water drains slowly from the pond and the level is only partially lowered. Beaver hear the water flowing out of the dam and come to repair it at night. Traps are set at the dam, two or three feet in front of the break, and may also be set on pathways across the dam. The method is selective because the large beaver usually go to repair the dam first. After an animal is caught, traps may be reset at the same place to catch the other large beaver, and then medium sized beaver.

Before freeze-up beaver may also be caught near the trails into the bush where they are cutting trees. Selectivity against trapping small beaver is possible as teeth marks of the beaver on stumps in the area give a general indication of whether small beaver are working there.

In both cases, at the dam and at the path to the feeding area, the traps are set under water when possible and are secured to a sliding pole or stake of spruce, which the beaver will not cut through. The traps are weighted with a rock so when the animal is caught and attempts to return to deeper water he drags the stone down with him, which prevents him from rising for air and he drowns. A drowned beaver is secure from predators, and dies quickly with less chance of wringing himself free of the trap than he would have if he were trapped on land where he would live longer and have better leverage to work the trap. The preferred trapping locations before freeze-up then are at the dam and the feeding areas, both being sites that provide opportunity for selective trapping. Dams are only available at stream locations. Before freeze-up two traps are typically set at a lodge, by one or two men, as in winter. A lodge is said to be trapped for a week. However it takes somewhat less time to set and check traps than in winter because ice does not have to be cut.

In the spring three variations on the methods of capturing and killing beaver are typical, shooting along rivers, streams and lakes, waking the beaver, and trapping at the house. In the spring, the water levels rise with the snow melt, and burrows and some houses become flooded, so the sides or top of the house may be the only dry spot off the land. The beavers are active searching for new fresh vegetation, and possibly for new mates. Traps can be set, but with feeding widespread and the dam not being repaired, the best location in spring is immediately around the lodge itself or on the lodge. The sites are mainly above the water level and are subject to higher beaver loss.

Alternatively the rivers and large streams can be searched in a canoe for beaver which travel widely at this season, because the usual dawn and dusk active periods are part of longer daylight hours at this season. They are shot with a .22 calibre rifle when they are sighted swimming or surfacing to breathe.

Finally, the lodge may be broken into to wake the beaver and to force them out. With many burrows flooded they stay in and around in the pond and are shot as they surface for air.

d. Choosing the Method of Capturing and Killing

From this descriptive account of methods of capturing and killing beaver it is clear that at any season there are at least two methods available to a man to try to capture and kill beaver. It is also already clear that there are some differences among the methods available in any season as regards their requirements, effectiveness and impact on the beaver colony family. Individuals take account of certain of these differences when choosing which harvesting method to use. Once an active beaver habitation has been located the hunter must decide which method to use and try to capture and kill the beaver. The choice among the three basic methods can take two forms, a choice of the initial method to use, and a choice of follow-up or successive methods to use if the first chosen are not successful. To outline these choices it is necessary to compare the alternatives on those dimensions relevant to the Waswanipi.

Discussions of the reasons for using one or another of the three methods available to kill beaver when a habitation is first found revealed eight relevant dimensions mentioned by the Waswanipi: number of people required; total time required to complete harvesting; the potential of the method to select large beaver; the effect of the activity on the future of the beaver family, and the likelihood that family members which survive will breed the next year; the likely time delay between commencement of the activity and killing of the first beaver; the physical site requirements for the method; the scheduling requirements; and the chances of maiming rather than killing the beaver.

As outlined above, trapping and snaring can be done by a single individual but typically are done by two, whereas breaking the house and rousing the beaver require at least two individuals and usually three or four. Shooting in the spring along rivers can be easily done individually but is usually done in groups.

Trapping is typically said to require a week or two at each lodge, but six to ten lodges will be trapped during that week on two daily circuits. Breaking the lodge typically requires three days, so that two lodges can be completed in a week. I have no reports on the time involved in shooting, but after freeze-up when many beaver are active, the procedure must be more productive than it is before freeze-up, when beaver are settling down, and they can only be shot around the lodges during dawn and dusk.

With trapping it is possible to selectively cull out the large beaver before and after freeze-up, but leave the medium sized beaver which can form a family the next summer when they will be two-years old, and they can mate the next winter. Thus if a pair of medium are left, the reproductive potential for the winter of trapping is lost, but there is a good chance reproduction may occur the following winter at that site. Looking at the stream as a whole, the medium beaver left in the upstream lodges may not only continue the family, they or their offspring can reinhabit lodges downstream at which large and medium beaver have been killed. With the breaking of the lodge, the removal of all large and medium beaver makes no provisions for reinhabitation and reproduction in the succeeding year, although this may occur if other beaver immigrate to the site.

Trapping provides the opportunity to kill the first beaver only two or three days after the traps are set depending on whether body-gripping or leg-hold traps are used. Breaking the lodge and shooting, on the other hand, provide an opportunity to capture the first beaver on the day the activity begins, although only breaking the lodge is said to be almost certain.

The physical requirements for trapping are that a lodge or burrow complex be located. Breaking the lodge on the other hand can only occur at ponds and streams which meet the conditions for size and location of the lodge mentioned previously. Shooting can only be done near the lodges in the fall, but can be done on many rivers and streams after break-up. Finally the temporal requirements for trapping and breaking the lodge are wide, but shooting cannot be done in winter, and is restricted to limited parts of the day. The distribution of these dimensions among the methods is summarized on Table 6-7.

The alternative methods are generally assessed according to these dimensions in the following way: the consideration of the physical and temporal limitations immediately narrows the choices and works against shooting except in the spring when it is the preferred method. The unselectivity of snaring generally makes it less desirable than is trapping and it is not considered on Table 6-7. The labor needed and the impact on reproduction make the use of waking the beaver less desirable than trapping, but the speed of capture of the first beaver works in favor of it. Breaking the lodge is therefore considered an

Table 6-7 Dimensions for Choice Among Methods of Encountering and Capturing and Killing Beaver

Season and Method of Encountering Beaver	Minimum No. of People Required (and Typical No. Participating)	Time Requirements (No. of Lodges per Week)	Physical Site Requirements	Scheduling Requirements	Chances of Maiming Beaver	Selectivity for Size of Beaver Killed	Chances of Breeding in Family the Next Year	Days on Which First Beaver May be Captured
Winter[1]:								
Trapping	1(2)	3-10	All colonies	Any day (less effective in cold mid-winter)	Low	High	Good	Second or third
Waking the Beaver	2(3-5)	2	Some stream lodges	Any day	Low	Low	Low	First
Fall:								
Trapping	1(2)	3-10	All colonies	Any day	High for traps set on land	High	Good	Second or third
Waking the Beaver	2(3-5)	2	Some stream lodges	Any day	Low	Low	Low	First
Shooting	1(2)	n.a.[2]	Near Lodges	Any day, but only during dawn and dusk	Medium?	High	(Unknown)	First, but not high certainty.
Spring:								
Trapping	1(2)	3-10	All lodges, but few sites per lodge	Any day	High	Low	Good	Second or third
Waking the Beaver	2(3-5)	2	All lodges, streams preferred	Any day	Medium?	High	Good	First
Shooting	1(2)	n.a.[3]	Many rivers and streams	Any day	Medium?	High	(Unknown)	First

Footnotes:

1. Shooting is not possible as a separate activity distinct from other methods in winter.
2. Not available.
3. Not available, but large numbers of beaver may be killed.

appropriate initial choice if beaver are desired immediately. In this circumstance, the otherwise lower evaluation of breaking the lodge as opposed to trapping is overridden. This lower evaluation may also be overridden in cases of large family types, especially F4, where the personnel and time requirements for breaking the lodge are offset by the size of the return. In summary, in fall and winter trapping is the first choice for method, in general, but waking the beaver may be adopted as a first choice when time is short, and especially before freeze-up for large beaver families.

A method of encountering, capturing and killing beaver may not be chosen as an initial choice, but it may be chosen later as the hunting activity at a colony progresses. While trapping is the preferred initial method for harvesting beaver under most conditions, with the exception of the spring, if beaver are not caught after two weeks of trapping then it may be that the beaver do not want to be caught in traps, and want to be caught by other means. Trapping may therefore be the first among several harvesting methods that are tried. Asked "What do you do if you do not catch beaver with trap sets?" most individuals said first they move their traps, as was reported above. If that does not work then after that, individuals said, they break the lodge and use a net, or that they snare the beaver. If the latter did not work they would break the lodge. If the beaver do not want to be caught in traps: they may then be left alone, the lodge may be broken or they may be snared and, if snaring is unsuccessful, the lodge may be broken. Asked "What do you do if you do not catch beaver when you break the lodge?" all agreed that the method <u>works</u>. Breaking the lodge always catches some of the beaver. It should be noted however that it does not always catch all the beaver, not even all big ones.

> "He knows a lot about what a beaver does when he does not want to be caught in a trap. Beaver is stubborn when he does not want to be caught. Even when is hungry he will not go near the trap, /there is/ no sign of beaver... Same with a net. He knows there is a net there. Does not want to be caught, will not go there. Even if you let all the water out cannot kill him if he does not want to be killed" (Interview notes, #69).

Other individuals report that they have seen beaver push the net aside to pass up the stream. Although some individual beavers may not be caught by netting, the method always catches some, and it is terminal. No further method is used after breaking the lodge.

It should be emphasized however that this sequence is not automatic, it depends on a number of other generally longer term plans and situations. The factors that affect the choice between leaving the beaver alone, after unsuccessful trapping or snaring, and breaking the lodge will be discussed below. First I discuss the decision to stop trapping when it is successful.

v. Deciding When to Stop Trapping at a Beaver Colony

A decision which Waswanipi hunters say they must take is when to stop trapping at lodges when the trapping is a success. Trapping, if not used selectively appears to be capable, at least under some conditions, of killing all the beaver available; for example, if traps are set near the entrances of the lodges for long enough time periods. The Waswanipi have at their disposal the means to effectively kill nearly all the beaver they can locate, but this is not what they do.

Three kinds of statements are made by Waswanipi individuals when asked "When do you take your traps out?" The most common is that they remove the traps after they kill two large beaver (10 occasions), the next most common is after they kill the large and medium beaver (5 occasions), sometimes these specify two large and medium beaver (2 occasions), the least common statement is that sometimes the man kills all the beaver before he removes his traps (2 occasions). These three statements each constitute a possible rule for terminating trapping at a given lodge. The first and third can apply to any beaver family, but the second could not apply to type F1 and F2 families.

These rules cover a wide range of possibilities, but it should be noted that they also exclude some possibilities. The first is that killing only one beaver at a lodge is not considered. This is explicitly stated by Waswanipi who say that beaver mate in February and are born in May. If the breeding male is trapped out during early winter then the female will not breed that winter. If the breeding male is killed after breeding then the Waswanipi say that the female of the pair will abandon the kits after they are born to search for a new mate. This means that in both cases if either adult of the breeding pair, male or female, is killed, then killing the other should not have an additional impact on reproduction: in either case there will be no young surviving from that winter. Only type F4 families are somewhat different because here if both adults are removed, any two of the offspring that are left could mate the next year. But, the conclusion is the same, killing only one of the adults does not have any special benefits when compared to killing both.

At one level of analysis each of the three rules represents an alternative which the actor can use in response to situational factors. No Waswanipi individual explicitly told me how to use these rules, although several individuals give more than one of the rules when answering the question. At another level however I would infer certain distributional priorities for the use of these rules from other statements of the Waswanipi.

The first is that trapping out is a culturally recognized option, but it is not considered to be a regular occurrence. Reference to this rule was always qualified by the informant himself, as "sometimes" done. Other individuals commented on several occasions, both in response to the question about how to catch beaver and on other occasions, that they do not trap out lodges, although they do try to kill all the beaver when they break the lodge. It takes a long time to trap all the beaver at a lodge. The Waswanipi are aware that there are much more efficient ways to "clean out", as it is called, most lodges than trapping the lodge. Thus I infer that this rule is residual for occasions when an individual does wish to kill all the beaver, but other methods, such as breaking the lodge, are inappropriate, and I also infer that it is not preferred practice. The key choice normally facing individuals is between killing two large beaver and killing the large and some or all the medium beaver. These rules make a difference only for beaver family types F3 and F4. For family types

F1 and F2 there are only two large beaver and no medium beaver. In the case of types F3 and F4 beaver families the first rule would be expected to result in leaving some of the medium sized beaver whereas the second would be expected to leave either two medium, assuming two were killed, or no medium, assuming all were killed. If the adults are removed, and a male and female yearling are left they can stay and form the nucleus of a continuing family and mate the next winter. Thus, in principle, there could be a significant difference between killing two or all medium beaver. I think that in practice the Waswanipi see these possibilities as having less distinct effects than this discussion suggests. The location of traps can be partially selective against the capture of small beaver, but it is less effective discriminating against medium sized beaver. Thus when traps are set for the large beaver some medium sized beaver are usually caught as well before two large have been caught. The difference between the two rules is probably therefore between killing all large and some medium beaver, assuming F3 or F4 families, and trying to kill all medium beaver.

To formulate a hypothesis about how the two rules are used they must be considered in the light of the daily work schedule for trapping. Men say that they can visit usually up to three or four lodges a day.[9] The men say that it takes approximately an hour to one and a half hours to set a trap but twenty to thirty minutes to check and reset each trap. Each day the men must leave their camp and walk to the streams they are trapping, check their traps, and then return to camp, with their harvest. Time and distance vary, but if the camp is well situated men say they can travel for up to five hours and then must start to return to the camps during the short daylight hours of winter. If two men are trapping together this allows approximately three hours for walking and two hours for checking and setting traps at houses along the way. Thus beaver lodges are not trapped at individually but in daily work units of three to five lodges: on a single stream, or on adjoining streams, so the individuals can go up and down one stream or adjacent streams, or at least along a convenient walking circuit.

During the course of a week a pair of men will try to be trapping at two lines of traps, visiting one on a day, the other the next day, taking a third day to do other activities and returning to the first line of traps the fourth day. On this system each trap is visited after three days, and each lodge is visited twice a week.

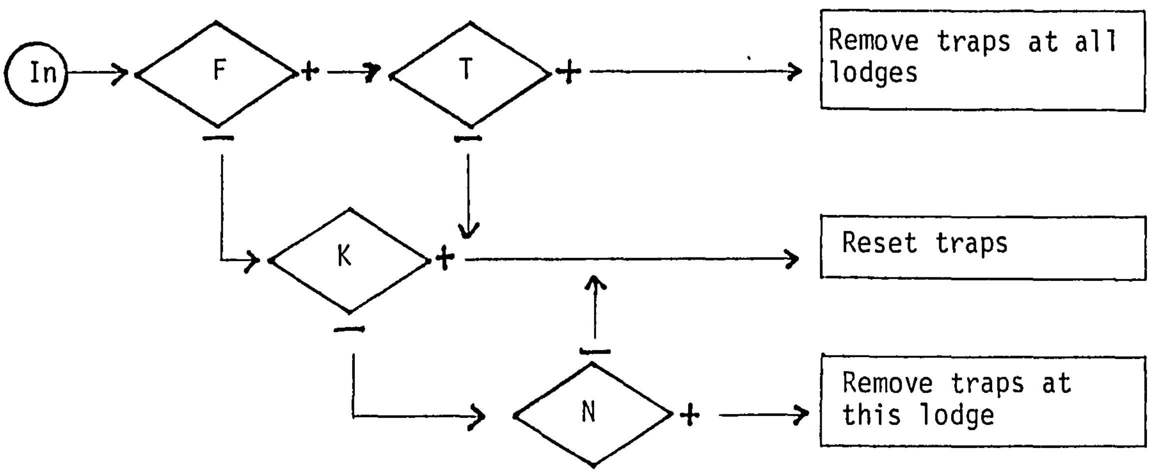
The decision to remove traps from the lodge is not therefore only a decision taken at each individual lodge. It is also a decision taken about whether it is worth returning to a stream, a section of a stream, or a circuit of trap sites. This implication of the data only became clear after fieldwork was complete and I never formulated and asked an appropriate question to directly elicit statements from hunters on the topic. Nevertheless, I think it is possible to infer some of the context in which one rule or the other would be used.

A trapping day consists of visiting three to five beaver lodges. And travel is easiest up and down a single stream. But streams vary in length and number of suitable locations for beaver colonies and each may have anywhere from one to five or more colonies on it. What I would infer is that there may be a tendency to hunt colonies on streams with three or more colonies more intensively than colonies on streams with only one or two colonies, except where two adjacent streams can be easily visited on the same circuit. The rule to try to capture all large and medium beaver would therefore be used whenever a stream, or two adjacent streams provided three to five colonies which could be visited in a day. Here more intensive hunting by more extended visits would occur. However, on streams with only one or two colonies, trapping would be less intensive, and after a few visits and the capture of the large beaver the trapping would tend to be stopped. These sets of rules for terminating trapping are shown on Figures 6-3 and 6-4.

It should be stressed that this is an inference I am making only from very limited and indirect evidence, and it must be treated as an untested ethnographic hypothesis about a possible rule for when to remove traps from lodges.

It should be noted that the application of these principles for deciding when to cease harvesting or change harvesting methods requires that individuals make use of the model of beaver family types. An individual assumes he is

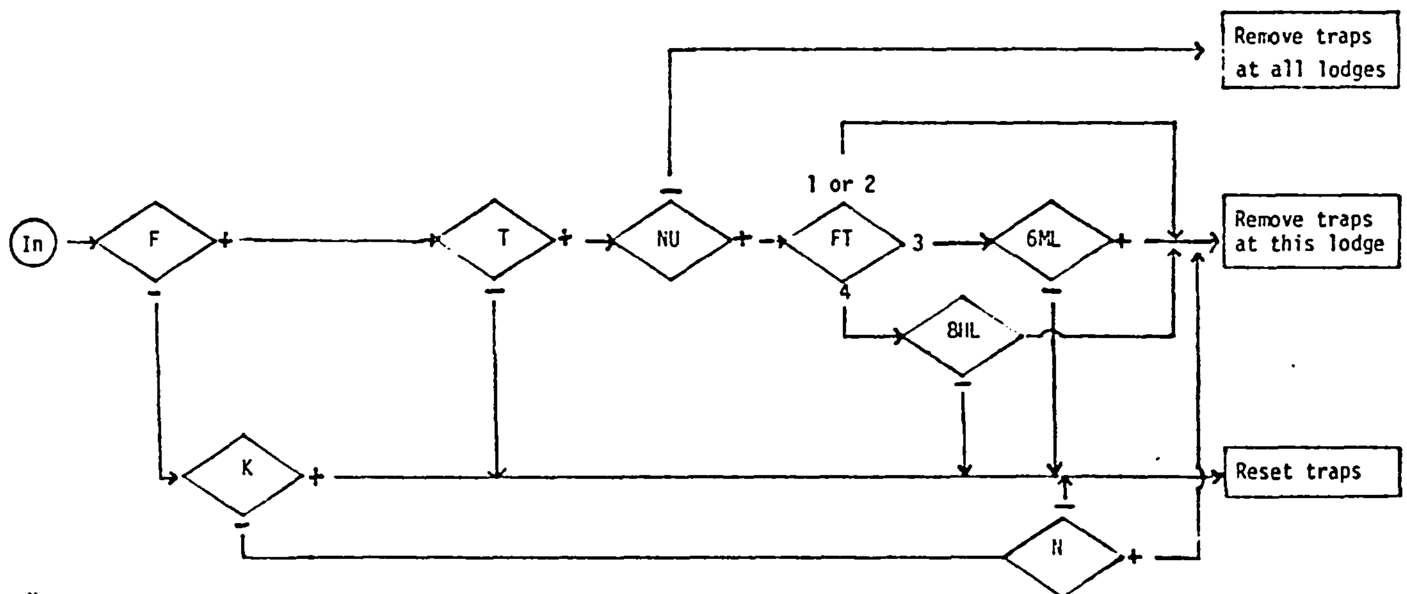
Figure 6-3. Decision Model for Resetting or Removing Traps at Beaver Lodges on a Short Daily Trapping Circuit of 1 or 2 Colonies



Key:

F = Have beaver been found in traps?
T = Have two large beaver been captured at each of the lodges being trapped?
K = Have beaver been killed on previous checks at lodge, if any?
N = Has it been two weeks that nothing has been found in traps at this lodge?
\- = no
\+ = yes

Figure 6-4. Decision Model for Resetting or Removing Traps at Beaver Lodges on a Regular Daily Trapping Circuit of 4 or 5 Colonies



Key:

F - Have beaver been found?
T - Have two large beaver been captured at each of the lodges being trapped?
NU - Are there more than two lodges still being trapped on the circuit?
FT - Beaver family type 1, 2, 3, 4
6ML, 8ML - Have 6 (8) medium and large beaver been captured at the lodge?
K - Have beaver been killed on previous checks at lodges, if any?
N = Has it been two weeks that nothing has been found in traps at these lodges?
\+ - yes
\- - no

dealing with a given family type, which defines for him the number of large and medium beaver presumed to be present. He checks his actual harvests against this expected number to decide if there are any large or medium beaver left at this and other lodges. In this sense the family type model is used as an input to the model for deciding when to stop trapping. It may however need to be corrected as harvesting proceeds. The information gathered in the course of harvesting not only feeds into the family type decision model, it also feeds back to the model for termination of trapping. This indicates the complex linkages that may exist between the different decision models.

vi) Deciding When to Stop or Continue Hunting Beaver During the Year

Waswanipi say that beaver can be hunted at any time of the year. However, they also say, that beaver is best in winter and beaver harvesting between June and October is very occasional and is normally done by only a few men. Before freeze-up, after families settle on their hunting territories beaver trapping starts in earnest, and continues until after break-up or return to the settlement. There are two or three weeks during freeze-up and again at break-up when most travel comes to a standstill and beaver cannot be caught; and there are four to six weeks in late January and early February when the beaver are said not to go in traps, because it is too cold and they do not go out of the lodge often.

So far I have discussed decisions to harvest beaver at the level of the daily and two weekly pattern of activity at a particular lodge and at the level of a group of several lodges on a given stream or adjacent water bodies. In that analysis I have shown that there are several points at which harvesting can be terminated, and where there may be signs that the beaver do not want to be caught.

Now I want to examine the annual harvesting standard and plan, and to indicate how it leads to decisions about how intensively to try to encounter, capture and kill beaver during a given year. Here the choice is how many beaver to attempt to find or, if found, to attempt to capture and kill. I want to examine the longer-term context in which daily or weekly decisions fit, and which help to explain how some of the open-ended aspects of daily and weekly decisions are ordered by the longer-term strategies.

The data for this part of the analysis do not come from the same question-response series that I have just been using. In general, responses to the question "How do you capture beaver?" focussed on the methods and decisions that are made within the daily and weekly temporàl context. Discussion of longer-term harvesting decisions was revealed with different questions, and in discussions about the underlying causes of harvesting success and failure. If Waswanipi individuals are asked "How many beaver do you kill a winter?" the answers are diverse, and the most common is a form "I do not kill more than I want to" or alternatively "...more than I need to." These replies provide a lead to understanding the cultural knowledge of the size of harvests, and also a lead to a more appropriate formulation of the question. Everyday conversations about differences in beaver harvests from year to year and from man to man revealed that there are cultural standards for individual desires and needs. These standards are revealed by the question "What would be a good catch of beaver for a year?" Eight replies to this question are listed on Table 6-8. They show a clear tendency toward identifying forty to sixty beaver as a good hunt, with half the replies agreeing on a yearly harvest of fifty. Only one individual, a young man, replied that he "did not know" when asked this question. I also asked people how long the food from beaver would last a family and the responses are listed on Table 6-9. If it is assumed that during a period of active trapping only two meals a day are eaten, then over half of the responses indicate a beaver lasts two days, or four meals, and nine of the eleven responses indicate two days and three or four meals. The variation that occurs could easily reflect differences in family sizes, but I did not explore this possibility at the time. The standard good catch is therefore the equivalent of about three months of food for a family.

A similar order of magnitude of standards for annual beaver harvests is reflected in comments on the economic dimensions of harvesting. People

Table 6-8 Number of Beaver Said to be a Good Catch for a Year

Individual Number	Less than Good Catch of Beaver	Good Catch of Beaver	Better than Good Catch of Beaver
75		50	100
97			100
58		50	
82	30	50	
22		50	
96		40	
87		60	
98		50	

Table 6-9 Responses to: "How Many Days or Meals Does a Beaver Last?"

Individual Number	Number of Days a Beaver Lasts a Family	Number of Meals a Beaver Lasts a Family
87	2	
52		3
98		4
56		4[1]
68		3
81		3
43	2	
79		2
69		4[1]
93	2	
85		2

Footnote:

1. Where an individual said two meals for two families this has been listed as four meals for a single family.

generally say that about $1000 from the sale of beaver pelts is a "good hunt", and they also indicate that this is based typically on an assumed price of $30 a beaver pelt. This corresponds reasonably well for a harvest of 35 to 40 beaver a year. It should be noted however that this is a generalized expression of the standard, not a statement of actual economic transactions, because the actual prices being received by the Waswanipi at the time of this study were significantly lower than $30 per pelt on average.

These statements again emphasize that there is a widely shared cultural model of hunting that is distinct from the immediate situational experience in which each individual is actually taking decisions and acting. The standard is a cultural model, but it is not a cultural model which people expect to actualize in their activities on a continuing basis.

The relation between actualization and standard can be seen in discussions of actual individual annual harvests. Individuals were asked, "How many beaver did you catch this year?" and "Was that a good catch?". This was asked of twenty one individuals (Table 6-10), some of the same individuals who were asked the previous question on the standards, and some other individuals not asked the former question. Ratings were consistent among the twenty-one and close to but different from the standards revealed in the earlier question. The break between an actual good annual catch of beaver and less than a good catch falls at 35 beaver. The difference between 35 and 50 beaver may be explained by the fact that hunters do not expect to consistently meet the standard. About one half the individual interviewees selected for this list solely on the basis of the interviews having occurred within the same three-week period, did not have a good hunt. This feature reflects several aspects of the cultural ordering of wants/needs. As I have indicated earlier there is a proverb that a hunter should not expect to have a good hunt every year. This appears to be reflected in the different quantitative cultural standards for expected harvests and actual harvests.

Also the standard only applies to hunters of certain recognized maturation/activity classes. As reported in Chapter 5, the Waswanipi classification of individuals involves distinguishing active middle-aged men and women from

Table 6-10 Evaluations of Reported Actual Harvests of Beaver for a Year

Individual Number	Actual Harvest of Beaver Rated as Less Than a Good Catch	Actual Harvest of Beaver Rated as a Good Catch	Individuals' Comments	Commentary
57		40	- "got what he wanted in the fall"	- Caught 25 in fall, 15 in winter, may consider total catch a little low.
58	(15)[1]		- "did not catch much Nov. to Jan., did not go back"	- Fifteen too low for fall catch.
93		35	- "good hunt"	
75	15		- "not Good"	
97	21		- "did not get all he wanted"	
72	30		- "not all beaver he wanted"	
91		(20)	- "till Christmas, got all he wanted"	- Half year catch.
98	(9)		- "to mid-December, not good hunt"	- Approx. half year catch.
96		(25)	- "pretty good, not too good"	- Half year catch.
55		49	- "good hunt, got what he wanted"	
94		35	- "good hunt"	
99	37		- "to March not good hunt"	- Caught 22 from Oct. to March, 15 in March.
68	32		- "not too good"	
74		35	- "happy with what he caught"	

(CONTINUED)

Table 6-10 Evaluations of Reported Actual Harvests of Beaver for a Year (Continued)

Individual Number	Actual Harvest of Beaver Rated as Less than a Good Catch	Actual Harvest of Beaver Rated as a Good Catch	Individuals' Comments	Commentary
41	10		- "not enough, wanted more"	
7		(25)	- "happy with catch"	- Half year catch.
87	10		- "not good"	
21		80	- "happy with catch"	
22	20		- "not a good year"	
44		(30)	- "got what he wanted"	- Half year catch.
43		60	- "good hunt"	

Footnote:

1. Numbers in parentheses apply to catches for approximately half a hunting season.

young men and women without family responsibilities, from older men, some of whom are no longer physically able to be active, but who are highly knowledgeable. The latter may still be important and influential, and may play leadership roles in decision-making, even if they are no longer intensively harvesting animals themselves. The point here is that the standard applies differently to each of these groups of men. When asked what their beaver harvest was, and "why?" these young unmarried men report they are "still learning how to hunt", and oldest of the older married men say it is all they can catch now, often recalling their age or the condition of their legs. These individuals tend to cite a limit for their harvests as twenty or twenty-five beaver. This is not considered as "good hunt" but it is what they want/need. The key in passing from the category of youthful unmarried hunter to fully active married man, is having responsibility for the support of other people. The transition is not solely determined by age or marital status, but by responsibilities. One extreme case of the operation of this criterion was a family where, at the time of the study, there were four adult unmarried brothers and one unmarried sister in addition to the aging parents. The brothers were 47, 37, 32 and 29 years old, respectively. The two older brothers were unmarried čeonapēo. One of the younger brothers explained that "four brothers /ēach/ cannot kill much, too much meat, would waste it if I wanted to kill a lot" (Interview Notes, #75). It was explained that two of the brothers have to be leaders, when the others are older or married then they will catch more. A younger brother said he would have killed fifty beaver if he wanted a lot, but he only killed fifteen. The two younger brothers are still oseničeo 'young unmarried men' in behavioral terms.

Many men therefore do not expect to meet the standard. Nevertheless, a significant number of men who do expect to kill 40 to 50 beaver actually get less.

The Waswanipi call having a good catch 'good luck' and not having a good catch 'no luck' or 'bad luck'. The use of the terms "luck" and "no luck" has been cited above, and here I want to show how it works in decisions on how many beaver to capture. If a man has no luck capturing beaver then it may be a sign that he should stop trying to hunt beaver. This is sanctioned by the proverb-like statement cited previously, that if there are three or four families living together there has to be one that does not do well, and one that does do well so they can help each other out (Interview Notes, #68). A man should not however stop hunting altogether. If a man is not getting what he wants then he should work hard even if he did not get what he wants. But, he should work hard at catching other animals. There is a term t_sišišaoeitam which was explained to me as "working hard even if you do not get any because of luck." This contrasts with $t_s$itimeo which is said to be like being "lazy" in English, when a man starts to hunt and he knows that he will not have luck, he just does not continue (Interview Notes, #114). Men should not be 'lazy', they should continue to try to hunt animals. Some men say when they have no luck they stop trying and leave the bush. However, most men say if they have no luck hunting beaver they will try to hunt other game, and will then return to beaver hunting later, when the weather changes, or the season changes. If they do not have luck after freeze-up they will try again after the snow is high or after break-up. Alternatively, if they are having luck with other animals, they may wait until next year to try to have a good beaver hunt. The hunting of beaver may be stopped, for a part of the peak seasons or for the entire year, if a man has no luck.

I am aware of two ways by which people arrive at a conclusion that they are not having luck. There probably are others with which I am not familiar. Of those I learned, one refers to how to decide one is having bad luck during the course of hunting in a given season, the other to how to anticipate a year of no luck with beaver, the two are linked together.

People say that they are having no luck if they get none or no more than just a few beaver for a week or two. People have not said to me how many beaver they must get to have luck. If they get none they definitely have no luck. It is clear that a few can be caught and people will also decide they have no luck for beaver.

One approximation from what has been said already is if fifty beaver is a standard for a good yearly catch, and twenty-five are to be caught before and twenty-five after Christmas, then since there are about six to eight weeks between the time most people set up their bush camps and the Christmas break and a similar period after mid-winter until break-up, they should average then six to eight beaver every two weeks. I would infer that if only two to four beaver are caught in two weeks it may be a sign of no luck. This would mean that, if a man were trapping, say at eight lodges, he would have to have one to two catches at four of the lodges and no catches at four of the lodges. An alternative way of estimating the levels would be to note that a large-medium beaver lasts two days or less for a family. If beaver are to be the main food during periods of intensive trapping, a large-medium beaver would have to be caught every second day. In two weeks seven beaver are needed. If, during a two-week period, only two or four large-medium beaver are caught, I infer that there may be a very real unfilled need for beaver. I am not here implying starvation, but rather a very real felt need that the beaver hunt is not good, that a man is not getting the beaver that he wants/needs. His family may be eating other animals, or he may be receiving meat from other hunters in the group. They may in fact have quite ample meat from other sources, but the hunter will be having bad luck with his beaver hunt, indeed good luck in other hunting is expected to go with bad luck with beaver. The point here however is that a low catch of trapped beaver is an indication that a hunter is having bad luck with beaver.

In these situations, and possibly in situations less severe, the expectation is that a man will conclude he is having no luck with trapping beaver. He may then either change his hunting method or he may turn his attention to the hunting of other animals. If he decides to change his hunting method because he is not getting beaver in the traps he may decide to wake the beaver up. The decision depends on an interpretation of the meaning of the beaver's refusal to be caught. When beaver at several lodges over a two-week period "do not want to be caught in traps" it may mean that they may be willing to be caught by other methods or that they may be willing to be caught by that man only when the season changes. Whether or not they are interpreted as being willing to be killed by other methods depends, I think, on the annual expectation of the harvest.

When luck capturing beaver is discussed it is often remarked that a man knows in advance if he is going to have luck. One of the things people know/dream is how many animals they are going to be given the next winter, as was outlined in Chapter 5. Here the point is that people anticipate their harvest before it begins, and have an initial knowledge about whether or not they will have luck or not. This knowledge is given by 'God' and the 'spirit beings' through dreams, thoughts and various signs and indications of his intentions, and the animals also give people signs of their intentions. For most people, almost all knowledge of the future is derived from dreams/thought, and from animal omens.

In the case of beaver a cue to what these omens are is the commonplace discussion of the number of beaver lodges seen, and particularly the trend in the number of lodges. Men say that when game is getting scarce on the territories which they harvest they either "just kill what is necessary to eat", that is, other game (Interview Notes, #52), or they do not harvest the land for a few years, they "wait for things to grow" (Interview Notes, #27). When the beaver, or other animals go down in number, it is a sign that 'God' wants them to kill less. I did not get a list of other possible indicators, and the actual range of indicators the Waswanipi use is probably quite extensive and subtle. When I would ask directly, people would suggest I would be best to live in the bush and learn myself. The answers were in their view too subtle to be learned without direct experience. Nevertheless, when I made some suggestions they would be confirmed or denied. A probably very partial list is the result. The key cues would appear to be: a decline in the number of active lodges in areas being limited, especially vis-à-vis the numbers of inactive lodges, and by comparison to unharvested areas; an increase in the ratio of small beaver to medium and large beaver; and, an increase in the "shyness" of beaver to traps.

A key decision the Waswanipi hunter consciously must make is which beaver are being given to him. The process of encountering beaver is a long drawn out process. It does not begin when he goes looking for a beaver habitation, it may begin six months or a year before, when he last saw that site, or when he had a dream about his harvest of beaver this winter. Looking for beaver is a progressive, step by step process, and setting a trap or breaking a lodge are late stages in this process. At many stages the signs or the situational factors may convince a hunter not to pursue the capture or killing of a particular family of beavers, or beavers at all. The hunter must decide at each step if beaver are being given to him.

When hunters see indicators such as those cited above, and presumably others, they know that 'God' or the beavers themselves want men to kill less and the hunters are given less. They know, even before the hunt starts that they will not have luck, and if initial efforts confirm this knowledge they may reduce or stop harvesting beaver, for a season or the rest of the hunting year. In a year in which a hunter knows he will have luck, what may simply convince him the beaver do not want to be trapped but hunted by other means, may in a year in which he knows he will not have luck, convince him the beaver do not want to be caught by him that year.

In short, there is a context of knowledge about what is to be expected, given the long-term trends, which is part of the seasonal, weekly and daily recipes for action and that has an influence on decisions and actions at the seasonal, weekly and daily levels.

vii) Hunting Territories and Annual Hunting Decisions

When fall comes each year hunters must not only decide what to hunt, how to hunt, and how many, but associated with each of these decisions they must also decide where to hunt. The decisions on where to hunt each year are organized around the system of hunting territories, and, when deciding where to hunt a hunter may also be deciding where not to hunt. There are therefore decisions about the hunting of beaver populations of particular territories that take place on a yearly, or multi-yearly basis. In order to describe the model for these decisions it is first necessary to briefly describe the hunting territory system of the Waswanipi, a more complete discussion occurs in Chapter 11. All the Waswanipi land is divided up into co-extensive hunting territories. These are called nitaounasčič, 'my hunting land'. The Cree term includes the word asči, or 'land' and nitao-, which in this case emphasizes 'hunting' and 'growth'. A hunting territory is an area where a hunter hunts on a recurring basis and the hunting territories are in charge of men who "own" them as a result of inheritance and recurring use.

These men can each draw on a map the boundaries of the hunting territories for which they have responsibilities. When these maps are put together they effectively cover the entire Waswanipi area, although there are some areas where the hunting territories overlap, and there are small areas not included if each man makes a map independent of his neighbors. The hunters can however come together, discuss these apparent inconsistencies and agree on a map without overlaps, and without unclaimed gaps. Some variability in the location of the boundaries of a territory may be consistent with the day to day conception by the owners. The focus in this presentation will be on how the territories are said to be related to hunting activities.[10]

A hunter was always able to answer the question "Why did you go to that hunting territory?" by saying either it was his hunting territory, or that he was invited or asked by x, where x was a man who was a "owner" of the hunting territory in question. I was also told by a few "owners" however, that their hunting territory was being used by a hunter who had not asked them before he used it; and this was always accompanied by a complaint.

Decisions on whether to use or not to use a hunting territory in a given year, or season, typically are taken by the "owner". He has the right to decide on the use of the hunting territory. The decisions of a current "owner" of a hunting territory on whether or not to use, or to allow a territory to be used, in a given year form a critical part of the hunting plans and decision-making. Whether a hunting territory is used, how frequently it is used, and how intensively it is used is said to depend on the condition of the beaver population on the hunting territory. The unit under consideration may be the whole hunting territory or a section of the territory. About half the "owners" say they use one part of the hunting territory at a time.

The decision on the use of hunting territories is most clear in cases where "owners" choose not to use their hunting territory, or a section thereof during a given year. Asked "Why did you not go to your hunting territory this year?" the most common answer is that the "owner" is waiting for the animals to grow on his hunting territory, particularly beaver. "Waiting for beaver to grow" (Interview Notes, #57, 74), "want it to grow beaver, lots now" (Interview Notes, #15), "want it to grow beaver" (Interview Notes, #69, 42, 43, 44).

Hunters go onto explain that their own kills were too high and that is why they must wait before hunting on a hunting territory again. "He waits for things to grow, because he kills too many beaver in one year" an "owner" who uses his hunting ground every second year reported (Interview Notes, #20). He had to kill as many beaver as he did to pay for the costs of getting to his hunting territory. Several "owners" say that too many beaver are or were being killed (Interview Notes, #61, 57, 58, 97). Two reasons were given, either the money from selling the pelts was needed (Interview Notes, #42, 44, 20), or because there are too many people using a hunting territory (Interview Notes, #97, 52) implying too many to feed. The problem is said to be clear because the "game is getting scarce" (Interview Notes, #57, 97), the "catch is no good" (Interview Notes, #57, 58, 97, 61), "only babies left now" (Interview Notes, #97), "few beaver in each house" (Interview Notes, #58). What is happening is that the animals stop being given to the hunters, the hunters get 'bad luck'. Thus 'bad luck' may be an indication that the hunters are killing too much, more than they are given.

If there are signs the beaver have been killed too much then an appropriate response by the hunters is to let the beaver grow, by not hunting on that hunting ground. Some men say they do this on a regular rotation every second year. They may divide the hunting territory into two or three sections, and use them each every second or third year (Interview Notes, #94, 34). But some men who say they would like not to use the whole hunting territory every second or third year, cannot do this in fact (Interview Notes, #97). The alternative is to use the territory every year, and then not use a hunting territory on an ad hoc basis, whenever they have hunted "too much" and get 'bad luck' and want to let "the beaver grow". In these cases hunters may estimate it will take from two years (Interview Notes, #52, 85) to three years (Interview Notes, #69, 42,43,44), to four years in a few cases (Interview Notes, #57), before the beaver will be grown. When a hunting territory has not been used for several years there are said to be "lots of beaver" (Interview Notes, #28, 15) or it is said that the beaver are close to the hunter's habitations, "where his pillow is, that is where beaver house is" (Interview Notes, #22), or the beaver are very calm (Interview Notes, #95). It is said that if there are too many beaver then they will start to fight among themselves and that this is a sign that they want to be hunted (Interview Notes, #95). And if 'God' thinks there are too many animals "he takes them away, like with people" (Interview Notes, #69).

The Waswanipi hunters then, recognize that there are times when they will hunt too much, and there is an established knowledge for why that is not good, it brings 'bad luck', and for how to return the situation to one where continued hunting is again proper.

This is the most general decision the Waswanipi must take about the hunting of beaver. That it is regularly made is revealed by the model for rotational use and ad hoc abandonment of hunting territories, and by the special hunting activities of the hunters when they do not expect to use a hunting territory for a few years. In this case they may try to clean it out, and in effect, bring on 'bad luck', because they have other plans for hunting. A more complete discussion of these strategies and tactics is given in Chapter 11, along with quantitative data on actual behavior patterns.

In summary, I have presented an outline of Waswanipi beaver harvesting recipe-that begins with models of beaver habitations, of the social structure and family developmental cycle of beaver, and that shows how these are used in the course of decisions about harvesting activities. The methods of capturing and killing beaver and the criteria which distinguish them are listed. And, the decisions to be made about the choice of methods in the sequence of harvesting are outlined.

One of the things the account of choice among methods of capturing and killing beaver shows is that once beaver habitations are found, and that in itself is not difficult at least when beaver are reasonably abundant, the Waswanipi have at their disposal methods that could virtually assure encountering, capturing and killing of most beaver. The effectiveness of the methods led to formulation of a series of questions about how decisions to stop and limit hunting are made, and this was shown to be recognized in a series of decision models of weekly, seasonal and annual choices about where, when, what, how, and how much to hunt. These models included those for deciding when to remove traps from a group of lodges, when to follow unsuccessful trapping with other methods of hunting beaver or with hunts for other animals, and when to decide not to hunt the beaver population of a given hunting territory for one or more years.

B. Moose Hunting

i) Recipes for Hunting Moose

Moose are hunted during all seasons of the year except early summer. During the summer moose are typically looked for by going along a creek or shore line in the early morning or evening nanitaomuseikateo. In winter moose are looked for on snowshoes, nanitaomusAneo.

When moose are found and killed they are usually shot, pastisAkaneo, with 30-30 or more powerful rifles. It is not considered good to shoot a moose with a .22 calibre rifle, the moose is "too tough", but there are occasions when it is said to have been done. The recommended shots with high powered rifles are neck and chest shots which are capable of bringing down a moose on the spot, as a result of very rapid bleeding of the animal. The neck is preferred as less bloody, but there are suggestions that it is considered a more difficult shot. An animal brought down by a rifle shot may be finished off with an axe blow to the skull to save a second bullet. There are stories of less common ways to proceed to kill moose, including: killing a moose immobilized by snow with the blunt end of an axe used to strike the back of the skull; and, drowning a swimming moose by coming along side in a canoe and holding its head under water. Attempts to check these stories elicited confirmations, but indicated that the few hunters involved had done this only once or twice in their lifetimes. There was a common element in these fragmentary stories, namely that these uncommon methods were used because the hunters did not have their rifle with them, or because the animal was seen unexpectedly, and either approached close to them or was discovered quite close to them, indicating clearly that it was being given.

Three kinds of data are available on Waswanipi moose hunting: general descriptions of moose hunting from a series of interviews which were initiated with the question "How do you hunt moose?"; specific descriptions of particular moose hunts from a series of interviews which were initiated with the question "What are the stories of the moose you killed this past year?"; and a set of typical verbal expressions, words, phrases, sentences, that are associated with moose hunting, provided by a linguistic informant. As in the case of beaver and other hunting recipes, the linguistic data provide a starting point and background for the analysis of hunting activities, but the major analysis is based on accounts of moose hunting of the first two types. There are nine individuals with whom extensive interviews were conducted on moose hunting, either generalized accounts, specific stories, or both, and another sixteen individuals from whom more limited, but important new or confirming data were gathered.

The accounts of moose hunting distinguish several steps in the process: looking for signs of moose, looking for the moose themselves and killing the moose, preparing or initially butchering the carcass, returning the carcass to camp. The two early stages are the main focus here. They may be distinct stages separated by months or by weeks, or they may be compressed into a single continuous activity sequence taking just an hour or two, or less, to complete. When the latter is the case, the compression of the steps into a single event is itself taken as a significant and meaningful occurrence, as I have indicated in the previous chapter with an example of a man who killed five moose immediately near his camp. After giving an account of the specific steps in particular moose hunts, moose hunting will be set in a context of the annual standards and plans of hunting.

Men initiate the effort to get a moose by thinking about what they want and need, and possibly by asking for it by putting meat in the fire or by other techniques. They may then learn that they will be given a moose in dreams or thoughts, or they may not - in either case men may then continue the effort to get a moose by "looking for a moose" or by "looking for signs of moose." The latter refers specifically to finding fresh tracks of the moose and/or wallows were they have rested, mataakaneo, and to finding broken twigs where moose have been feeding, nameakaneo. In the early winter season signs of feeding are said to be more commonly found than are tracks or wallows, because snowfalls are more frequent, but for the same reason, when tracks are found they are fresh. After the snow is high tracks become the more commonly found sign, as they appear to be in summer. Individuals do not go looking for all the signs they see. Signs are also found in the course of tending beaver and fur-bearer traps, or conducting other hunting activities.

Finding signs of moose is one of the critical steps in finding and killing a moose. Individuals express a very high confidence of being able to kill a moose once appropriate signs have been found. "He is happy when he sees the tracks, lots of meat on it. He is happy because he is going to eat" (Interview Notes, #57). "Looks for tracks, when (I) see fresh tracks I think I will kill him" (Interview Notes, #83). And, "If you are good in looking for moose it is easy" (Interview Notes, #97). Fresh signs of moose are like dreams or thoughts that indicate a moose will be given, they are a source of future knowledge with a relatively high level of certainty because they are communications from the various powerful beings that must participate in a successful hunt.

While people say that they kill moose in all seasons, except early summer, there are during the rest of the year three clearly preferred periods for harvesting moose. These are: during the rut, *oičimuso*, in September and October; when *pipun* begins, that is, when the snow is high, in January and early February; and in *sikun*, when the snow begins to melt and a crust forms on the top, in March. The latter two periods may be temporally separated or may form a continuous period, depending on the annual weather pattern. The term *mekoapipun*, 'mid-winter' mentioned when seasons were discussed as a sub-category of *pipun*, may be used to refer specifically to the coldest part of *pipun* in January and early February, when moose are said to be easy to look for and hunt.

The reasons the Waswanipi give for hunting at these times involve two major factors, concentration or distribution of moose and mobility of moose. Two additional factors to be discussed later are the quality of the meat and fat, and the ease of approaching the moose.

Before discussing ways of hunting moose in different periods, it will be useful to discuss the types of precipitation characteristic of periods. Lists of precipitation names from one informant appear on Tables 6-11, 6-12. They have been checked in use with other individuals, but I have not exhaustively elicited types from several individuals, and the lists are probably incomplete. Besides a general term for snow, and a term for snow that is not falling but being blown by the wind, the next set of terms distinguish snow on the basis of its powdery versus granular structure and on the basis of surface hardness or crust. In early winter snow is light and powdery, but as winter progresses it becomes harder and more granular. The term listed *oateiao* appears to apply to this latter snow. A distinction also appears to be made between snow that is hard right through and snow that is hard only part of the way through, and this may be expressed by distinguishing conditions of *oateiao* in *sikun* versus *oateiao* in *pipun*. I have therefore provisionnally glossed *oateiao* as 'granular snow'. The other feature of snow that is systematically noted is its surface condition. Hardness or crusting on the surface

Table 6-11 List of Waswanipi Types of Precipitation from One Individual[1]

Name in Cree	Individual's Comments	English Gloss	Comments
$t_s$imioan	"raining"	'raining'	
mispun	"snowing"	'snowing'	
pinakonepain	"little snow falling"	'snow flurries'	
maskomitan	"hail"	'hailing'	
kasaoan	"fog"	'ice fog'	

Footnote:

1. Individual #114.

Table 6-12 List of Waswanipi Types of Snow from One Individual[1]

Name in Cree	Individual's Comment	English Gloss	Comments
kon	"snow"	'snow'	general term
pioan	"snow blows up from the ground"	'blowing snow'	
pikueatikun	"soft snow, dry, sink in on snowshoes"	'powder snow'	
maskoakonakao	"snow is hard in winter, very cold weather"	'cold hardened snow'	
saskakonakao	"very mild in winter, snow does not stick to hands"	'melting powder snow'	
kaoatsao	"hard snow after a rain, not deep"	'thinly crusted snow'	
saskasteo	"snow is very wet, snowshoe heavy, in spring"	'melting granular snow' or 'corn snow'	
oateiao	"walk on snow, after very mild, hard snow"	'granular snow, thick crust'	always crusted?
maskomi	"ice"	'ice'	
sosaskon	"ice on the river, but no snow"	'uncovered river ice'	Lake also?
sosatsipioan	"slush in middle of river"	'slush on ice'	
akočinkon	"snow up in trees"	'snow in trees'	
mataiu	"small trees which cannot be seen, completely covered with snow, little mound"	'hollow snow mound'	

Footnotes:

1. Individual #114.

is noted: after rains when crusting is thin, kaoatsao; as a result of extremely cold temperatures, maskoakonakao; and, as a result of repeated thawing and freezing, for which I again have the term oateiao. A distinction is made in discussion between the granular condition of the snow and the thick crust condition that forms, but the two appear to be considered to go together. The melting snow conditions that accompany the infrequent thaws in pipun, and the repeated thaws in sikun, are called saskakonakao and saskasteo respectively. Several other terms unrelated to the present context are also noted on Tables 6-11 and 6-12.

From the perspective of moose hunting the noteworthy point is that these types of snow are considered to be typically distributed in particular seasons. Thus cold hardened snow is typical of the mid-winter period, although it may occur at other times. Powder snow, melting powder snow and thinly crusted snow are snows typical of early winter and of the first part of pipun. In the later part of pipun oateiao is present and in sikun oateiao is hard right through and typically crusted. Saskakonakao is a winter melt brought on by an infrequent warm spell, whereas saskasteo is the spring melt brought on repeatedly by warm weather and increasing solar radiation, and causing a thick snow crust.

Now, to return to the distribution of preferred periods for looking for and killing moose, two of these occur during the period of the snow cover. Waswanipi say that during the early winter period moose range widely, move frequently and run far when disturbed; they may run for up to ten miles. As the snow builds up it begins to limit the mobility of moose. The Waswanipi say that the minimum snow depth affecting moose movements is between thirty inches and three feet. As the snow accumulates moose concentrate in the fewer and fewer locations with relatively low snow accumulation. At first they may be found at various places with low snow accumulation, burns, and open shorelines, where snow may tend to be blown clear. As snow accumulates the moose increasingly concentrate on highlands and hilltops, where snow accumulation is lowest because of blowing and where food is available along the upper slopes. Here they form yards often with 2 to 4 moose together and move about little from one day to the next. These conditions begin in pipun the season of high snow.

The effect of this concentration of moose is that it is relatively easy to search for signs of moose, the hunter simply searches the hills. And, when signs of moose are found the moose are nearby. Men say they usually know where the moose are. For example, one hunter reported that he ran "across tracks. He could not follow tracks, tracks all over. But he knew where moose was, so he went there" (Interview Notes, #13).

At this season, when a hunter having found signs of moose, goes to look for the moose itself to shoot it he can be very confident of success. The deep snow severely reduces the mobility of the moose. Even if the moose is alerted to the hunter's presence and it flees, it cannot run far, and must stop periodically for rests. According to the Waswanipi a fully active man in good physical condition can, on snowshoes and with only a steady walk, exhaust a moose to the point that it will run no further, will stand its ground, face the hunter and be shot. The pursuit may last one or two hours, or a few hours, two or three seem to be considered typical. Active adult men with snowshoes are more mobile than moose in high snow.

Sometimes people say they just follow along the tracks of the moose during the pursuit, but sometimes they say they know where the moose will flee and will go directly there. They say the moose do not go to muskeg, but toward mature forest or toward other hilltops. It is therefore possible for a hunter to have several opportunities to kill the moose before it is exhausted, either by anticipating where it will flee, or by coming up on it while it takes its frequent rests. People say that they can tell when the moose is getting exhausted because they can see where it has started eating snow during the rests.

The labeled steps in the stalking and killing of moose in mid-winter are: the initial step of looking for signs of a moose and for the moose themselves, called nanitaomusAneo; the moose may see the hunter and run away tsitsipatao, and run through the deep snow tAtAkonepitam; the hunters run after the moose noseneAkaneo; the moose eventually gets too tired to run aieskosio; the hunters see the moose oapimakaneo and shoot it pastisAkaneo; very few moose get away, ninakat$_s$ipaik, and even fewer are crippled and get away misAkan.

The second period of the year when people say it is preferred to hunt moose is in sikun, late winter, when the snow is hard right through and there is a thick ice crust on the snow. The crust, unlike the ones formed by unusually warm or rainy days earlier in the winter, is repeatedly formed by increasingly frequent warm weather and by daily cycles of melting radiation in daylight and freezing conditions at night. In sikun the crust is only occasionally covered by thick fresh snow.

In sikun the moose are still at maximum concentration because snow on the ground is still high, but in addition, at this season the mobility of moose is severely restricted. The moose cannot run through the hard crusted snow. The weight of the moose is sufficiently high that its legs penetrate deeply through the snow, but the crust breaks unevenly, and if the moose runs it will cut its legs on the jagged edges of the crust. Moose at this season therefore confine themselves to well-beaten trails, packed by repeated use, in the yards. Even in full view of hunters and/or dogs, the moose will run along the trails until cornered in a dead-end and then stand their ground rather than run through the crusted snow. When a moose stands but does not run because of the snow conditions it is called oatekapo.

Under these conditions hunters can search the hills for signs of moose and when found simply approach the yard, corner the moose and shoot them. At this time of the year hunting dogs may be used as well. Hunting dogs released at the yard will arouse the moose, run the trails until the moose corner themselves and then hold the moose at bay, until the hunters arrive. At this season then moose are, or can be within a matter of minutes, completely immobilized.

The third preferred season for hunting moose is during the rut in September and early October. At the time of mating bull moose are said to run around in the bush, papamipatao, but can be called to a shoreline and even into the water by imitating the calls of females. A moose caller made of birchbark, čitoimusAkan, is sometimes used, to čitoakaneo,'call', the moose to the water. The men sit in a canoe and quietly travel the waterway listening for the loud noises bull moose make during the rut, calling, trashing brush, and fighting. When signs of moose are detected they call the moose which leave the bush to investigate the call and may come far out in the open. When people shoot the moose there is ample time to fire off several rounds before the moose have a chance to run away in the bush, kospipatao. It usually does not take many shots.

Unlike winter harvesting then when the moose is concentrated in predictable locations, and is immobilized, or less mobile than are the hunters, during the rut the moose calls attention to itself and will come to the hunters.

These are the three preferred periods to harvest moose. During each of the three periods outlined men may look for signs of moose on any day that permits travel, but after signs are found they will make a choice, the moose may be pursued immediately, it may only be pursued several days, or even weeks later, or it may never be pursued. One reason for delay is that even within preferred seasons hunters typically only try to kill moose on days with specific weather conditions, conditions that further increase the chances of making a kill, and of making a quick and clean kill.

The Waswanipi recognize several basic daily patterns of weather conditions and have distinct terms for some of them, these terms are listed on Table 6-13. The table is based on a list provided by a single informant and presumably is incomplete, although the use of the categories listed has been checked with other informants.

The first seven terms apply to winter days. The first two oaaseskun and iokoskun distinguish the weather conditions typical of the presence of high and low pressure systems in winter respectively. The first is a clear cold winter day, the latter a cloudy warm winter day. These two terms, often spoken of

Table 6-13 List of Waswanipi Typical Daily Patterns of Weather Conditions from One Informant[1]

Name in Cree	Individual's Comments	English Gloss	Comments
oaaseskun	"cold clear day"	'clear cold winter day'	typical winter day for high pressure system
iokoskun	"mild cloudy day" "something in the way, cannot see sun."	'cloudy mild winter day'	typical winter day for low pressure system
musoesten	"fall, windy day and blowing snow"	'windy early winter day'	literally 'moose windy'
čisooaiao	"rain, wet snow, very mild day, stay in camp"	'rainy warm winter day'	
musot$_s$išikao	"winter, windy and light snow, mild cloudy day, high snow"	'windy, snowy mild winter day'	literally 'moose day'
mataoanipain	"very cold day, looks like snowing, cannot see clearly, not very windy, frost/fog"	'very cold winter day, ice fog'	
oateiao [2]	"after very mild, hard snow"	'cold winter day following warm spell'	
čisasteo	"clear sunny day"	'clear summer day, warm'	
čišiteo	"hot day"	'hot summer day'	

Footnotes:

1. Individual #114, 9/1/69.
2. See text.

in English as a "nice day" and a "cloudy day" are the most frequently occurring weather descriptions in natural settings in winter, and the other terms may be considered as refinements of these two. While the data are too incomplete to make a formal analysis of the structure of this domain, the two examples cited indicate what are presumably the major dimensions by which the Waswanipi classify typical daily weather conditions. These are visibility (clear, cloudy), coldness, and season. Two other dimensions appear in other glosses, wind conditions, and change in conditions from conditions the previous day. The seven terms for winter season weather patterns appear to condense a considerable variety of conditions and a number of dimensions, into a limited member of categories.

The typical weather patterns are distributed by season and each is directly related to moose harvesting activities. Musoesten, literally 'moose windy', refers specifically to conditions that occur in early winter, according to the informant, and discussion of this category will be delayed somewhat. The conditions covered by čisooaiao and mataoanipain are typical of pipun, but my data are not clear if they also occur in early and late winter. Musot$_s$išikao is literally 'moose day' and typically occurs in pipun. Finally, oateiao, refers to snow conditions, but I have included it here because it is used in an expression, "days with oateiao", which implies certain weather conditions. The set of four specialized categories that apply in pipun or sikun in fact specify the preferred days definitely appropriate for trying to kill moose, and the avoided days on which it is definitely not appropriate to kill moose. Days with other weather conditions are neither preferred nor avoided.

When signs of moose are found, the decision to proceed to the next step in hunting, to locate the animals themselves and to try to kill them, depends in part on the weather conditions at the time. Given certain weather conditions the search may proceed immediately upon finding signs, given other weather conditions the search for the animals will typically not begin immediately upon finding signs. Given neither category of condition there is, I think, a preference not to proceed immediately but to wait for definitely preferred conditions, but the data are not entirely clear on this point.

In pipun the preferred days for killing moose are musot$_s$išikao, 'moose days', windy, snowy mild winter days. The light wind rustles the trees and shrubs and prevents the moose from easily hearing the approach of the hunters. The light snow allows good judgment of the age of tracks, and reduces the range of vision of the moose. The mild weather means that the hunter can move relatively quickly. These weather conditions also appear to be days on which the comportment of moose is calm, "when it is blowing and snowing [moose] cannot see, just hears trees blowing, puts head up, calm, puts head down again" (Interview Notes, #83).

Thus during pipun, despite the relatively greater mobility of the hunter than the moose and despite the ability of the hunter to run moose down in two or three hours if they must be chased, hunters prefer to hunt moose on those days when there is a good chance of successfully sighting the moose and killing it before it flees. The main reason people give why they wish to avoid pursuit of the moose is that if the animal is killed after it has been run to exhaustion the meat is "very tired" or "not good". It is described as black or dark, and the fat is said to be red.[12] The term oinasteoeo is used for meat in this condition. People try to avoid this by killing moose on days when the first approach may be sufficient, or on days when it will be least likely to be necessary to run the moose to exhaustion. This also fits the general rule that animals should, in general, be killed swiftly and without undo suffering or maiming.

In pipun, čisooaiao, rainy warm winter days, and mataoanipain, very cold winter days often with ice fog, are days on which it is not appropriate to kill moose. The Waswanipi say this does not mean it never happens, but that it should be avoided. With rain moose stay hidden in deep brush and are hard to locate and snowshoeing is very difficult and exhausting as the snowshoes get very heavy. With extremely cold weather the snow becomes hard at the surface and walking with snowshoes is very noisy and can be heard a long distance away. The little twigs and branches also become extremely brittle and instead of bending, snap, adding to the noise. In the former case, the hunter is less mobile and the moose are hard to locate, in the latter the moose are alarmed and flee long before the hunter approaches closely, assuring the need for a pursuit to exhaustion.

In _sikun_, days with _oateiao_ are preferred for killing moose. On many days in _sikun_ the top layer of the snow cover melts and then refreezes at night. On colder days following warm days there is _oateiao_, on these days a hard crust forms on the surface of the snow following the melt of the previous day, and lasts throughout the day. Also, as mentioned previously, in _sikun_ the snow is granular through its entire depth. These conditions assure that the legs of the moose will penetrate the granular snow deeply and that the crust will make flight very difficult or impossible. The moose may be able to walk through such snow, but they cannot run, and if discovered will normally stand their ground and face the hunter rather than turn and run through deep crusted snow. On other days in _sikun_ overnight crust may melt during the day, and moose may be able to run, requiring pursuit. In _sikun_ then, hunters prefer to kill moose on days when the moose are least likely to take flight.

In summary then, the Waswanipi not only identify three periods of the year when moose hunting is preferred, in two of these seasons at least they identify those days on which they think their chances of killing the moose, and of doing it swiftly and calmly are maximized. During the rutting season I have no comparable data on preferred days for killing moose.

The Waswanipi state that there are therefore two immediate preconditions for most successful hunts, to find signs of the moose and the occurrence of weather conditions. As I have stated, people may wait several days or weeks after finding signs before undertaking to kill the moose, waiting for the proper weather conditions to occur. When fresh signs have been found and weather conditions are appropriate Waswanipi hunters are confident of a kill. This was brought home to me in a somewhat dramatic fashion in the following interview exchange through a translator with a thirty-four year old man:

> Q. "Does he sometimes want to get a moose and he cannot get it?"

A. "Always gets a moose if there are signs."
Q. "Has there even been a time when the moose ran away?"
A. "Yes."
Q. "When was the last time?"
A. "A long time ago, nine years ago."
Q. "Why did moose get away?"
A. "Snow was not deep enough"
(Interview Notes, #57).

If a man limits his harvesting to preferred occasions, he will not pursue every sign, or even every fresh sign he finds. He will however be confident of his chances of success. Nevertheless, not all moose are killed at preferred times, and there is in fact a clearly recognized set of less preferred periods and days for harvesting moose other than those already cited. I will review them briefly.

Immediately after break-up moose are not generally hunted, but later during summer they may be. It is said to be generally hard to catch moose in summer because they are difficult to see, they can run fast, and they can run far if they are disturbed. Nevertheless harvesting is done in summer and moose can be hunted on any day. The preferred days however are <u>čišiteo</u>, Table 6-13; 'hot summer days' when the moose are most likely to come out from the bush to the shore to drink and cool off by bathing. The moose may be seen standing in the water <u>sačipekapo</u> or swimming <u>pimatakao</u>. In early morning or late afternoon men will go along a shore or a creek quietly in a canoe looking for moose <u>nanitaomusoikateo</u>. If it has not been a wet summer, and there are few pockets of water in the bush, chances of finding moose are considerably better. Alternatively, the tracks of moose may be sighted along a shore, for example between a lake with marsh and a dense stand of trees. Under some conditions the path may be used daily by the moose, moving between the feeding area and a refuging area, and a hunter may lay in wait for the moose in evening or at dawn.

After the rut the moose are said to come down to the water, <u>nasipeo</u>, at the end of October, and seems to me this would appear to be a period during which moose could be relatively easy to kill. Nevertheless, people say that this is not a good time to kill moose. The meat of the bulls is said to be not good after the rut, it is oinasteoeo, just as it is not good after the moose is run to exhaustion. It takes about one month for the meat and marrow to taste better so that not until November are moose again considered desirable. Between then and the period of high snow moose can be hunted. Snowfall is frequent in early winter so that the fresh tracks can be easily identified. Only fresh tracks are pursued and the weather must be musoesten, 'moose windy', Table 6-13. These days typically have blowing snow, indicating a strong wind which is said to cover the noise of the hunter's approach. If the shot is missed there is a good chance the moose will run away so extreme care must be exercised in stalking and shooting. Musoesten are said to be the only days to hunt moose in the fall. The time when signs are located and when favorable weather conditions occur, presumably must follow in quick succession, because moose are said to move a lot in the fall and to be widely distributed. These then are the culturally recognized occasions and methods for looking for and killing moose. The Waswanipi stress their effectiveness, but it should also be noted that they limit the occasions on which moose should be hunted.

ii) Annual Harvesting Plans

Some hunters say that they could kill more game than they do, and especially more moose. The question, "Could you have killed more than you did?" is not a culturally appropriate question, and usually elicits responses to the effect that "it is not up to me to decide." Nevertheless, in various other contexts statements on this topic did occur, statements which indicate that men do not, in their own view, harvest all that they might, and that they are confronted by decisions not only about how and when to hunt, but also about whether to hunt, that is, how many to kill. Asked if he could hunt moose whenever he needed them, one reply was, "Yes. Whatever he felt he needed for meat he would kill. He could have killed more" (Interview Notes, #52). When discussing particular harvests with another individual he was asked if there were ways he could have killed more, in the particular context, but his reply was general, "Does not kill more than he has to, or more than he wants to. There might be a way he could get more than he does" (Interview Notes, #85). The phrases "whatever he felt he needed" and what "he wants to" kill are recurrent in discussions of the underlying causality behind hunting and are a key to the examination of harvest levels.

What people "need" and what they "want" is culturally ordered and valued in standards of what is needed and/or wanted. This is expressed most directly in the annual hunting plans. Waswanipi say that it is common for a person to know what will happen in the future, and one common example of this is to know what they are going to be given in the coming year. Most hunters appear to consciously formulate an anticipated harvest of moose and other important animals for the coming year. I have only four occasions in my notes where an actual anticipated annual moose hunt figure was reported to me. They are two moose (Interview Notes, #52), two or three (Interview Notes, #69), four (Interview Notes, #13) and five (Interview Notes, #87). These figures also correspond with several comments on actual harvests at the end of a winter. For example, when three moose were harvested it was said to be a "good hunt" or "all he wanted" (Interview Notes, #45 and 72). These limited data suggest that the actual number of moose anticipated may range from two to five, and three may be a typical number. As in the case of beaver however, only men with family responsibilities but who are not yet <u>čenu</u> generally claim to such standards in their own hunts. Younger men and older men say they do not kill moose, or that they only get one once in a while. The former refer to lack of experience or need, the latter to weak legs.

Asked "How long does meat from a moose last?" responses range from one-half to two months probably varying with the size of the moose and the size of the family. One to one and a half months is the most common range, Table 6-14. This means that three moose would last three to four and a half months.[13] Since the standard beaver for a good hunt were estimated as three months of food, the standard moose plus beaver harvests would feed a family for six to seven and a half months, or about the average full winter stay in the bush.

Each hunter learns which number of moose he will be given in a particular year

Table 6-14 Responses to: "How Long Does Meat from a Moose Last?"

Individual Number	No. of Weeks a Moose Lasts a Family	No. of Months a Moose Lasts a Family
87		2
52		2
13		1.5-2
98	6[1]	
71	4[1]	
56	4[1]	
68		1
85	2	
81	6[2]	
43		1
79	2	

Footnotes:

1. Where an individual reported two or three weeks for two families this has been listed as four and six weeks for one family respectively.
2. Individual reported two weeks for families.

from dreams, thoughts and signs. The number, initially dreamed or thought, seems to be confirmed, or revised, by signs during the course of hunting activities. The clearest of these signs are sightings of moose themselves, both in the course of hunting, but also when the hunter is not engaged in hunting moose. As reported earlier, men often see signs of moose in the course of other activities in the bush. They may be out fishing in summer for example, and sight a moose at a distance. Such a sighting is a sign of future harvests, in the words of one hunter it "was showing me I will get two or three moose this winter" (Interview Notes, #69). The extreme of such signs is when a moose proceeds to approach close to the hunter under such conditions, and then it is a sign not for the future, but for the moment and the animal will be killed.

The number of kinds of signs and the complexity of the process of understanding such signs must be considerable for men who spend five to ten months a year in the bush observing and thinking about their experience. The nature of the problem was poetically as well as practically conveyed by a man who I persistently asked "How does he know he will get something?" He answered: "(I) think animals all the time" (Interview Notes, #34). However, if the entire process cannot readily be put into words, at least a critical synthesizing step is accessible in verbal reports.

Whatever goes into thinking about moose, one level of synthesis of the information that all men seem to arrive at, and to express verbally, is an evaluation of the relative order of size of the animal populations on the areas they harvest. A question of the form, "Are there more or less x than there were y?" is a culturally relevant question, where x may be any important hunted animal and y may be any specific time in the past, from a minimum of "last year" to when "you were a young man just starting to kill animals." Each of 19 hunters asked this question in various forms gave replies comparing levels of populations of various animals for several periods back from 1969. With such questions people can talk about whether there are more or less moose or beaver than there were last year or over the last five years, about whether the number of sturgeon, pike or fish in general have declined since the Indian commercial fishery began, about ten years before fieldwork, about whether the hare or partridge populations are rising or declining as they do every few years, about how there are more beaver now than there were when the season was closed, about thirty-five years ago, but less beaver now than when the season opened, about twenty years ago. For many of these questions, answers are consistent across many individuals reflecting geographically widespread trends. In other cases the answers are not consistent between individuals but only among the repeated answers of the same individual. In the latter cases the assumption that the trends are geographically localized always makes reasonable sense relative to my knowledge of the species under discussion and the conditions during the period under discussion.

In short, at one level data from sightings and other signs of animals, including the ongoing hunts themselves, is synthesized into statements of population levels such that it is possible to quickly and conclusively state the relative size of the populations of an animal at two different times and to speak trends, increases or declines extending over one or more years. The usual minimum unit for such evaluations is one year period, the maximum appears to extend back beyond an individual's own experience to statements made by parents of the oldest people about their own childhood, giving a time horizon of nearly one hundred years.

This verbalizable knowledge of the relative sizes and trends in animal numbers, synthesized from a wide body of experience, itself is considered an important indicator of what future harvests will be, of what will be given the hunter. If there is a declining number of animals on a territory, it is a sign that the hunter is going to be given less. If there is an increasing number on a territory then a hunter may be given more. These trends in future harvests are presumably reflected in the number of animals the hunter knows he will get in the coming year, but this is not the sole general indicator.

In the Waswanipi view, indicated previously, men do not harvest fewer animals simply because there are fewer, men harvest fewer animals because the animals are not being given. It is therefore pointed out that there are times when there are signs of moose around but they cannot be found, neither fresh signs nor the moose themselves. Other men say that when the moose are not being given the moose are still there but they, čitče manitou or čuetenšu, do not want them to be caught. It is therefore not only a decline in numbers that indicates a lower harvest, but also any indication that moose are not as easy to locate, track or kill. This itself might be a function of changes in population sizes but it may also be a function of moose "shyness" or "calmness" and subtle related behavioral changes. Hunters talk about whether animals are more easily scared now than they were at various times in the past, and also about how many young they are having now compared to various times in the past.

Thus the decision on whether to kill moose occurs primarily at the level of whether or not to try to actually find a group of moose whose presence has been indicated by signs. If the group is hunted an effort will be made to kill all the members. During the rut, moose are generally encountered singly, and during summer and early winter the moose also are frequently encountered singly, but during the other periods of winter, when preferred hunting periods occur, moose are encountered in clustered groups. In recent years Waswanipi say these groups typically range from two to four moose. The groups will often be composed of a female and her young of the year plus possibly one or two other moose. The age and sex categories distinctively labeled by the Waswanipi appear on Table 6-15. A female stays with her new born until they become musus as they begin their second year of life. Females are said to have one, two or three young at a time. Three is said to be very uncommon, and an indication of 'bad luck'. Twin births are said to be more common than are single births, so that a very common grouping of moose is an adult female and two offspring. The units that tend to be found yarding together are a female and her young, sometimes two such females and young, or a female, her offspring and a male. When a yarding group of moose is found hunters say they try to kill them all. Sometimes, if the moose go off in different directions they will not catch all the moose because each will be followed in turn, and some get too far away to warrant pursuit. The adults are pursued first. A big moose in winter is said to provide about twice as much food as a small moose.

Table 6-15 Age and Sex Categories of Moose (Mus)

Name of Sex Class	Sex Category
Nabemus	Male
Nosemus	Female

Name of Age Class	Age Category	English Gloss	Waswanipi Size Classes
onanšiš	Fetus	Fetus	
osaooacus	First four months of life	Baby	Baby
osaoua	First year of life	Calf	Small
musus	Second year of life	Yearling	Medium/small
katikunmus	Third and fourth years of life	Young adult	Medium
čemus	Fifth and successive years	Mature	Big

The killing of all the moose found in a yard coincides with the common phrasing of knowledge about when to kill and when not to kill moose. Waswanipi hunters say that if a moose is not being given then the hunter will not find it. The data on harvesting practices cited previously suggest that there are very few searches undertaken that do not result in locating and killing moose. The statement that moose that are not being given and will not be found, is based on those relatively rare occasions when moose are looked for but not found. But, I think, this statement must, on most occasions, be applied not after a futile search, but before, to prevent a futile search in those cases when a hunter is convinced he is not being given a moose. This was hinted at explicitly when shortly after being told by a hunter that he did "not kill moose all the time because may not be given". I asked "Why is he sometimes not given a moose?" The reply was "If he does not want to kill it he does not have to" (Interview Notes, #52). The decision that a moose is not being given may be the result of dreams or thoughts about how many moose are to be expected that year, or it may be the result of the ongoing hunting experience.

For example, if there are undue delays between the date a sign has been found and weather conditions for preferred days, or if moose have moved locations by the time preferred weather conditions occur, then these events are sometimes taken as indicators that those moose are not being given, and they will not be looked for. How much emphasis will be placed on these unusual or delaying features encountered during harvesting is, I think, related to the overall annual hunting plan, but clear data on this point are not available. What hunters do say during the year is that they "do not kill more than he has to", or "If there are many, kill what you need" (Interview Notes, #85 and #53 respectively). And since what a man wants/needs is related to what he has been told he will be given, which itself is related to how many moose signs there are, the cultural rules imply that hunters respond to indicators of moose population numbers and conditions. This would be so especially in late winter, because by late winter several moose may already have been killed, and men having hunted and trapped over much of the area may know the locations of many more moose. At these times a man may decide he is not being given those moose.

The number of moose a hunter "knows for sure" he will be given during a year, affects the number of moose he will look to kill that year.

Finally, the decisions on whether to hunt on a hunting territory or not are, in practice, decisions about whether to hunt the moose population on that trapline. While hunting territory use is always discussed in terms of beaver, the use of hunting territories involves moose hunting decisions as well. If a hunting territory is not hunted for beaver no hunters will establish full winter camps on the hunting territory, so winter moose harvests are not made as well. Only in the fall rut, if access is easy to a hunting territory, may a moose hunt occur even if the hunting territory is not to be used for beaver hunting. While hunting territory use inevitably is phrased in terms of a right to decide on beaver hunting, there were several indications during fieldwork that a sense of exclusive right occurred with respect to moose as well. There was, for example, an explicit reluctance to mark on maps moose killed on a hunting territory to which the hunters had no rights or invitations. During other discussions of decisions not to hunt particular traplines, it was clear that declines in moose populations sometimes were factors in the decisions.

In summary then, Waswanipi men have a prodigious knowledge of moose behavior in relation to environmental conditions and human hunting, and this knowkedge is structured so as to order preferred times and methods of looking for and killing moose. Such recipes are claimed to be highly effective and to minimize uncertainty of the outcome of hunting activity. These recipes are used in a context of a larger frame of knowledge which is the basis for annual harvesting plans which are established in the light of multi-annual trends in the population. Finally the use of longer-term trends in hunting decisions is supported by a series of proverbs. Hunting decisions are related to the set of proverb-like statements reported in Chapter 5. People say that a man cannot get what he wants/needs every year, and that if a man has 'luck' all the time he will not live long. The first of these proverbs expresses the view that even a mature hunter should expect not to meet the standard good hunt on all occasions, the latter that he should not steadily have a high harvest. Both imply a long-term limitation on harvests and acceptance of a long-term adjustment of harvests as proper and beneficial. The latter proverb explicitly links current moderation to future success, in hunting and in life itself.

C - Hunting of Fish and Other Animals

No data comparable to that gathered for moose and beaver were gathered for other animals hunted. A survey was made of the knowledge of times, places and methods for hunting other kinds of animals regularly killed, and information was gathered on the Waswanipi model of the annual cycle of harvesting activities which integrates and ranks the alternative activities possible at any one time. These two areas of knowledge are briefly reviewed in this and the following sections of this chapter. This will complete Part II and lay the basis for considering the actual patterns of Waswanipi activities in Part III of this study.

Fishing, *notomesano*, is done primarily with nets set in water in summer, and under ice in winter, *patsitaoneo*, and to a lesser degree with hooks on lines set through the ice in winter *koskaneo*. Some fishing with rod and reel was done *ot$_s$ikoatsikaneo*, but this was considered a White man's way of fishing by the Waswanipi people I spoke with, and a few men still used a spear, *takatsikan*, to kill fish. Techniques for killing fish were not however completely distinct from techniques used for animals. Some fish were shot with .22 calibre rifles, *pastisAkaneo*, and fish that were still alive when caught by net, hook or spear were often killed by striking them on the skull with a stick or paddle.

Fishing can be conducted at any time of the year, except for two or three weeks at freeze-up and again at break-up. In summer a distinction is made between *misakamin*, the period when the water is high in early summer, and *pakoao* the latter part of summer when water levels decline in June or early July. Some fishing activities focus on the specialized catch of particular species during spawning periods. However, during summer general fishing for several species is considered productive. During the high water period general fishing is said not to be as good as after the water goes down. In late summer the spawning periods of several species occur. Fishing continues intensively in the early winter period before the ice is thick, and generally declines after that until break-up occurs.

Summer fishing times generally depend on the distances to be travelled to good net sites. At Waswanipi River good sites are found almost immediately in front of the settlement, at least at some seasons, and along the river not far upstream and downstream. At Matagami, the Indian village was at the edge of the city just downstream from the town. The city sewage outlet was just upstream of the Indian village. Fish from the immediate area were said to taste bad, and most fishing was done in Lake Matagami which required a canoe trip of several miles and the crossing of one rapids. Some fishing was done upstream of Matagami, but as there was a series of rapids just at the town site, only a few men chose to keep their canoes permanently at beach locations on the other side of town from which the upstream reaches of the river were accessible. These were men who had or used hunting territories in that direction. The standard fishing net was 100 yards long by about four feet deep and had a 2½" to 3½" stretched mesh. Once on site it would take 15 minutes to a half-hour to check one, and men could have up to three such nets set at a time. Travel however might turn checking a net into a three or four-hour operation, if it was being done from Matagami settlement to Lake Matagami, for example. The closer river sites took about an hour and a half. People say that a net should be checked everyday.

In winter, setting a net under up to three feet of ice can take a whole day. Once set however it could be checked in about a half-hour to an hour and it was said it should be checked every second day, if possible. The specific techniques for setting nets, preparing nets, and repairing nets and other fishing gear will not be described here. For some accounts of techniques of fishing in other East Cree communities see Berkes (1976, 1977), Lebuis (1971), and Rogers (1973), on Fort George, Nemiscau and Mistassini respectively.

Sturgeon are caught all summer long, but not under the ice in winter when they are said to be *mosaopaio*, out in the deep waters of the lakes. Sturgeon may be caught in regular nets, but when specifically sought are caught with ten-inch-stretched-mesh nets and with spears. In June the sturgeon spawning runs occur for a period of one week. They are found during spawning in the water just below a rapids, *nitat$_s$ioan*. They used to be speared with a two-pronged spear made of a wooden pole and two large nails. Spearing would start with the fish furthest downstream because if the blood flowed into the pack the fish disperse. Sturgeon of ten to forty pounds are said to be most common now. Older larger sturgeon are called *nemeočenu* 'old-men sturgeon' and were thought to have hard flesh. Younger fish were preferred. Sturgeon feed during the summer at places where the bottom of the water body is covered in weeds and mud, *sasapiskao*, and where a net gets clogged with weeds. The nets are set near but not in the weeds in order to catch sturgeon. It is said that sturgeon may know the net is there and swim away rather than be caught, *ošimo*. This occurs especially if the net is visited frequently, the sturgeon, they say, smells the gasoline from outboard motor. Sturgeon is unique in that it is the only fish that does not normally die in the net. It is said to be bad luck when sturgeon die in a net. During commercial fishing operations sturgeon taken live from the nets were tied by the tails to the dock and kept alive until a shipment would be going out. They would then be brought in and killed and prepared for shipment. Grabbing a sturgeon is called *makonakaneo*. This is what would be done when night fishing with light. In several ways then sturgeon is a unique fish in the Waswanipi view. The distinctive quality of its flesh has been noted in the previous chapter. The preference for smaller fish rather than very large ones, and the expectation that a net should not be visited too frequently, suggest that there may be strategic and management decisions with respect to the harvesting of sturgeon but I did not pursue these questions intensively.

Pike are fished all year round. They spawn in May, and at that time large fish will move into a shallow weeded area, *kaakotačači?*. Here in a few inches of water they can be readily seen and are shot with .22 calibre rifles. The spawning lasts five days or a week. In winter pike can be caught on a hook and line set through the ice, near the surface.

Suckers and dore also spawn in early summer, the suckers in May. Suckers can be caught in small streams and at small rapids, dore, at the shores of lakes and streams, are said to be more widespread. White suckers are said to be willing to swim into bags during spawning and one technique to catch them was to hold potato bags open in the stream or rapids. They used to be caught this way, as well as with a net, spears, or by hand. Dore can be caught all winter.

In the late summer the whitefishes and goldeye spawn. The former spawn in October and November, some at rapids and some where rocky shallow bottoms occur near islands with generally deeper water around. They are caught in nets. Goldeye spawn in September in streams along the shores in slow current. If sought they too are caught in nets. Whitefish are caught in winter in nets.

Burbot spawn in February or March under the ice, at the same places whitefish use in late summer, near islands on rocky bottoms. Nets are used at these locations and are said to have to be checked twice a day because they are full. Hooks are used at other times of winter and are checked everyday, otherwise burbot "brings up" the hook.

Waswanipi people say that the fish are given to men as are the other animals. They say that sometimes there are many fish around where a net is set and they may not catch any fish or just one fish. During the period of my fieldwork the Waswanipi were also deeply concerned about the general low level of the fish populations of the major, most accessible lakes of the area. The chain of lakes from Matagami east to Waswanipi Lake had been supporting an Indian commercial fishery. The lakes where there was no commercial fisheries were still good, but in the ones that were harvested commercially there were less fish being caught now and the fish were harder to catch (Interview Notes, #53, Fieldnotes, #17, 115 and 47). In 1963, when H.A. Williamson visited Waswanipi Post he was told that the commercial fishery on Waswanipi Lake had been closed largely at the insistence of the Waswanipi who feared negative impacts on their subsistence fisheries. After the post closed the commercial fishery re-opened on that lake.

The Waswanipi hunters' knowledge about fish parallels their knowledge about moose and beaver in some important ways. Naturally occurring discussions of the conditions of the fisheries, and the effects of commercial fish harvesting are clear instances where the Waswanipi claim a relationship between past harvests and current and future harvest. In this case, too large a harvest by the commercial fisheries is considered to be the cause of the lower harvests being made in 1968 to 1970. Waswanipi individuals disagree on whether the fish are there or whether they have gone away, but it is agreed that they do not want to be caught. These features parallel those for moose and beaver. A similar process of knowing what will happen in the future also occurs with respect to fisheries as it does with moose and beaver. Thus, I was told that two men had known that there would be poor commercial fishing harvests in the summer of 1970, and also that the fishing would have to close down earlier than in the previous summers (Interview Notes, #114). Although the commercial fisheries were ostensibly run by the fishermen, the key decisions were in fact taken by the Indian Affairs Branch personnel, which subsidized the operation, and which in fact did decide to close the fisheries early that summer. The Waswanipi knew the relative magnitude of the harvests "before they started fishing", and they also knew Indians Affairs response to that situation. To what extent these pieces of the Waswanipi belief system may indicate that the Waswanipi regulate harvests of fish is beyond the scope of the belief system data I have available. The question is addressed however in a later chapter where I argue on the basis of behavioral data that some Waswanipi fishing patterns amount to a controlled system of harvesting.

Bears are hunted during any season of the year, but especially during winter, early summer and berrying season. Bears may be shot or hit over the head with an axe or heavy stick. During the summer men may look for bear. In early summer they look at places where fish spawn in shallow water - such as sucker spawning locations, and later in summer in good berry areas. If sighted in summer the bear may be shot. If signs are seen and a path is found a large leg-hold bear trap can be set and baited usually with fat of moose or beaver wrapped in paper with motor oil or naphta on it. If a bear is caught it will not die in the trap. When the hunter returns he will call to the bear to get up, and when the bear rises and faces the hunter he will shoot it.

In winter, when bears are denned up, the dens can be found sometimes, because in winter the snow is yellow around the air hole through the snow. Bears apparently often use the same locations so that hunters can check denning sites that have been known to be used before. Often signs of the bears' preparations for winter will be found around the den, claw marks on trees, and conifer boughs broken off to form a bed. It is said that bears break the boughs, stakuin, downwards whereas human beings break them upwards. When a cave is found it may be excavated. Then the bear is called to come out and the bear understands what people say and comes out. He is slow when coming out and is either killed with the back of an axe or shot. Bears are considered the most powerful animals, and most are killed by men who have "started thinking" or under the supervision of such men.

Lynx are killed in winter. Lynx are caught in snares and traps and by being run down. They are killed by being hit over the head. If a man sees a lynx, or very fresh tracks, he may try to run it down. Not all men can do this, but some can and do. The hunter follows in the tracks of the lynx, running hard on snowshoes and in twenty minutes the lynx is exhausted, stops and faces the hunter. The lynx is killed with a blow to skull. The meat is not good to eat. A variation on this method is to chase a lynx more slowly, so it snares itself. If very fresh lynx tracks are seen near a hare trail in the snow, the hunter sets a wire snare for lynx on the trail and then proceeds to chase the lynx. Pursued slowly the lynx stays in front of the hunter, but is reported to have a tendency to circle back on its own trail. When it is allowed to do this it is caught in the snare set at the beginning of the pursuit. I do not know how common the technique is, only two or three men told me they ever used it. Most lynx are simply caught in leg-hold traps, No. 3, or snares set in hare runways in areas where there are signs that lynx have been hunting hare. Where a lynx has stolen a hare from a hare snare set, it often will eat half of the hare and bury the other half under the snow nearby. A trap may be set next to the buried hare to catch the lynx.

Lynx are said not to die in traps, if they do it is bad luck; but it is said that they will not usually die even if they are in the trap a month, they just slowly starve. Nevertheless, men should not leave lynx traps unchecked more than a day or two. If a lynx is left in a trap for a long time it will fight a lot and the meat will be bad. Traps are regularly checked and the lynx killed with the back of an axe. Lynx caught in snares strangle to death quickly.

Other fur-bearers are most often killed in winter when pelts are prime, in trap sets made along the trails the men use to visit beaver lodges. Mink, otter and marten traps may be set in appropriate locations near signs. There may be several along a trail. Marten sets are more likely to be further away from water courses than the mink and otter and take longer to check, up to a half hour. But marten are considered easy to catch. If the fur-bearer traps are appropriately located they will be visited only every fourth of fifth day. Weasels are generally not killed intentionally but are caught in sets for other fur-bearers. Occasionally they are caught to make medicine from oil sacs. Muskrats are sometimes trapped at winter push-ups, but are mainly harvested in spring when they are shot swimming along the streams and rivers.

Hare and grouse are snared and shot in winter and in summer. Intensity varies with populations and anywhere from ten to a hundred rabbit snares may be set at points along the rabbit trails packed in the snow by repeated use. Usually they are set to form a short circuit out and back to the camp. They are visited every few days. Hares are not good to eat unless killed quickly when caught in a snare. If caught unintentionally by a leg in a trap they are not good to eat unless found soon. Traps are generally set to try to avoid this. Grouse are harvested along the trails on the way to other activities or on summer outtings. Grouse may be seen but not pursued if there is the possibility of big game in the area because the shot will alert the big game. Young men hunt the grouse with sling shots. Spruce grouse may be killed by manoeuvering a snare at the end of a pole over their heads and strangling them while they sit motionless in the hunters' presence. Porcupine are knocked from trees, or the tree is chopped down, and the animal killed with a blow to the skull.

Waterfowl are hunted intensively in the late winter when they return from the south, intermittently through the summer and somewhat more intensively again in the fall when in migration again. Loons are the most actively sought all summer. Waterfowl are killed with shotguns and rifles. When disabled they would be picked up and then killed by twisting the neck.

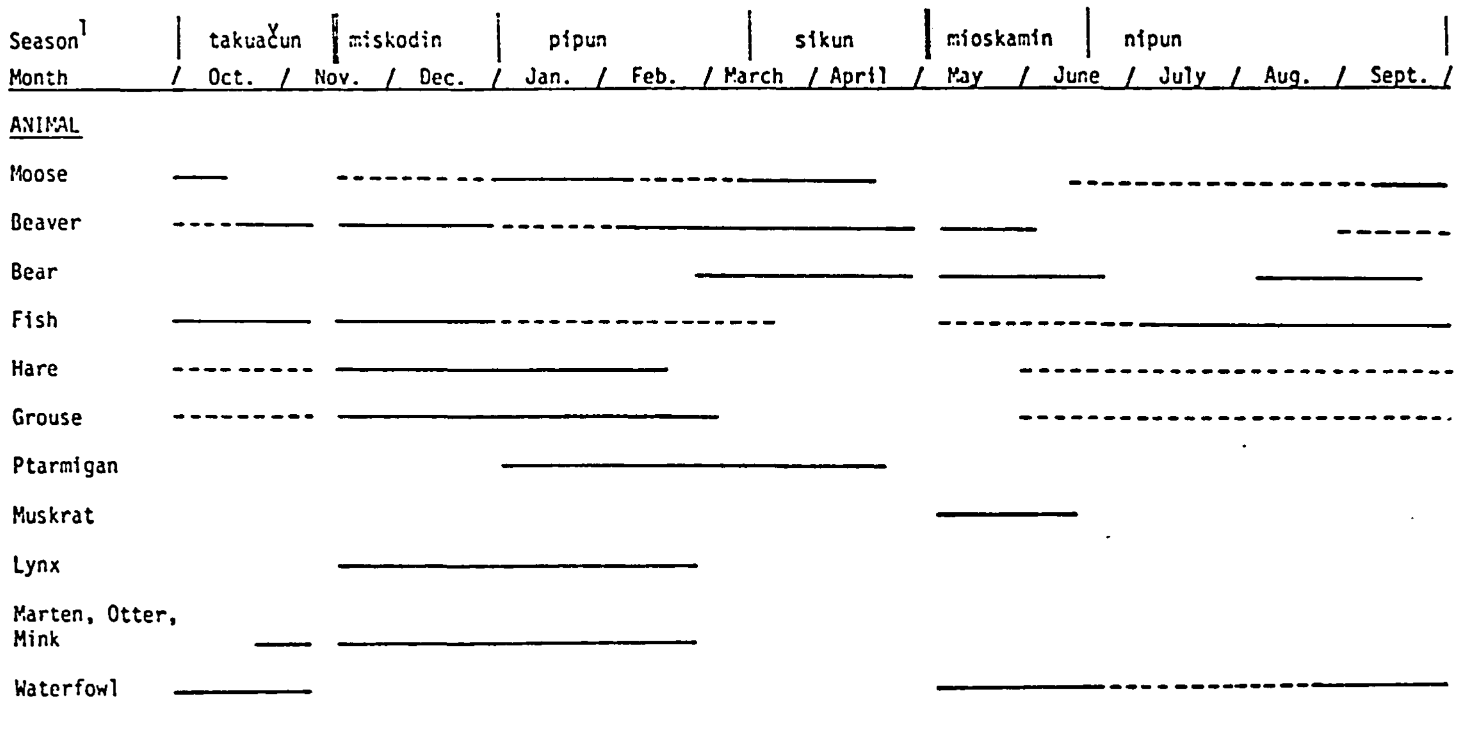
D - Annual Cycle of Hunting Activities

The preferred periods for hunting each of the various kinds of animals just outlined are integrated into an overall program for the distribution of hunting activities during the course of a yearly cycle. This is clearly done by the Waswanipi themselves who specify for each recognized season those preferred hunting activities which typically occur at that season. The annual distribution of preferred hunting periods for the various animals are presented graphically on Figure 6-5.

The first feature of this figure to note is that the preferred periods for moose hunting and beaver hunting complement one another. From mid-September until early-June there is an alternating set of preferred periods for hunting one or the other of these two animals, with the exception of freeze-up and break-up. Only the summer period from June until mid-September is not preferred for either animal, although most of the period is a secondary period for moose hunting. The harvesting of bears also covers a brief part of this period.

During the summer period the preferred activity that is more or less continuous is fishing, from July until December. In May and June fishing is

Figure 6-5 Annual Cycle of Hunting Activities and Periods



Key:

- continuous line is preferred harvesting period
- broken line is secondary preferred period
- blank indicates non-preferred periods during which it may still be possible to harvest

Footnote:

1. Double lines indicate freeze-up and break-up.

discontinuous, being preferred during a series of four, five to ten day long spawning periods (pike, dore, sturgeon and sucker).

During the course of a full year then, the preferred periods for hunting moose, beaver and fish together provide a continuous chain of periods which effectively fill the entire annual cycle, with some overlaps, particularly in late winter between moose and beaver and in late summer between fish and moose or beaver. The preferred periods for the other animals fall into two parts of the annual cycle early and mid-winter which is for hunting hare, partridges, lynx and fur-bearers, and late winter and summer for muskrat and waterfowl. These periods dovetail to form a continuous chain of preferred periods from September to June, with a break only for July and August. In effect then there are during any period of the year at least two animals or animal groups which it is preferred to hunt during that period. The only exceptions are July and August, but during those months several secondary preferred periods occur. Often there are usually more than two animals or animal groups which it is preferred to hunt in a given period.

If attention is directed only at the most highly rated, preferred 'flesh food' namely moose, beaver, bear, sturgeon, and geese, it will be seen that the preferred periods for hunting these preferred species also form a continuous chain throughout the year. Moose and beaver together cover mid-September to mid-June, sturgeon spawn in June and are fished all summer, geese are harvested in migration in late summer and late winter.

The Waswanipi also say that because of differences in the weather conditions from one year to the next, the intensity of the harvest of particular animals will vary from year to year. In some cases, the choices between two alternative animals will be influenced by these considerations. The most important example is the winter hunting of moose and beaver. In winters with early, heavy and continuous snow cover, the locating and trapping of beaver will be made more difficult, and people say they are given less beaver. These same conditions, however, create especially favorable conditions for hunting moose, and people say they may be given more moose in such winters. In winters with later, below normal, and less continuous snow cover, the opposite effects on hunting will occur, fewer moose and more beaver may be given. In summer, moose respond to the opposite precipitation conditions. Limited rainfall means there will be fewer water pockets in the forest and moose will come to the shores of water bodies more frequently, and will be given and killed more often.

E - Conclusions

The decision models outlined in the present chapter indicate in some detail how culturally encoded categories, propositions and values may be integrated not only into models for experiencing and understanding the world, but also into models for acting in the world. It is an analysis of this kind, an analysis which links people's models of and people's models for their reality, which I consider essential for an adequate ethnoecology.

In this second part of the present study I have linked together approximately a dozen types of cultural models that are parts of the Waswanipi belief system and that are relevant to decisions concerning hunting activities. These include specific models for ordering: 1. immediate human needs, in this case for food and some materials; 2. long-term human goals and aspirations for the conduct of life, and the fulfillment of moral responsibilities; 3. those parts of the Waswanipi world that are potential resources, in this case living resources; 4. preference scales among those resources with respect to meeting certain needs or ends; 5. alternative methods of producing need fulfilling products from those resources; 6. the labor, environmental, technological and information requirements for each of those methods; 7. the steps and alternative choices that have to be taken to implement each method; 8. the level of uncertainty associated with each resource/method combination; 9. the potential consequences of the use of each method, i.e., the relationship of each method to longer term goals and aspirations; 10. the situational choices among methods; 11. the scheduling of various resource use activities so that they overlap and integrate appropriately; 12. expected levels of success with respect to attainment of immediate needs and the long-term goals; 13. the linkages between experience, action, consequence and history that make possible a meaningful life. Taken together, these models constitute a program for rational, i.e., culturally structured, decision-making, action and living.

The models described herein clearly show how folk systematics and ethnoscientific classifications are themselves critical components of decision-models. But the models for hunting also show how ethnoscientific classifications, in and of themselves do not lead to models for action. Models for action built on ordered classifications of needs, goals, resources, tools, time, space, persons, etc. but they are not concatenations of such folk classifications, nor are they simply based on the same criteria as those classifications, as has sometimes been claimed. They also depend on propositions, values, and historical experience.

Furthermore, the decision models outlined here not only involve formulations of goals, situations and means, and a ranking of courses of action, the models involve anticipations of the consequences of such action. The models therefore can be used to anticipate and deal with the uncertainties of current decisions.

The means of dealing with uncertainties is through a continuing process of anticipation, decision, action, effect, evaluation, anticipation, and decision. There are anticipated consequences of a decision which form a part of the decisions, and there are means of evaluating the actual consequences of action that flow from decisions and of responding to those consequences in new decisions.

Decision models for action therefore imply an ongoing process of interaction between belief, action, consequence and experience. This relationship is however complex, in that the relationship of belief to action is not to be assumed, nor is the relation between the consequences of that action and the experiences of those consequences to be assumed. Thus, the Waswanipi model for hunting must be compared to independently gathered data on action; and, the consequences of hunting activity must be independently assessed, and then compared to the experienced consequences. On the latter point, Waswanipi decision models contain explicit formulations of the different kinds of consequences that can be expected, and the relation of these to the actual consequences is an ojbect for examination.

The formulation of decision models therefore leads to an analysis of actions and their consequences. The analysis of hunting activities will occupy Part III of the present study, and the relationship of decision, action, consequence, and experience will occur at various points throughout that discussion and will be returned to at the end of that section and in the conclusions.

Footnotes for Chapter 6

1. The transformation of appropriate animals into appropriate 'flesh foods' for human consumption is effected in part by the process of harvesting the animal. Other transformations are usually necessary before animal foods can become food at a meal. These include butchering, cooking, takasAkaneo 'to cook', and in some cases preservation. The butchering of animals will not be discussed here. Several ways to cook animal foods are recognized - pakatakaneo, to boil or stew the food in water, čistaAkaneo, to roast pieces on a stick over a fire or along side a stove, sakapaneo, to roast the food in a stove, and sasetikaneo, to fry the food. People say they never used to fry things in the old days (Interview Notes, #114). There are however other ways to transform animal food into consumable food, namely smoking and drying. Smoking 'flesh food' akApasikateo is done by placing large pieces of 'flesh food' on a rack over an open fire. To dry 'flesh food', pasinaoaneo, the 'flesh food' is cut into thin pieces before being placed on the rack and is dried right through not only on the surface (Interview Notes, #114). Smoking and drying are not spoken of as kinds of cooking, rather they are spoken of as ways of storing animal food, astatsikonaneo. A third method of storing, freezing the animal food, maskaoatitakaneo, is possible throughout the winter months. Smoking and drying are mainly done in summer or with meat that is to be kept for the summer. 'Flesh food' that has been frozen is cooked to be consumed. Meat that has been dried or smoked is usually boiled to prepare it for a meal, but the broth in this case is not eaten, whereas with fresh meat it is eaten. 'Flesh food' that has been smoked lasts about one week, and does not attract flies as does unprocessed 'flesh food'. Dried 'flesh food' can be kept a year, or "as long as you want to keep it." Fish can be smoked or dried, and can last several months. For some 'flesh foods' drying, and possibly smoking, are sufficient to transform the 'flesh food' into a consumable condition. Thus, fish may be eaten after being dried and without cooking, as may some pieces of meat, especially moose. Beaver is said to be dryable, but is said to get mouldy with age because of its fat. Those animal foods that are eaten after drying and without cooking are especially valued. A very few kinds of 'flesh foods' may be eaten without being cooked, smoked or dried, particularly small pieces of fat, pimi, and sturgeon roe, which is very fatty. Pimi contrasts in the context with 'meat' wies. 'Flesh food' that is so eaten is highly valued. In some of these cases at least, it appears that the fat so eaten is not so much a 'meal' as an 'offering', although I have not inquired explicitly on this point. The degree of fat is an important criteria for rating 'flesh food' and is an important feature of comment about animals that have been caught or that are being eaten. For example, beaver is good to eat because it is fat, moose is good to eat if it is fat, bear is good to eat when it is fat (Interview Notes, #14). There is a legend in which čuetenšu personally tries to kill a young hunter by sending extreme 'cold' into the lodge, and the young hunter is able to save himself, and his kinsmen by pouring 'fat' he has been saving up into the fire to drive the 'cold' back outside where it belongs and where it is not so dangerous.

2. In the case of beaver harvesting, eight individuals gave extended accounts of their knowledge, most of them over a series of two to four interview sessions (Individuals #56, 61, 67, 57, 85, 25, 88 and 69). In addition over twenty other individuals provided some significant useful new or confirming data. The account provided here is a composite cross-checked with several of these individuals. In general not every citation of specific individuals will be given in the text unless the data cited are unique to a single informant or there is a reason to believe it may not be commonly held knowledge, or in cases where a highly specific ethno-model was elicited from several individuals for comparison. Context will distinguish the significance of the citation.

3. Harvesting activities occur in spatial and temporal contexts. Some spatial categories are unique to particular harvesting activities, and the Cree language has a rich repertoire of forms for categorizing, naming and describing geographical and vegetational features of the landscape. No full accounting of spatial categories has been attempted here. See Appendix 6-1 and MacKenzie, 1977; Mailhot, 1975; Denny, 1975.

4. My data are not entirely clear, but the ease of locating lodges is also thought to be related in the Waswanipi view to weather conditions, and especially snow conditions in some of the comments I have. If snow cover forms early in fall and is deep it makes location beaver lodges more physically difficult, and may result in some being missed.

5. Tanner (1976) has a discussion of the symbolic meaning of this practice for the Mistassini.

6. This suggests that an important piece of knowledge would be whether the lodge was inhabited the previous years, and whether it had been hunted, and whether beaver were left after hunting. Such knowledge would be available to a man who was hunting the same area year after year. However, as I will indicate below, this is often not the case, and the Waswanipi themselves did not emphasize such a consideration.

7. These figures are based on the flow diagrams used by Keesing to present cultural rules for decision-making (1971a). Some of the comments Keesing has made concerning the use of flow charts should be summarized here. The charts show an initial condition and then the alternate paths that can be followed to culturally possible final outcomes. The nodes (diamonds) are contingent circumstances with more than one possible outcome. The charts imply logical sequences, but not necessarily temporal sequences in time (Keesing, 1970a:994). The intention of the flow charts is to formalize the relationships reported in the discursive text and reduce ambiguities. The assumption is that culturally recognized courses of action are limited, and that expectations are based on these limited outcomes. There is an assumption that behavior will show some meaningful relationship to these structures, but there is no assumption that people blindly follow a set of rules, nor that the rules can cover all circumstances, nor that behavior can be predicted on the basis of these logical relationships in the

particular cases (cf., Keesing, 1970a:1018; and 1971a:47-48). In the present study such assumptions are unnecessary because independent records of actual harvesting behavior are available and are analyzed in Part III of the study. There will be a number of points at which the relationship between model and behavior can be examined at that point.

8. Other techniques of snaring, such as forming a "tree" of snares are used in other Cree communities. I was unaware of these methods at the time of this study, and they were not described to me at Waswanipi. I am unsure if they are known.

9. At the time of this study only two men were intensively using a skidoo on the traplines. They would travel by skidoo out from their camp to the mouth of a stream to be trapped and then proceed up the stream on snowshoes. Alternatively they would trap only beaver families located along river banks and lake shores where they could use the skidoo for the entire travel. However these habitation sites are located further apart than on streams. The net effect of using a skidoo was to increase the number of lodges visited a day to approximately five.

10. There is a long debate in the anthropological literature on the legal nature and origin of the hunting territory systems. This will not be the focus of the present discussion, although I will, in the context of an analysis of the historical data on Waswanipi, return to this topic. I will use the terms hunting ground and hunting territory interchangeably in this discussion.

11. Adrian Tanner has made this point for the neighboring Mistassini people (1973).

12. This appears to be a reference to the effects of muscle exhaustion and insufficient oxygenation.

13. People say that a family requires between one and two moose hides per year to lace snowshoes and make moccasins and mittens. A hunter may replace each of his one or two pairs of snowshoes each year, and use two or three pairs of moccasins plus mitts. The women and children will require the same items but fewer. Moose hides are sold between families for $45 a hide, fully prepared and tanned.

CHAPTER 7 HUNTING ACTIVITY: INDIVIDUAL INVOLVEMENTS, SOCIAL GROUPS, AND PRODUCTION FOR USE AND EXCHANGE

A - Introduction

The third part of this study concerns the description and analysis of the actual behavior of Waswanipi hunters. I have argued in the introductory chapters that human action must be a central focus of ecological anthropology and, in the course of the present study, I have indicated how the analysis of a central and ecologically relevant cognitive domain such as 'living beings' reveals that the main concepts in that domain are multivocal symbols that link propositions and values, and that comprise central elements in models that inform both explanation and action. In addition, 'hunting' was shown to be a concept whose meaning for the Waswanipi provides a pervasive model and an ultimate goal, or project, for living. That project is to live in intimate balance with a cyclical and powerful world, contributing to its maintenance and moderating its variability. I have also indicated the yearly, seasonal, and daily recipes for action which will be consistent with, and essential to, pursuing that project. In the remaining chapters I examine and analyse independently gathered data on the actual behavior of the Waswanipi hunters.

This third part of the study examines the actions of hunters in relation to their environmental settings including the consequences of behavior, foreseen and unforeseen, on those settings; it also examines the actions of hunters in relation to the ethnoecological models formulated in part II.

While the cultural belief systems are a synthesis of "common" or "shared" elements of the ideational order, an observer's model, action will be treated first as an individually situated event. The actions of individuals will also be described as a system that is more than the simple sum of such individual actions. This is not however, I would hasten to add, to desocialize the individual, individuals act in ways that are structured by their individual understandings of the social expectations of others in their world, as I will indicate in detail. And, in the Waswanipi case these socially significant others include personal beings both within and beyond Waswanipi society, including animals and other powerful beings. The individuals' acts are socially rooted to their core, but the actor is no less an individual. This is the dialectic of human life which is lived in the interaction of human action and belief in a social context.

In this part of the study I will examine, in turn: individual involvement in hunting activities, social organization and external exchanges of goods and services relevant to hunting; the levels of production of food and materials; the labor time and reliability of hunting activities; the use of resources in relation to the reproduction of resources; and, the use of land and the distribution of people in relation to resource use, i.e., the resource management strategy. Each of these topics will be discussed in turn as either a chapter or a major section of a chapter. Most chapters involve looking at individual actions of small production and consumption units, and then examining the community-wide pattern which is brought into being by the individual or small productive and consumption group activities.

The last chapter specifies the mechanisms by which community-wide patterns are generated through the action of socially located individuals such that the overall pattern is not just a sum of individual decisions; and such that individuals are socially and culturally located with respect to a social organization and culturally encoded projects. Throughout the analysis I give consideration to decision making by elaborating on the possibilities for choice and describing the actual patterns of action.

Chapter 8 analyses Waswanipi production of foods as sources of energy and other nutrients and demonstrates that the level of production is not set by immediate need, and that the 'mix' of resources used is also variable. These two issues are formulated as problems of decision making. The chapter indicates in a general way how production is allocated, but only raises the questions of how the level of production and the mix of production is decided. These questions are returned to in following chapters and in the conclusions of the study.

Chapter 9 analyses production in relation to the labor inputs to hunting and the levels of uncertainty with respect to outputs. The analysis indicates how the two variables do not coincide, and how Waswanipi decisions are taken with respect to choices among alternative short-term goals, i.e., how parts of the decisions on the 'mix' of resources used is taken.

Chapter 10 analyses production, harvests, in relation to the productivity of the resource populations, and in relation to alternative goals and strategies for managing those populations. The analysis shows the alternative choices of long-term management goals which are possible and it analyses hunters actions to indicate the choices the Waswanipi make with respect to the actual levels of harvests taken. The specific consequences of those choices on the animal populations they are harvesting are considered. The chapter demonstrates the significant control the Waswanipi exercise over the resource populations, and how choices must be made among alternative long-term goals.

Chapter 11 analyses the social organization of decision making, showing how community-wide patterns are generated from the decisions of individual socially located decision makers using culturally encoded models. The strategies and tactics for the management of the use of resources and for the associated management of the resource users are specified on the basis of a mix of behavioral and cognitive analyses. The management practices identified are then considered in a historical perspective.

Before beginning these analyses however, the present chapter provides the basic background data on: the involvement of individual men in hunting activities; the hunting groups and commensal groups that are the main production and consumption units of the society; and, the range and extent of exchanges between hunters and the market economy, and the relative balance between local domestic production and inputs from the market economy. Each of the items examined in this chapter could be the basis of a chapter, or indeed a study, in its own right. My treatment of them here is limited to a basically descriptive account intended to serve as a background to the ecological analyses that are pursued in the following chapters.

B - Individual Involvements in Hunting

i) The Classification of Involvements

As I have indicated in chapter 2, hunting was an important activity of the Waswanipi people in 1968 to 1970, as it had been throughout their past, and as it has continued to be up to the present. In 1968 to 1970 every able-bodied resident Waswanipi man did at least some hunting, the most universal activities being fall moose hunting, spring and fall waterfowl hunting, and summer fishing. Hunting activities were important to everyone involved, even when the involvement was not intensive or extensive.

The actual extent of involvement of individuals in hunting activities varied considerably among resident adult men during the period of this study, and some indication of the intensity and extent of involvement among the population is a prerequisite to fuller analysis of the hunting activities of the community members. As I have already indicated in Chapter 2, hunting was not the sole productive activity in 1968 to 1970, it was not the sole means of meeting subsistence needs, nor was it the sole source of cash incomes. As is characteristic throughout the Canadian north, the

Waswanipi people were practicing a mix of economic activities involving various combinations of hunting and wage labor. A very small number of individuals were primarily dependent on welfare. At Waswanipi, however, as in the entire James Bay area, hunting has remained a more significant and important activity, for a larger percentage of the men, than is characteristic of many other areas in the Canadian sub-arctic regions.

During the main fieldwork period for this study, from the fall of 1968 to the fall of 1970, there were 107 men resident in the Waswanipi communities at Matagami, Miquelon, Desmaraisville, and Waswanipi River. This total does not include five young men, over the age of eighteen who were still in full-time attendance at schools outside the region during the school year, but who would technically be considered residents of these settlements. The total does include all the men who were considered by the Waswanipi to be potential hunters or working for wages. Thus, the total includes those young men who have left school and who had either begun to learn to hunt, or who were working or seeking employment. The former criterion led to the inclusion of the youngest men in the group, one born in 1956 and one in 1955, both of whom began their training as hunters in the fall of 1969 when they were thirteen and fourteen years old respectively. By these criteria the list of 107 resident men included fourteen born after 1950, and therefore under 18 years of age when the fieldwork began.

The Waswanipi distinguish several categories of involvement a man may have in relation to hunting activities. In discussions Waswanipi generally distinguished between men who participated in winter hunting activities from camps located outside the settlements, which activities typically included intensive hunting, and those men who do not participate in winter hunting from bush camps. The set of activities that are involved in hunting from winter bush camps is in many ways definitive for the Waswanipi of a commitment and involvement in serious hunting. The discussions indicated that the classification of men by these criteria was not based on the activities of an individual during a single year, but rather on the activities of a man over a few recent years. Thus, a man might not hunt one winter because he, or his wife or child, was ill, because he wanted his trapline to rest, or because he had taken employment for that winter, but he would still be considered an active hunter. The winter period is however significant because during this time of the year a clear choice must be made between fully active hunting, including trapping, and wage employment. During the summer it is possible, to some degree, to work in bush locations and continue summer hunting activities.

Among those who did not hunt from winter bush camps two categories of men were identified by Waswanipi as not being, in their view, active hunters. In the ethno-classifications one category of men were said to have no serious hunting experience, they were men who had not undertaken to learn the techniques of hunting, and especially winter hunting. Such men almost universally could and did hunt waterfowl in spring, fall and summer, some hunt moose during the fall rut, the time of the non-Native sport hunt, and all could fish during the summer, although few actually did. During the course of the year they each did engage in at least some of these hunting activities. But, these men were not considered experienced hunters because they did not know, and were not in the process of learning, how to live in the bush in winter, and how to support themselves and their dependents by means of their hunting. These men valued the hunting that they did do, and the products of their hunts were used by them for food and to meet other needs, but both they and the community at large considered that they were not fully experienced hunters. They knew how to kill some kinds of animals, but they did not know how to systematically carry on the wide range of hunting activities over a period of several months and years that is the criterion of an experienced hunter. Such men did not know how to "think" in the bush, did not know how to get what they wanted and needed, and did not have powers of their own. To start to learn such things they said they would have to live in the bush in winter for a few years. Ten men were said to have no serious hunting experience by themselves, or closely related persons in the community. All of these men were born between 1938 and 1950, and were therefore approximately 18 to 30 years old. Everyone born before 1938, and therefore older than 30 years of age, had serious hunting experience.

The second ethno-classification was of men who were not active hunters were men who were said to be former hunters. These men had, at one time or another, been fully active and experienced hunters, but were now either permanently employed or were remaining continuously available for occasional employment. They said they were not hunting intensively at the time of this study. These men also did some hunting, especially for waterfowl and for moose during the fall, and sometimes for fish and/or small game. Occasionally they would trap for fur-bearers, but this was rare, and when it was done very few traps were set, and they would not be set for long regular use. Those who were continuously employed would hunt in the evenings in summer, and on weekends and during annual holidays. One or two with relatives in the coastal Cree communities would take their holidays in the fall and go to the James Bay coast for the goose hunts. Those who were occasionally employed would hunt also during the periods between jobs, but without establishing their own bush camps, and without any sustained involvement over several weeks or months at a time. Nine men were considered former hunters by themselves or their close relatives, and they varied in age from about fifty years old to about twenty. One was born in 1917, two in the 1920's, three in the 1930's and three in the 1940's.

Thus, of the 107 resident adult men, a total of nineteen were considered either to have no experience at intensive hunting, or were not hunting intensively any longer, although men from both groups were involved in some hunting activities on a regular basis. Table 7-1 lists the 107 resident men, their years of birth, their classifications and their general hunting experience during and immediately previous to the fieldwork period. It should be noted however, that the classification of individual men can and does vary over time. Thus, in the period since 1970, I am aware of four of the nine men who were listed as former hunters in 1968 to 1970 who have returned to full-time winter hunting for one or more years, and at least one of the men listed then as having no experience has also learned to hunt since. The ethno-

Table 7-1 Hunting and/or Trapping Experience of Waswanipi Men

Ethno-Classification of Hunting Involvement[1]

R "Retiring" -	Reduced hunting activities because of physical conditions brought on by old age. Most still active on a limited basis.
T "Training" -	Undergoing apprenticeship and/or explicit instruction in hunting.
F "Former" -	Formerly fully active who reduced activities to take ongoing employment. Most still hunt waterfowl and big game.
N "Inexperienced" -	Never undertook or completed training. Most hunt waterfowl or big game.

Intensity Classification of Hunting Involvement[2]

A "Fully Active" -	Spend at least five months a year at winter hunting/trapping[3], unless temporarily restricted by illness or animal conservation.
P "Partly Active" -	Residual category.

No.	Class of Involvement	Year of Birth	Hunting and Trapping Experience
1	F	1938	1969-70, 1968-69: working full-time. Went hunting and trapping last seven years ago.
2	R	1901	1969-70, 1968-69: trapping within walking distance of the settlement. In 1969-70 trapping activity reduced again due to age.
3	R	1904	1969-70, 1968-69: trapping all season. Lives in bush in summer, 15 minutes by canoe from settlement. Has young men in training with him most winters.
4	F	1924	1969-70, 1968-69: working. Went hunting and trapping last five years ago.
5	P	1925	1969-70, 1968-69: steadily employed; sets a few traps near settlement. Last spent whole season hunting and trapping in 1965-66.
6	F	1928	1969-70, 1968-69, 1967-68: working at various jobs.
7	T	1953	1969-70: five months hunting and trapping; 1968-69: one month; 1967-68: four months. Hunts and traps a few months each year, still in training.

Table 7-1 Hunting and/or Trapping Experience of Waswanipi Men (Continued)

No.	Class of Involvement	Year of Birth	Hunting and Trapping Experience
8	F	1938	1969-70, 1968-69: working intermittently. Sometimes trapped when not employed, but did not in 1969-70, 1968-69, 1967-68.
9	P	1947	1969-70: 3 weeks trapping; 1968-69: none. Traps sometimes when not employed.
10	P	1950	1969-70: trapped one week; 1968-69: none. Traps sometimes when not employed.
11	A	1930	1969-70, 1968-69: hunted and trapped all season.
12	P	1940	1969-70: two months trapping; 1968-69: two months; 1967-68: one month. Works intermittently and traps when not employed.
13	A	1909	1969-70, 1968-69: hunting and trapping all season. Did not hunt and trap in 1966-67 and 1964-65 due to illness.
14	A	1924	1969-70: in hospital one year; 1968-69, 1967-68: hunted and trapped all year, but from a settlement and not intensively because of illness.
15	A	1923	1969-70: hunted and trapped all season; 1968-69: worked fall, then hunted and trapped five months.
16	T	1950	1968-69, 1969-70: trapped with No. 15.
17	F	1940	1969-70, 1968-69: working intermittently. Last hunted and trapped eight years ago, prior to which he hunted and trapped for five years.
18	N	1944	1969-70: two months hunting and trapping in the Fall, after which he left the region to take steady employment. Helped No. 69. 1968-69: no hunting and trapping.

Table 7-1 Hunting and/or Trapping Experience of Waswanipi Men (Continued)

No.	Class of Involvement	Year of Birth	Hunting and Trapping Experience
19	P	1909	1969-70, 1968-69: regularly employed, sets a few traps on his ground near settlement where he lives.
20	P	1916	1969-70, 1968-69: discontinuously employed, no hunting or trapping. 1967-68: hunted and trapped a few months.
21	A	1906	1969-70, 1968-69: hunted and trapped whole season.
22	A	1914	1969-70, 1968-69: hunted and trapped all season.
23	A	1948	1969-70, 1968-69: hunts and traps with No. 22.
24	R	1902	1969-70, 1968-69: traps a little around settlement. Hunted and trapped only part-time since 1944.
25	A	1929	1969-70, 1968-69: hunted and trapped whole season.
26	P	1931	1969-70: hunted and trapped two months; 1968-69: a few weeks. Last hunted and trapped a full season two years previous.
27	A	1931	1969-70: hunted and trapped two weeks in fall, and three months in spring; 1968-69, 1967-68: all season.
28	A	1935	1969-70, 1968-69: hunted and trapped all season.
29	N	1938	1969-70, 1968-69, 1967-68: working. Has spent time in the bush formerly, but never hunted or trapped full-time. Now intermittently employed.
30	P	1939	1969-70: working; 1968-69: two months hunting and trapping in the Fall, then working. Last hunting and trapping a full season in 1965-66.

Table 7-1 Hunting and/or Trapping Experience of Waswanipi Men (Continued)

No.	Class of Involvement	Year of Birth	Hunting and Trapping Experience
31	A	1912	1969-70, 1968-69: hunted and trapped the full season.
32	P	1949	1969-70: worked; 1968-69, 1967-68: hunted and trapped full season; 1966-67: worked. In school for ten years prior to 1966-67.
33	A	1951	1969-70, 1968-69: hunted and trapped full season.
34	A	1916	1969-70, 1968-69: hunted and trapped full season.
35	T	1954	1969-70: started hunting and trapping with No. 34; 1968-69: in the bush with No. 34. Quit school 1968.
36	A	1922	1969-70, 1968-69: hunted and trapped full season.
37	A	1927	1969-70, 1968-69: hunted and trapped the whole season.
38	T	1956	1969-70: began hunting and trapping; 1968-69: in the bush; both years with No. 37.
39	P	1928	1969-70: hunted and trapped for two months in fall, then took steady employment; 1968-69: hunted and trapped all year; 1967-68: hunted and trapped only in the spring, after his wife had a baby; 1966-67, 1965-66: was working.
40	P	1942	1969-70: hunted and trapped for two months in the fall, then worked; 1968-69, 1967-68: hunted and trapped all season; 1966-67: winter and spring only.
41	R	1906	1969-70, 1968-69: trapped whole seasons.
42	A	1928	1969-70, 1968-69: hunted and trapped for the whole season.

Table 7-1 Hunting and/or Trapping Experience of Waswanipi Men (Continued)

No.	Class of Involvement	Year of Birth	Hunting and Trapping Experience
43	A	1933	1969-70: hunted and trapped all season; 1968-69: hunted and trapped for five months.
44	A	1935	1969-70, 1968-69: hunted and trapped for the whole season.
45	A	1941	1969-70, 1968-69: hunted and trapped for the whole season.
46	P	1915	1969-70, 1968-69: hunted and trapped two months in the fall before returning to seasonal employment. Sets traps around settlement.
47	F	1917	1969-70, 1968-69, 1967-68: steadily employed.
48	N	1940	1969-70, 1968-69, 1967-68: steadily employed.
49	N	1943	1969-70: worked away from region; 1968-69, 1967-68: in college.
50	A	1940	1969-70, 1968-69: hunted and trapped full season.
51	P	1931	1969-70: trapped a few weeks; 1968-69: trapped two months. Traps sometimes between jobs.
52	R	1906	1969-70: trapped from settlement for the first time; 1968-69: trapped in the bush.
53	R	1909	1969-70, 1968-69: trapped the whole season.
54	N	1949	1969-70: in the bush three months, after training course; 1968-69: in the bush five months, then working. Helps No. 53.
55	A	1926	1969-70, 1968-69, 1967-68: hunting and trapping all season; 1966-67: working; prior to that hunted and trapped every year.
56	A	1935	1969-70, 1968-69, 1967-68: hunted and trapped all season.

Table 7-1 Hunting and/or Trapping Experience of Waswanipi Men (Continued)

No.	Class of Involvement	Year of Birth	Hunting and Trapping Experience
57	A	1936	1969-70, 1968-69, 1967-68: hunted and trapped all season.
58	A	1938	1969-70: hunted and trapped for two months, then lived on welfare; 1968-69, 1967-68: hunted and trapped all year.
59	P	1939	1969-70: hunted and trapped two months in the fall, then worked; 1968-69: worked, then hunted and trapped for four months in the winter and spring.
60	P	1935	1969-70: hunted and trapped for 2½ months; 1968-69: hunted and trapped for one month. Hunts and traps sometimes between jobs.
61	A	1943	1969-70: hunted and trapped for three months, then lived in settlement and trapped intermittently rest of season - no employment; 1968-69, 1967-68: trapped all season.
62	N	1944	1969-70: in the bush all season; 1968-69: in the bush three months. Helps No. 53.
63	N	1947	1969-70: in the bush one month; 1968-69, 1967-68: in school.
64	R	1897	1969-70, 1967-68: in the bush all season, traps a bit; 1968-69: at settlement.
65	A	1912	1969-70, 1968-69, 1967-68: hunted and trapped all season. Worked each of three years previous.
66	P	1951	1969-70: worked; 1968-69: hunted and trapped whole season.
67	R	1895	1969-70, 1968-69, 1967-68: in the bush all season, occasional trapping.
68	A	1951	1969-70, 1968-69: hunted and trapped all season. Started in 1965-66 and has hunted and trapped each year since.

Table 7-1 Hunting and/or Trapping Experience of Waswanipi Men (Continued)

No.	Class of Involvement	Year of Birth	Hunting and Trapping Experience
69	A	1921	1969-70: hunted and trapped all season; 1968-69: stayed in settlement living on government payments; 1967-68: hunted and trapped all season.
70	T	1954	1969-70: trapping with No. 69; 1968-69: in school.
71	P	1930	1969-70: trapped one week; 1968-69: trapped two months. Lives in settlement, unemployed, intermittently ill, lives on welfare. Sets a few traps.
72	A	1932	1969-70, 1968-69: hunted and trapped all season.
73	A	1934	1969-70, 1968-69, 1967-68: hunted and trapped all season. Took steady employment Summer 1970, may be in transition to "F".
74	A	1934	1969-70, 1968-69: hunted and trapped all season.
75	A	1937	1969-70, 1968-69: hunted and trapped all season.
76	A	1940	1969-70, 1968-69: hunted and trapped all season.
77	F	1945	1969-70, 1968-69: no hunting or trapping; three years hunting experience several years ago.
78	R	1903	1969-70: in the bush two months, then at settlement; 1968-69: at settlement, traps a bit.
79	F	1934	1969-70, 1968-69: working. Last hunted and trapped a full season in 1961-62.
80	R	1881	1969-70, 1968-69: traps a bit.
81	R	1913	1969-70: in hospital and recuperating all

Table 7-1 Hunting and/or Trapping Experience of Waswanipi Men (Continued)

No.	Class of Involvement	Year of Birth	Hunting and Trapping Experience
			season; 1968-69: hunted and trapped two months in the fall, then took sick and was intermittently in hospital. Until illness he was an active hunter and trapper, now with permanently reduced health he is retired "R".
82	N	1950	1969-70: in bush one month; 1968-69: in bush two months. Took a steady job, Spring 1970.
83	A	1919	1969-70, 1968-69, 1967-68: hunted and trapped all season.
84	A	1948	1969-70, 1968-69: hunted and trapped all season.
85	A	1923	1969-70: hunted and trapped five months, then worked; 1968-69, 1967-68: hunted and trapped all season.
86	T	1952	1969-70, 1968-69: with No. 85.
87	P	1934	1969-70: hunted and trapped one month in fall, worked four months in winter-spring, hunted and trapped one month in spring; 1968-69, 1967-68: hunted and trapped all season.
88	P	1937	1969-70: hunted and trapped one month in the fall, worked for three months in winter, hunted and trapped one month in spring; 1968-69: hunted and trapped five months.
89	N	1944	1969-70, 1967-68: no hunting or trapping; 1968-69: in bush for two months. Helps No. 81.
90	T	1953	1969-70: in the bush all season; 1968-69: in school.
91	P	1927	1969-70: hunted and trapped two months in fall, one month in spring, worked in winter; 1968-69, 1967-68: hunted and trapped all season.

Table 7-1 Hunting and/or Trapping Experience of Waswanipi Men (Continued)

No.	Class of Involvement	Year of Birth	Hunting and Trapping Experience
92	T	1952	1969-70: with No. 95 all season; 1968-69, 1967-68: in school.
93	A	1918	1969-70, 1968-69: hunting and trapping all season.
94	A	1949	1969-70, 1968-69, 1967-68: hunting and trapping all season.
95	A	1910	1969-70, 1968-69: hunting and trapping all season.
96	T	1949	1969-70, 1968-69, 1967-68: with No. 95.
97	A	1946	1969-70, 1968-69, 1967-68: hunting and trapping all year.
98	P	1934	1969-70: hunted and trapped two months in fall, returned to settlement for rest of year - intermittent work, set a few traps in spring; 1968-69, 1967-68: hunted and trapped all season; 1966-67: worked all season.
99	A	1922	1969-70, 1968-69: hunting and trapping all season.
100	P	1949	1969-70: adult education until March, hunting and trapping then until May; 1968-69, 1967-68: hunting and trapping all season.
101	T	1955	1969-70: with No. 65 five months; 1968-69: in school.
102	T	1952	1969-70: with No. 45; 1968-69: in school.
103	A	1953	1969-70, 1968-69: hunting and trapping all season.
104	P	1947	1969-70, 1968-69: worked; 1967-68, 1966-67: hunted and trapped. Possibly moving to an "F".

Table 7-1 Hunting and/or Trapping Experience of Waswanipi Men (Continued)

No.	Class of Involvement	Year of Birth	Hunting and Trapping Experience
105	F	1947	1969-70, 1968-69: worked.
106	T	1951	1969-70: with No. 46 for two months, then working; 1968-69, 1967-68: in school.
107	N	1948	1969-70, 1968-69: worked.

Footnotes:

1. Individual men were classified on the basis of comments of the individual himself or of closely related members of the community.
2. Individual men were classified by the researcher.
3. Considerable emphasis is placed in the following notes on 'trapping' as opposed to 'hunting', because trapping is the activity which: is only learned by undergoing formal training; that conflicts with employment and that is substantially reduced or abandoned by men who seek regular employment; that along with winter moose hunting, must usually be curtailed when physical conditions prevent an older hunter from remaining fully active.

categorization of the men is based on several years of activities, and therefore the categorization can change over time, and it also may not coincide with the activities of a man during any single year.

The remaining 88 men, those who were not former hunters nor inexperienced hunters (Table 7-2), were active in hunting including generally in winter hunting, but in quite variable degrees. The Waswanipi considered all these men to be active hunters, but distinguished two relatively small sub-groups among them, those who were in training and those who were retiring.

Twelve men were said to be in training, or learning how to hunt. They were being taught the basic techniques of hunting, usually first how to hunt small game, then how to trap and hunt beaver, then how to hunt moose, and also how to trap other fur-bearing animals. Of these twelve, all were born after 1948. There were four men born after 1950 who had already completed training, three who were born in 1951, one in 1953. Those in training were all twenty years of age and younger, and those who had completed training were all fifteen years of age or older (Table 7-3).

A second ethno-category among the active hunter group was those men who were said to be retired, or retiring. There is a certain clarification required with respect to the use of the term 'retiring'. In some contexts individuals were identified who were said to be "retiring", on other occasions it was stressed that this Waswanipi concept does not coincide with Western notions of retirement. It was sometimes said that a hunter does not retire, and that hunting is not like employment, implying it is not just an occupation, hunting is a way of life. The eleven men said to be retiring had all been full-time hunters for most of their lives, and had been forced to significantly reduce their hunting activities because of the physical limitations brought on by old age. The onset could be quite sudden, when struck by illness, as happened in one case I knew, but more commonly it was a progressive limiting of physical capacity, a general decline in an individual's capability to conduct the full range of

Table 7-2 Distribution of Waswanipi Men Among Categories of Involvement in Hunting

Category of Hunter[1]	Number of Men	Percentage
All	107	100
"Inexperienced"	10	9
"Former"	9	8
Active (residual category)	88	82
Partly Active	23	21
"Training"	12	11
Intensive Hunters (residual category)	53	50
Fully Active	42	39
"Retiring"	11	10

Footnote:

1. See Table 7-1 and text for definitions and descriptions of categories.

Table 7-3 Distribution of Waswanipi Men Among Categories of Involvement in Hunting, by Decade of Birth

Category of Hunter[1]	Number of Men Born:					
	Before 1910	1910-1919	1920-1929	1930-1939	1940-1949	1950-1956
"Retiring"	10	1	0	0	0	0
Fully Active	2	7	10	12	8	3
Partly Active	1	2	3	9	6	2
"Former"	0	1	2	3	3	0
"Inexperienced"	0	0	0	1	8	1
"Training"	0	0	0	0	1	11
All	13	11	15	25	26	17

Footnote:

1. See Table 7-1 and text for definitions and descriptions of categories.

activities associated with winter hunting from a bush camp. Two men who reported they were just retired, or unable to be fully active, said that in the previous winter a moose had run away from them, that they were no longer able to pursue moose effectively. I am unsure how general a sign this is of the declining physical capacities of a hunter, but it may be a common indication of the onset of reduced hunting activities and of retirement.

Because retired men are all _čenu_ they are men who know all about hunting, and retirement does not indicate that they are less important as hunters. While they take less themselves, they continue to get many animals for others because they continue to tell younger men where to go and how to get the animals they need. Thus the older men continue to exercise their knowledge and power, and they share them with the younger hunters who slowly learn how to think and slowly inherit power. Men who are retired therefore remain central participants in the hunting activities of the community, and particularly of the groups of hunters in which they participate. All retired men continued to hunt, either in the bush during the winter, or from the settlements, more or less actively. Medical personnel encouraged those older people with serious medical problems not to go far in the bush, or for long periods, and these concerns kept some retired people in the settlements for some of the time. Virtually none stayed in the settlements continuously. When staying in the settlements they were generally less active at hunting. Three of the retired men were born before 1900, the oldest in 1881. The youngest retired mean was born in 1913, and was about 55 years old. The oldest man not reported retired was born in 1906, and was 64 years old in 1970.

To recap this classification, of the 107 men resident in the Waswanipi communities under study: nineteen did not engage in any intensive and sustained hunting, and of the remaining 88 active hunters, twenty-three were engaged in limited hunting activities because of old age, or because they were youths undergoing training. The remaining 65 men were potential fully active hunters.

Among those men who were potentially fully active hunters I received comments from, and about, several that they were not fully active during the period of this study. These comments often occurred in discussions of the time, location and results of the hunting activities of the individual. My data however are insufficient to define and apply an ethno-cateogry as used by the Waswanipi. I myself have therefore divided those men who were potentially fully active into a fully active group and a residual group of partly active hunters. The former I have defined as men who spent at least five of the seven months of winter hunting period in hunting activities. I have included those men who spent five months in each of 1968-69 and 1969-70, and those who did not spend at least five months during both years but who had indicated that they do normally do so. The latter group of men all indicated their hunting activities were restricted in the years of this study because of personal or family illness, or because they had to let a hunting territory go unhunted. By including these men within the category of the fully active hunters I have attempted to create a category that indicates the involvement of a particular individual in a pattern of hunting activities that extend over a several year period, and that is not overly responsive to temporary conditions. By this criterion, 42 of the 65 potential fully active hunters were classed as fully active, and the remaining 23 were classed as partly active hunters (Tables 7-1 and 7-2). The age distribution of these men and of the entire 107 men, by category of involvement in hunting appear on Table 7-3. There are fewer partly active men than fully active men in each age group, but whereas the partly active are about one-third as many as the fully active among men born before 1930, the partly active are about three-quarters as many as the full active among the men born after 1930. The mixed economy is therefore not solely practiced by the younger men, but there is much more of a balance between hunting and wage employment activities among younger men under 35 to 40 years of age.

Summarizing the picture of hunting involvement as it existed at Waswanipi in 1968 to 1970 in a slightly different way: all men engaged in some hunting activities; 18 percent however did not effectively hunt in winter and were not considered active hunters by the Waswanipi; among the remaining 82 percent of the men, 21 percent were partially active in winter hunting, generally spending less than five months a winter in hunting, as did many of the 11 percent who were in training; the remaining 50 percent were active hunters, including about 10 percent who were retiring (Table 7-2).

ii) Individual Skill and Involvements in Hunting

Waswanipi informants generally do not emphasize individual skill as an important factor determining the outcome of a particular hunt, determining whether an animal is caught or not. Whether a man catches an animal depends on whether it is given to him. It is said that nearly all men are effective hunters and that at the level of catching animals all active hunters know how. Some individual variations are noted but they do not explain the outcome of a man's hunt. Good hunters have bad years and the best that can normally be expected is good hunts during most years.

Even so, Waswanipi do recognize differences in the skill of individual hunters, and each individual has a widespread reputation as a hunter which is freely discussed in casual conversation, although not so easily discussed in formal settings. In order to synthesize the commonly held views, I asked four hunters to comment on the skill of each of the adult men in the three villages I was studying.

The informants involved appeared to find giving their views in an interview setting uncomfortable, but all also indicated that they were willing to provide the information. Signs of their unease are reflected in the data. Two of the four men did not comment, or gave ambiguous comments, on over fifty percent of the 99 adult men, on whom they were asked to comment, 59 of 99 men in one case, 65 of 99 the other.[1] However, not all these no comment responses indicate reluctance to comment on others. Because of the geographical separation of the population many individuals were unsure of the actual activities of others who live regularly in a settlement at some distance from their own. The two remaining men interviewed gave no comments on 25 and 29 percent of the men listed. This level of no response probably reflects the difficulty they had giving comments on those individuals who were living in a village other than their own. Communications between the settlements, and particularly between Matagami on the one side, and Miquelon and Waswanipi River on the other, were limited, so that information on men living in the distant settlements was often in short supply, or out of date. This was reflected in the frequency and distribution of the wrong information which was given during the interviews concerning which men were working and which hunting.

A second feature of the responses was that it was emphasized that all men were good at some tasks. A man who was said to be not too good a hunter was often said to be a good fisherman, or a good worker, and a man who was not good with beaver was often good with moose. Ratings were therefore not phrased as good or bad but more commonly as "very good" and "not so good." The actual question which was developed was "How good a hunter is each of these men?"

Although the term hunting was used to leave open the range of activities to be included, the comparative statements on a hunter's other skills made clear that for the Waswanipi beaver hunting was the primary standard of skill of a hunter. Moose hunting was sometimes distinguised and sometimes not, but fishing, fine fur trapping, and other activities were frequently used as activities and skills which contrasted with beaver hunting. Furthermore, it was also clear from responses that the standard of skill was sustained beaver hunting from winter bush camps. Thus it was said of some men that they do not hunt beaver much, or they hunt just around town a bit. What appears to be implied here is that it is not skill at capturing beaver but skill at long-term sustained harvests of beaver that is being rated.

The comments made by each interviewee were recorded verbatim, and later each comment was given a value on a three point scale. A "good hunter" or other positive comparative comment got a rating of 1. Qualified comments such as "not so good", and negative comments, were grouped together and given a value of 0. Emphasized positive comparative comments, such as "very good" and the occasional superlative comments, were given a value of 2. The ratings appear on Table 7-4.

The most common rating, based on the comments by each interviewee, was 1. For three of the interviewees, 1 ratings accounted for between 65 and 75 percent of all comments. Ratings of 0 were however more common than ratings of 2. Overall, the ratings by each interviewee averaged close to 1.0, ranging from 0.9 in two cases to 1.1 in one case.

The skill rating for each individual on the list is the mean of the scores from each of the up to four interviewees who made a classifiable comment on that individual. The skill ratings have been grouped into three groups. Those equalling 1.0, those below 1.0 and those above. Skill ratings of 1.0, "good hunters" account for 43 percent of the eighty men with skill ratings. Ratings of more than 1.0, "very good hunters" account for 25 percent of the men, and ratings of less than 1.0, "not so good hunters" account for 33 percent of the men.

When interviewees made comparatively positive or superlative comments about a man, they often gave explanations of the reasons for the general comments. Three kinds of supporting comments were made, as noted briefly in Chapter 5. Most frequently, it was said that a hunter was good because he "always has a good hunt", or a similar phrasing which indicated a continuity of good hunts over an extended period of time. This contrasted with an absence of comments citing especially large harvests. In other contexts, as reported previously, unusual particularly high harvests may be cited as examples of "spoiling oneself" or of making a bad reputation not a good one.

The second type of explanation given for the comparatively positive rating

Table 7-4 Hunting Skill Ratings of Waswanipi Men by Four Waswanipi Hunters

Hunter Number	Scores[1] Based on Comments by Raters[2] A	B	C	D	Number of Two's	Skill Rating[3]
1	-[4]	-	-	-	-	-
2	2	1	1	2	2	1.5
3	2	2	1	2	3	1.8
4	1	1	-	-	0	1.0
5	1	-	-	0	0	0.5
6	1	-	1	-	0	1.0
7	-	-	-	-	-	-
8	1	0	-	0	0	0.3
9	-	-	-	-	-	-
10	-	-	-	-	-	-
11	2	2	1	2	3	1.8
12	-	0	-	1	0	0.5
13	0	0	-	0	0	0.0
14	1	1	1	1	0	1.0
15	0	2	-	0	1	0.7
16	-	-	-	-	-	-
17	0	-	-	0	0	0.0
18	-	-	-	0	0	(0.0)[5]
19	0	-	0	0	0	0.0
20	0	1	0	0	0	0.3
21	1	1	2	1	1	1.3
22	1	1	-	1	0	1.0
23	1	-	-	1	0	1.0
24	1	-	1	1	0	1.0
25	1	1	-	1	0	1.0
26	1	1	-	1	0	1.0
27	1	1	-	1	0	1.0
28	0	2	-	1	1	1.0
29	0	-	-	-	0	(0.0)

(CONTINUED)

Table 7-4 Hunting Skill Ratings of Waswanipi Men by Four Waswanipi Hunters (Continued)

Hunter Number	Scores[1] Based on Comments by Raters[2] A	B	C	D	Number of Two's	Skill Rating[3]
30	0	-	0	0	0	0.0
31	1	1	1	2	1	1.3
32	-	-	-	-	-	-
33	-	-	-	-	-	-
34	2	2	2	2	4	2.0
35	-	-	-	-	-	-
36	1	2	-	2	2	1.7
37	2	1	1	2	2	1.5
38	-	-	-	-	-	-
39	1	1	-	0	0	0.7
40	1	1	-	-	0	1.0
41	0	-	-	0	0	0.0
42	1	1	-	2	1	1.3
43	1	0	-	0	0	0.3
44	1	0	-	0	0	0.3
45	1	2	-	-	1	1.5
46	1	1	-	1	0	1.0
47	2	-	1	2	2	1.7
48	1	-	-	0	0	0.5
49	-	-	-	-	-	-
50	1	1	-	1	0	1.0
51	0	-	-	0	0	0.0
52	1	-	1	2	1	1.3
53	0	-	1	0	0	0.3
54	-	-	-	-	-	-
55	1	-	-	0	0	0.5
56	1	-	-	1	0	1.0
57	1	-	-	1	0	1.0

(CONTINUED)

Table 7-4 Hunting Skill Ratings of Waswanipi Men by Four Waswanipi Hunters (Continued)

Hunter Number	Scores[1] Based on Comments by Raters[2] A	B	C	D	Number of Two's	Skill Rating[3]
58	0	-	-	0	0	0.0
59	1	-	-	0	0	0.5
60	1	-	-	-	0	(1.0)
61	1	-	-	0	0	0.5
62	-	-	-	-	-	-
63	-	-	-	-	-	-
64	1	-	-	1	0	1.0
65	1	-	-	0	0	0.5
66	-	-	-	-	-	-
67	1	1	2	1	1	1.3
68	-	-	-	-	-	-
69	1	1	-	-	0	1.0
70	-	-	-	-	-	-
71	1	-	-	0	0	0.5
72	1	-	1	1	0	1.0
73	2	2	1	2	3	1.8
74	1	1	1	2	1	1.3
75	1	-	1	1	0	1.0
76	1	-	1	1	0	1.0
77	-	-	-	-	-	-
78	1	2	-	2	2	1.7
79	1	-	1	1	0	1.0
80	1	1	-	1	0	1.0
81	1	1	-	2	1	1.3
82	-	-	1	-	0	(1.0)
83	1	1	1	1	0	1.0
84	-	-	1	1	0	1.0
85	1	1	1	1	0	1.0

(CONTINUED)

Table 7-4 Hunting Skill Ratings of Waswanipi Men by Four Waswanipi Hunters (Continued)

Hunter Number	Scores[1] Based on Comments by Raters[2] A	B	C	D	Number of Two's	Skill Rating[3]
86	-	-	-	-	-	-
87	1	1	1	1	0	1.0
88	1	-	2	-	1	1.5
89	-	-	0	-	0	(0.0)
90	1	-	-	1	0	1.0
91	0	-	2	1	1	1.0
92	-	-	-	-	-	-
93	1	1	1	0	0	0.8
94	1	-	-	1	0	1.0
95	1	1	1	2	0	1.3
96	1	-	-	1	0	1.0
97	1	-	-	1	0	1.0
98	1	-	-	1	0	1.0
99	-	-	1	2	1	1.5
Average Ratings	0.9	1.1	1.0	0.9	0.5	0.9
Number of Ratings at:						
0	13	5	4	23		
1	54	26	25	31		
2	7	9	5	16		
No Comment	25	59	65	29		
Total	99	99	99	99		
Less Than 1.0						26
Equal 1.0						34
Greater Than 1.0						20
No Comment						19
Total						99

Table 7-4 Hunting Skill Ratings of Waswanipi Men by Four Waswanipi Hunters (Continued)

Footnotes:

1. Comments on whether each individual man was a good hunter or not were coded as follows: good = 1; "not good", "not very good", other qualified statements = 0; "very good", other superlative statements = 2.
2. Ratings were made by four older adult hunters, numbers 2, 52, 69, and 81. The raters are identified only by randomly assigned letter codes to assure anonymity.
3. Mean of scores given, not counting non-comments.
4. No comments on skill given by rater.
5. Average ratings in brackets are based on a comment from only one of the four raters.

of hunters was that a given man was good at everything, for example "moose, beaver and fishing." This perception is an extension of the former comment that very good hunters always have a good hunt. A hunter who is good at everything has good harvests throughout the year, at each season. He is also able to maintain good harvests when he has bad luck at one kind of hunting because, for example, if beaver hunting is not good he can be successful hunting moose or fishing as an alternative. Thus, a man who is good at everything, is also a man who makes good harvests relatively more consistently, although not of the same animal continuously.

Finally, interviewees said of some men they rated highly that they were especially good at killing a particular species of animal, and the animals so mentioned were always the lynx, bear or sturgeon. It will be recalled that lynx was the most highly rated of the "small" large mammals, that sturgeon was the most highly rated fish (Table 4-17), and that bear is generally considered the most powerful and respected of all animals. These animals are all therefore especially highly valued and especially powerful, and the hunters who can kill them regularly are themselves men who have been given special powers by spirit beings. This is brought out clearly in the actual process of hunting these three animals, because it has been pointed out to me in completely separate contexts that each of these animals is distinct from most animals the Waswanipi harvest, because it normally does not die in a traps or net. Lynx are said to stay alive in traps for weeks, and the hunter must normally kill the trapped lynx when he checks his trap, with a blow to the head. If a lynx dies in a trap it is bad luck. Sturgeons do not normally die in a net, and during commercial fishing operations those caught were tethered by the tail to the docks until they were to be killed. Bears, finally, do not die in traps, and are normally killed with a rifle when a trap is checked and a bear found.

This explanation of the characteristics of very good hunters therefore links a hunter's skill and reputation back to the models of power, of hunting and of life and death reviewed in Chapter 5. The exceptionally skillful hunter is in all senses a man in balance with the long-term cycles of life and of death in the world, and one who in his course through these cycles maintains a relative stability and balance.

There are in fact fairly clear relationships between the hunting success of the groups of hunters with different skill ratings, but as would be expected, there is no completely consistent relationship between the skill rating of an individual hunter and his harvests in any one or two years. When those hunters who had skill ratings of 1.0 are compared to those who had higher and lower ratings with respect to the average harvests of beaver and moose taken in 1968-69 and 1969-70 differences between the groups of hunters are apparent, but considerable individual variation within each group is also clear (Tables 7-5 and 7-6). Some hunters rated over 1.0 have relatively low hunts in one or both years, and some hunters rated below 1.0 have relatively good hunts. The harvests of some hunters vary significantly from one year to the next.

On an average basis, however, the groups of hunters can be differentiated. The average beaver harvest of hunters rated below 1.0 was 31.2 and 29.4 beaver for 1968-69 and 1969-70 respectively. The harvests of those rated 1.0 were 42.3 and 34.0 in each of the two years, and the harvests of those with ratings above 1.0 were 50.4 and 51.5 beaver per hunter in each of the two years respectively (Table 7-5).

With respect to moose the three groups of hunters do not each have distinctive mean harvests. The hunters rated below 1.0 averaged 1.1 and 1.0 moose per hunter in 1968-69 and 1969-70 respectively which was below the harvests of both of the other groups. The hunters rated at 1.0 and those over 1.0 however did not have mean harvests of moose per hunter that could be distinguished in either year. In 1969-69 those rated 1.0 harvested an average of 1.9 moose per hunter and those rated above 1.0 harvested an average of 1.7, whereas in 1969-70, the average harvests per hunter were 1.2 and 1.3 for each of the two groups.

Table 7-5 Harvests of Beaver by Men With Different Skill Ratings, 1968-69 and 1969-70

Men With Skill Ratings Below 1.0			Men With Skill Ratings of 1.0			Men With Skill Ratings of Over 1.0		
Hunter	Beaver Harvest		Hunter	Beaver Harvest		Hunter	Beaver Harvest	
Number	1968-69	1969-70	Number	1968-69	1969-70	Number	1968-69	1969-70
5	15	10	14	37	-	2	25	20
12	20	22	22	35	20	3	100	30
13	25	0	23	25	30	11	30	20
15	30	70	24	10	15	21	70	80
18	-	6	25	70	75	31	28	33
30	25	-	26	8	14	34	100	99
39	35	5	27	90	46	36	35	40
41	20	10	28	50	54	37	90	89
43	48	60	40	36	26	42	70	122
44	25	52	46	15	25	45	50	42
51	16	28	50	42	36	52	29	20
53	23	60	56	60	48	73	50	134
55	53	49	57	36	40	74	75	35
58	45	15	60	20	35	78	5	21
59	15	35	64	-	16	81	8	-
61	40	30	69	-	50	88	87	41
65	70	40	72	19	30	95	30	23
71	1	2	75	25	15	99	25	37
93	56	35	76	15	20			
			83	100	70			
			84	60	35			
			85	50	60			
			87	35	28			
			91	30	20			
			94	67	35			
			96	20	25			
			97	100	40			
			98	44	9			
Average	31.2	29.4		42.3	34.0		50.4	51.5

Table 7-6 Harvests of Moose by Men With Different Skill Ratings, 1968-69 and 1969-70

Men With Skill Ratings Below 1.0			Men With Skill Ratings of 1.0			Men With Skill Ratings of Over 1.0		
Hunter	Moose Harvest		Hunter	Moose Harvest		Hunter	Moose Harvest	
Number	1968-69	1969-70	Number	1968-69	1969-70	Number	1968-69	1969-70
5	2	2	14	0	-	2	0	0
12	0	0	22	0	0	3	0	0
13	0	2	23	0	0	11	2	1
15	3	2	24	0	0	21	3	1
18	-	0	25	2	3	31	1	0
30	1	-	26	0	0	34	3	2
39	1	0	27	4	2	36	2	3
41	0	0	28	4	2	37	2	1
43	0	0	40	2	0	42	2	5
44	2	2	46	0	0	45	1	3
51	0	0	50	2	1	52	2	0
53	2	2	56	0	0	73	4	3
55	1	2	57	4	3	74	4	0
58	1	0	60	0	1	78	0	0
59	0	2	64	-	0	81	0	-
61	3	0	69	-	1	88	2	1
65	2	2	72	4	3	95	2	2
71	1	0	75	0	2	99	1	0
93	1	2	76	3	6			
			83	3	3			
			84	6	4			
			85	0	0			
			87	1	0			
			91	1	0			
			94	2	0			
			96	2	0			
			97	8	1			
			98	2	1			
Average	1.1	1.0		1.9	1.2		1.7	1.3

It would appear from this that "good hunters" and "very good hunters" are, on average distinctive with respect to beaver harvests, but not with respect to moose harvests. This is consistent with the comments which indicated that intensive beaver harvesting is the activity most basic to the evaluation of hunters skills.

The skill of hunters is an important factor in the choices men make between various combinations of involvement in hunting and in wage employment (see Salisbury, Filion, Rawji and Stewart, 1972). The Waswanipi stress that anyone can learn to hunt in a year or two, and even the men who were rated to be not so good hunters were often said not to have learned correctly, or that they set a trap a funny way. Asked explicitly, informants assert that bad hunters could learn to be good hunters. Nevertheless, it is also clear that there are important differences of skill among the hunters, and such differences could help to explain the choices men make between hunting and wage employment.

A suggestion of such a link occurred in the context of the elicitation of the skill ratings because during those interviews comments were also made frequently on the skill of some men as wage laborers, although these comments were not explicitly elicited. One comment for example identified a linkage between skill and activity category:

> "Heard he used to hunt, but not very good. So he asked for that job. Ever since had that" (Interview Notes #69).

Two kinds of comments were made more generally. Some men who were said to be poor hunters were also said to be good workers. This comment was made in the spirit of indicating each individual's strong qualities while noting his weaker ones. In other cases individuals who were said to be good at everything were also said to be good workers as well as good hunters. The frequency of these comments varied from informant to informant, the former generally being the more common. These comments then suggest that men who choose to work rather than hunt may be primarily those who are relatively less skilled hunters.

When the skill ratings of men in different activity categories is examined it generally confirms this interpretation. The average skill ratings of active hunters, and retiring hunters was 1.0 and 1.1 respectively (Table 7-7). The average skill of partly active and former hunters was 0.7 and 0.8 respectively. The average skill rating of inexperienced hunters was 0.3. And, most training hunters had not yet established a reputation as hunters.

Of the 20 men with skill ratings greater than 1.0 only two were not fully active or retiring hunters (Table 7-8). One was a partly active hunter, and one a former hunter. On the other hand, of the 26 men with a skill rating of less than 1.0, eleven were fully active or retiring hunters, whereas eleven were partly active or former hunters, and four were inexperienced hunters. Of the 34 men with skill ratings of 1.0, ten were partly active, former or inexperienced hunters, 23 were fully active, training or retiring hunters, and one was somewhat anomalously listed as inexperienced.

These data indicate a clear relationship between skill and activity choice. Of the men with skill ratings below 1.0, but who were not inexperienced as hunters, half were fully active or retired hunters and half were partly active or former hunters (Table 7-8). Of the experienced hunters with skill ratings of 1.0 about two-thirds were fully active or retiring hunters, one-third partly active or former hunters. Finally, of those men with skill ratings over 1.0, all were experienced and 90 percent were fully active or retiring, and only 10 percent were partly active or former hunters. It would therefore appear that about one half of the less skilled hunters are primarily engaged in employement activities, whereas few highly skilled hunters are primarily engaged in employment activities.

Table 7-7 Skill Ratings of Men Grouped by Activity Categories

Fully Active		Partly Active		Training		Retiring		Former		No Experience	
Hunter Number	Skill Rating	Hunter Number	Skill Rating	Hunter Number	Skill Rating	Hunter Number	Skill Rating	Hunter Number	Skill Rating	Hunter Number	Skill Rating
11	1.8	5	0.5	7	-	2	1.5	1	-	18	0.0
13	0.0	9	-	16	-	3	1.8	4	1.0	29	0.0
14	1.0	10	-	35	-	24	1.0	6	1.0	48	0.5
15	0.7	12	0.5	38	-	41	0.0	8	0.3	49	-
21	1.3	19	0.0	70	-	52	1.3	17	0.0	54	-
22	1.0	20	0.3	86	-	53	0.3	47	1.7	62	-
23	1.0	26	1.0	90	1.0	64	1.0	77	-	63	-
25	1.0	30	0.0	92	-	67	1.3	79	1.0	82	1.0
27	1.0	32	-	96	1.0	78	1.7			89	0.0
28	1.0	39	0.7			80	1.0				
31	1.3	40	1.0			81	1.3				
33	-	46	1.0								
34	2.0	51	0.0								
36	1.7	59	0.5								
37	1.5	60	1.0								
42	1.3	66	-								
43	0.3	71	0.5								
44	0.3	87	1.0								
45	1.5	88	1.5								
50	1.0	91	1.0								
55	0.5	98	1.0								
56	1.0										
57	1.0										
58	0.0										
61	0.5										
65	0.5										
68	-										
69	1.0										
72	1.0										
73	1.8										
74	1.3										
75	1.0										
76	1.0										
83	1.0										
84	1.0										
85	1.0										
93	0.8										
94	1.0										
95	1.3										
97	1.0										
99	1.5										
Avg.	1.0	Avg.	0.7	Avg.	1.0	Avg.	1.1	Avg.	0.8	Avg.	0.3

Table 7-8 Distribution of Men With Different Skill Ratings by Activity Categories

Activity Category	Skill Rating: No Comment		Less Than 1.0		Equal to 1.0		Greater Than 1.0	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Fully Active or Retiring	2	11	11	42	21	62	18	90
Partly Active or Former Hunter	6	32	11	42	10	29	2	10
Training	7	37	0	0	2	6	0	0
Inexperienced	4	21	4	15	1	3	0	0

C - Hunting Activity and Social Groupings

i) Bush Camp Hunting and Settlement Based Hunting

As indicated above, one of the most significant distinctions the Waswanipi make among men is between those who hunt in winter from camps more or less isolated in the bush, and those who stay at the settlements. A similar distinction may occur in summer, but at that season the living location of a family is likely to be decided by employment opportunities, as well as by hunting possibilities. LaRusic, however, has pointed out that choice of employment is affected by possibilities of hunting, especially fishing (LaRusic, 1970). In winter, intensive and extended hunting must, with few exceptions, be conducted from bush camps, and a choice must be made between intensive and extended hunting in the bush, and a combination of employment and more limited hunting near the settlements. Not all winter employment is in the settlements, but that which is not is generally temporary and jobs are arranged at the settlement. Those men who are "former hunters" and who either worked or sought employment on a continuing basis therefore did not participate in winter bush camps.

The bush camps, as was reported earlier are formed between September and November, typically in the latter half of October, and may last until April or June, typically the middle of May. The most common pattern is for families living in the bush to visit the settlement at Christmas-New Year's and at Easter, although people in more distant camps may not make visits, and people in camps more easily accessible may visit more frequently. The visits provide opportunities for hunters and their families to leave camps or to join other camps. It is therefore relatively easy for hunters and their families to decide to spend less than the full seven months between mid-October and mid-May in bush camps. Those who spend less than the full winter period, typically begin or end their stay at Christmas-New Year or Easter, so the winter hunting period may be considered, for these purposes, as being comprised of a pre-Christmas period, a New Year's to Easter period and a post-Easter period.

During the winter hunting season of 1968-69, from October to May, 48 hunters were in bush camps for the seven month season, two for six months, and an additional 11 hunters were in camps for two to five months, that is for one or two of the three winter hunting periods. No former hunters were at bush camps as mentioned previously, but four inexperienced hunters lived at bush camps for from two to five months, helping hunters out. In 1969-70, 44 hunters went to bush camps for seven months, two for six months, and 22 additional hunters were in camps for two to five months. Again, although no former hunters lived at bush camps four inexperienced men spent one to three months at bush camps.

In total then 61 of the 88 active hunters were at bush camps in 1968-69 for at least two months, and 68 in 1969-70. The major part of the increase in 1969-70 is accounted for by the four men who left school in 1969, and who undertook training at hunting in 1969-70.

The time spent in bush camps by men from each of the classifications of hunters are given on Table 7-9. Those in the bush included all the young men who were in training in 1969-70 and all but one in 1968-69, plus six of the eleven men who were retiring hunters, although only four of the retiring hunters went to bush camps in both years.

Of the hunters classed as generally fully active two did not go to bush camps in 1968-69, and three in 1969-70, but of those classed as generally partly active, ten did not go to bush camps in 1968-69 and twelve in 1969-70. Thus a total of twenty-seven active hunters in 1968-69 and twenty in 1969-70 did not go to bush camps for two months or more. The majority lived at the settlements and hunted from the settlements on the lands immediately adjacent. They were joined for part of the winter by the eleven men in 1968-69, and 22 in 1969-70, who hunted only part of the winter hunting

Table 7-9 Distribution of Waswanipi Men by Time Spent in Bush Camps During the 1968-69 and 1969-70 Winter Hunting Seasons, by Categories of Involvement in Hunting

Category of Hunter[1]	Number of Men in the Bush Camps							
	1968-69				1969-70			
	Less Than Two Months	Two or Three Months	Four or Five Months	Six or Seven Months	Less Than Two Months	Two or Three Months	Four or Five Months	Six or Seven Months
Fully Active (N=42)	0	0	3	37	0	3	2	34
Partly Active (N=23)	0	3	4	6	0	11	0	0
"Retiring" (N=11)	0	1	0	5	0	1	0	5
"Training" (1968-69, N=4; 1969-70, N=12)	1	0	0	2	0	1	4	7
Total of Active Hunters (N=88)	1	4	7	50	0	16	6	46
"Inexperienced" (N=10)	0	3	1	0	2	2	0	0
"Former" (N=9)	0	0	0	0	0	0	0	0
Total of Men in Bush Camps (N=107)	1	7	8	50	2	18	6	46

Footnote:

1. See Table 7-1 and text for definitions and descriptions of categories.

period from the bush camps. The intensity of involvement in hunting activities of those men who spent all or a large part of the winter in the settlements varied considerably.

Waswanipi hunters who establish winter bush camps for hunting usually form hunting groups comprised of two or more hunters and their relatives. Each married hunter is usually accompanied by his wife and usually some of his children, and this is the basic domestic or commensal unit. In general, single men and widowers form part of the commensal units of their parents and siblings respectively.

ii) Commensal Units

The commensal unit lives together in a single habitation or dwelling, but often shares this habitation with other commensal units. The commensal unit, as the name implies, eat together, and when in the bush each commensal unit had its own wood stove, usually of sheet metal, for cooking and heating, and its own area in the dwelling for sleeping and other activities. In town, sometimes a stove would be shared in a dwelling, but provisions were kept separate, and commensal units tended to eat and sleep separately.

The commensal unit is the social unit with the greatest economic cooperation and with the greatest social solidarity. The division of labor falls mainly along sex and age divisions. The latter have been discussed previously. Within the commensal unit the sexual division of labor is central. Women are responsible for care of children; preparation of food and meals; looking after the dwelling, including the provision of firewood and water; skinning of most animals; preparation of fur pelts for sales and skins for domestic use; manufacture of moccasins, mitts and snowshoe lacings, and some other clothing; cleaning and repair of clothing; gathering of moss, for use as diapers and caulking, and of boughs for flooring, when these are still used; some checking of fish nets; some snaring of hare and grouse; and much of the herbal and healing knowledge. Some women do hunt and trap more extensively, setting traps for beaver, and many women join a group of hunters and work with their husbands and/or sons when a beaver lodge is to be broken into. Occasionally a woman is said to have killed a moose, and some čiškueš are said to have power and to be able to know the future, and sometimes to know where and what to hunt. Most women's activities occur around the camp. There is no stigma attached to the women's responsibilities, and women with interests in more diverse kinds of hunting may do so, while on the other hand men may perform women's chores on occasions without stigma. One Waswanipi woman was widely considered to be a better beaver trapper than her husband. At the time of the fieldwork for this study, such official records of fur sales as there were generally did not list women as sellers of furs, although they did dispose of the pelts of the animals they caught. Since that time records of sales by women have been recorded separately from the sales of their husbands or fathers, and in neighboring Cree communities official quotas are given to women. In the present study the kills of women were not always distinguished from those of their husbands, informants tended to give a total including both, and in the figures presented in this report the harvests of women are included in the totals listed under their husbands' name. In one case a widow, and her son formed a commensal unit which has been treated here as one harvesting unit.

Most hunting activities are mainly performed by men, who also: erect camps and dwellings; do most hauling of equipment and camps; butcher big game before returning it to camp; help with the preparation of large hides, for example stretching moose hides; set fish nets, especially when they are set under the ice; produce tools and equipment, including snowshoe frames, toboggans, sleds, snowshovels, skin stretchers, crooked knives, and occasionally beds and stoves; and repair equipment, including canoes, outboard motors and skidoos. Men will check fish nets and snare hare and grouse as will women, and will help with the provisioning of firewood.

In the settlements, while men generally held public positions, it is my impression that women were equally or more important in arriving both at important community decisions and also in arriving at decisions within individual households. My data on this point are however highly impressionistic.

Men and women are interdependent, especially in the bush. No hunter stayed in the bush without being attached to a commensal unit. Unlike other subarctic hunters, there were no long-term all male bush camps established by the Waswanipi during the period of this study.

In the winters of 1968-69 and 1969-70 respectively, there were 42 and 41 commensal units that went to bush camps for at least two months. All but two commensal groups in each year were built around a conjugal pair, an active hunter and his wife (Tables 7-10 and 7-11). In the two other commensal groups that were formed a mother and son and a brother and sister formed the core of the groups. In the former case a woman widowed several years before formed a commensal group with her teenage unmarried son who took up hunting to support them and the other children. In the latter case an older bachelor formed a commensal unit with his unwed sister and their mother. In the one case where a widower without close relatives wanted to go to the bush he joined another couple as a member of their commensal group as will be indicated below. There were no commensal units in which two married couples occurred. Kinship, it should be noted, is reckoned bilateraly among the Waswanipi (Bernier, n.d.).

The majority of the commensal groups were nuclear families, a couple and their children or step-children, 79 percent in 1969-69 and 73 percent in 1969-70. All but four of the other cases of commensal groups were nuclear families that were "extended" by the addition of other relatives (Table 7-10 and 7-11, and Figures 7-1 and 7-2).[2,3] Not counting cases where the same commensal group occurs in the second year, the frequency of the relatives added was: a parent of one of the couple, in two cases; a grand parent of one of the couple, in two cases; a sibling of one of the couple, in four cases; a child of a child of the couple, in six cases; a child of a sibling

Table 7-10 Kinship Relationships Among Members of Commensal Groups, 1968-69

Commensal Group Number[1]	Male Head (No.)[4]	Consort	Relations of Other Members to Male Head[2,4]	Type of Family[3]
68ai[5]	97	Wi	Da, WiBr, WiBr, WiFaMo	E
68bi	52	Wi	So, So	N
68ci	53	Wi	So, So, So, WiDa, WiDaSo	E
68di	13	Wi	Da, So, Da, Fr	-
68dii	57	Wi	Da	N
68ei	95	Wi	So	N
68eii	98	Wi	Da, Da	N
68eiii	39	Wi	Da	N
68fi	27	Wi	So, So, Da, Da	N
68gi	41	Wi	So, SoSo, Da, DaDa, Da, DaSo, DaSo	E
68gii	44	Wi	Da, Da	N
68giii	85	Wi	So, Da	N
68hi	68	Mo	Si, SiSo	E
68hii	3	Wi	BrSoSo, BrSoSo	E
68hiii	15	Wi	So, So	N
68i-i	65	Wi	So	N
68i-ii	42	Wi	So, Da, Da	N
68ji	87	Wi	So, Da, So	N
68jii	81	Wi	So, So, Da, So, So	N
68jiii	30	Wi	So, So, So	N
68ki	11	Si	Mo	E
68kii	14	Wi		N
68kiii	50	Wi	Da, Da	N
68li	25	Wi	Da, So, So	N
68lii	31	Wi	So, So, Da, Da	N
68liii	73	Wi	So	N
68liv	88	Wi	BrDa	E
68lv	40	Wi	So, Da, Da	N
68lvi	22	Wi	So, Da, DaSo	E

(CONTINUED)

Table 7-10 Kinship Relationships Among Members of Commensal Groups, 1968-69 (Continued)

Commensal Group Number[1]	Male Head (No.)[4]	Consort	Relations of Other Members to Male Head[2,4]	Type of Family[3]
68mi	74	Wi	So, So	N
68mii	43	Wi	Da, Da	N
68miii	28	Wi	So, So	N
68miv	12	Wi	Da, Da	N
68ni	67	Wi	So, So, So, So, Da	N
68nii	36	Wi	Da, Da	N
68niii	83	Wi	So, So, Da	N
68oi	34	Wi	So, Da, Da	N
68pi	93	Wi	So	N
68qi	37	Wi	So, Da, Da, Da, So	N
68qii	21	Wi	WiSo, WiDa	N
68ri	56	Wi	So, So	N
68rii	71	Wi	Da, Da, Da	N

Footnotes:

1. Includes all commensal groups that spent two months or more in winter bush camps.
2. The code used is: Wi = wife; So = son; Da = daughter; Fa = father; Mo = mother; Br = brother; Si = sister; Fr = friend, unrelated, kinship linkage untraceable.
3. The code used is: N = nuclear family; E = extended family; - = includes members not related by kinship.
4. Underlined numbers and relation codes are active hunters.

Table 7-11 Kinship Relationships Among Members of Commensal Groups, 1969-70

Commensal Group Number[1]	Male Head (No.)[4]	Consort	Relations of Others to Male Head[2,4]	Type of Family[3]
69ai	41	Wi	So, SoSo, Da, DaDa, MoHuDaSo	E
69aii	3	Wi	BrSoSo, BrSoSo	E
69aiii	68	Mo		N
69bi	85	Wi	So, So, DaSo	E
69bii	43	Wi	Da, Da	N
69ci	73	Wi	So	N
69cii	42	Wi	Da, Da, So	N
69di	65	Wi	So	N
69dii	87	Wi	So, So, Da	N
69ei	15	Wi	So	N
69fi	22	Wi	So, Da, Da	N
69fii	21	Wi	WiDa, WiSo, Fr	-
69fiii	28	Wi	So, So, So	N
69fiv	44	Wi	Da, Da	N
69gi	25	Wi	So, So	N
69gii	31	Wi	So, Da, So, So, Da	N
69giii	40	Wi	So, Da	N
69giv	46	Wi	Da, So	N
69hi	37	Wi	So, Da, Da, So	N
69i-i	34	Wi	So, Da, Da, So	N
69ji	74	Wi	So, So	N
69jii	12	Wi	Da, So	N
69ki	56	Wi	So, So, Br, Br, FaMo	E
69li	93	Wi	So	N
69ni[5]	69	Wi	WiSo, So, Fa, WiSoSo	E
69nii	78	Wi	Da, Da	N
69niii	27	Wi	So, Da, Da, So	N
69oi	95	Wi	So, DaSo	E
69oii	98	Wi	Da, Da	N

(CONTINUED)

Table 7-11 Kinship Relationships Among Members of Commensal Groups, 1969-70 (Continued)

Commensal Group Number[1]	Male Head (No.)[4]	Consort	Relations of Others to Male Head[2,4]	Type of Family[3]
69oiii	39	Wi	Da, Da	N
69pi	97	Wi	Da, So	N
69pii	60	Wi	Da, Br	E
69qi	53	Wi	WiDa, So, So, So, So	N
69qii	57	Wi	Da, So	N
69si[6]	67	Wi	So, So, So, So, Da	N
69sii	36	Wi	Da, Da	N
69siii	83	Wi	So, So, Da, Fr	-
69ti	13	Wi	Da, So, Da	N
69tii	17	Wi	So, Da, Da, Fr	-
69ui	11	Si	Mo	E
69uii	50	Wi	Da, Da	N

Footnotes:

1. Includes all commensal groups that spent two months or more in winter bush camps.
2. The code used is: Wi = wife; So = son; Da = daughter; Fa = father; Mo = mother; Br = brother; Si = sister; Hu = husband; Fr = friend.
3. The code used is: N = nuclear family; E = extended family; - = includes members not related by kinship.
4. Underlined numbers and relations codes are active hunters.
5. The commensal group numbered 69mi joined another hunting group after two months by itself and was renumbered 69qii.
6. Commensal group 69ri hunted by itself for two months then joined another hunting group and was renumbered 69fiv.

Key for Figures 7-1 and 7-2[1]

○ : Female

△ : Male

●, ▲ : Deceased

ø, △̸ : Not present in groups, listed to illustrate kinship linkages

△ : Active hunter

△ : Head of commensal group

△ : Head of hunting group

| : Descent relationship

= : Conjugal relationship

┌─┐ : Sibling relationship

¦ : Separation between commensal groups comprising the same hunting group

Footnote:

1. Letter and roman numeral identifications correspond to those used on Tables 7-10 and 7-11.

Figure 7-1. Composition of Waswanipi Hunting Groups and Component Commensal Groups, 1968-69[1]

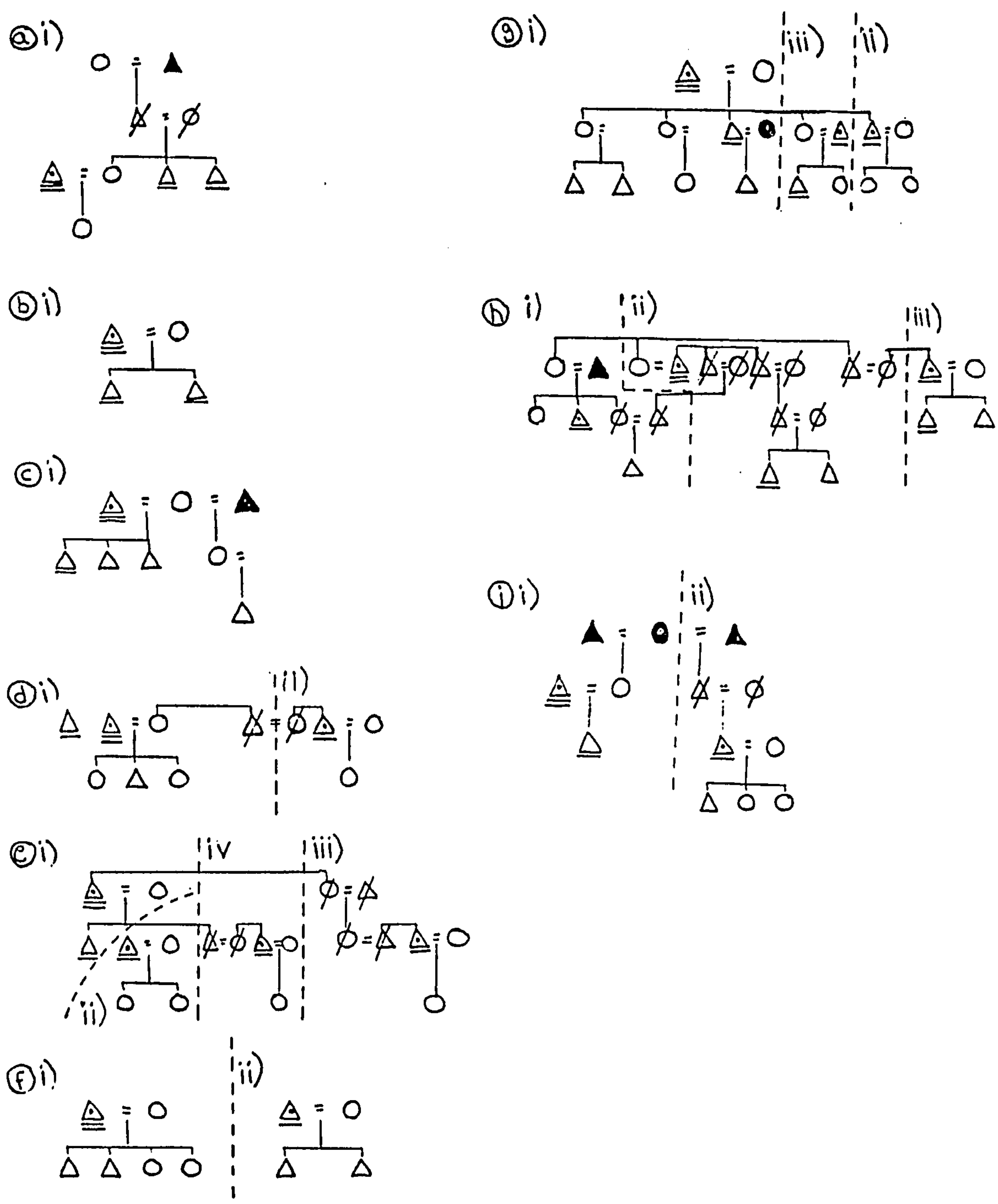


Figure 7-1. Composition of Waswanipi Hunting Groups and Component Commensal Groups, 1968-69[1] Continued

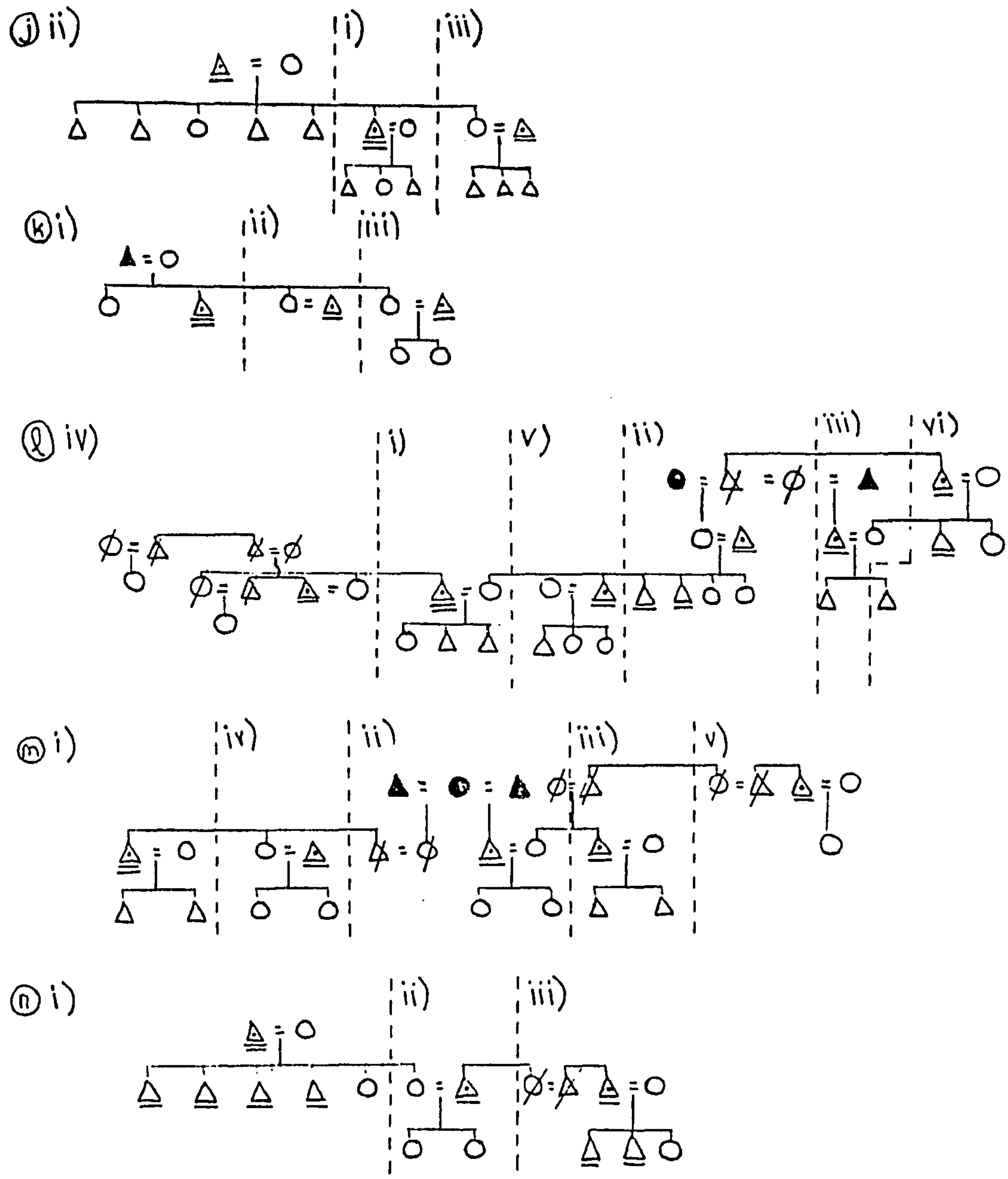
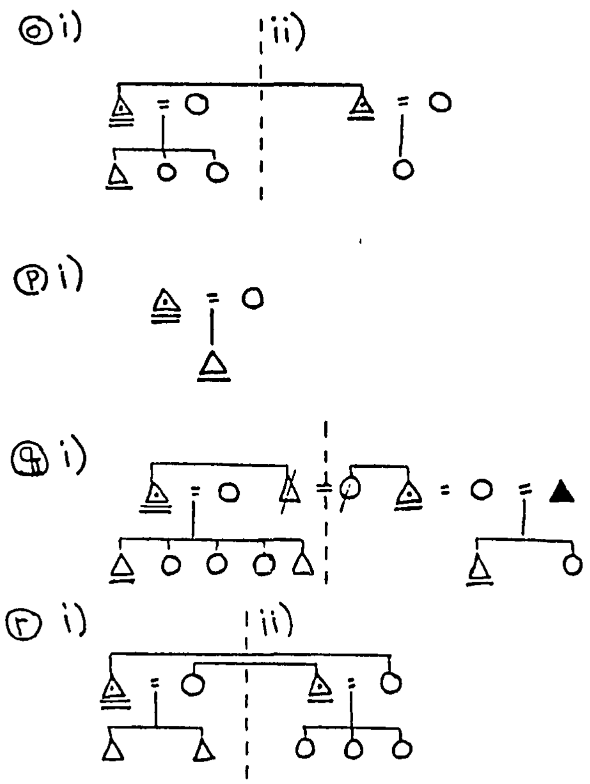


Figure 7-1. Composition of Waswanipi Hunting Groups and Component Commensal Groups, 1968-69[1] Continued



Footnote:

1. The data are complete for all people in the bush; those individuals not present are only included to indicate relationships between heads of commensal units. The children shown are those in the bush, those who did not go to the bush do not appear on the Figure.

Figure 7-2. Composition of Waswanipi Hunting Groups and Component Commensal Groups, 1969-70[1]

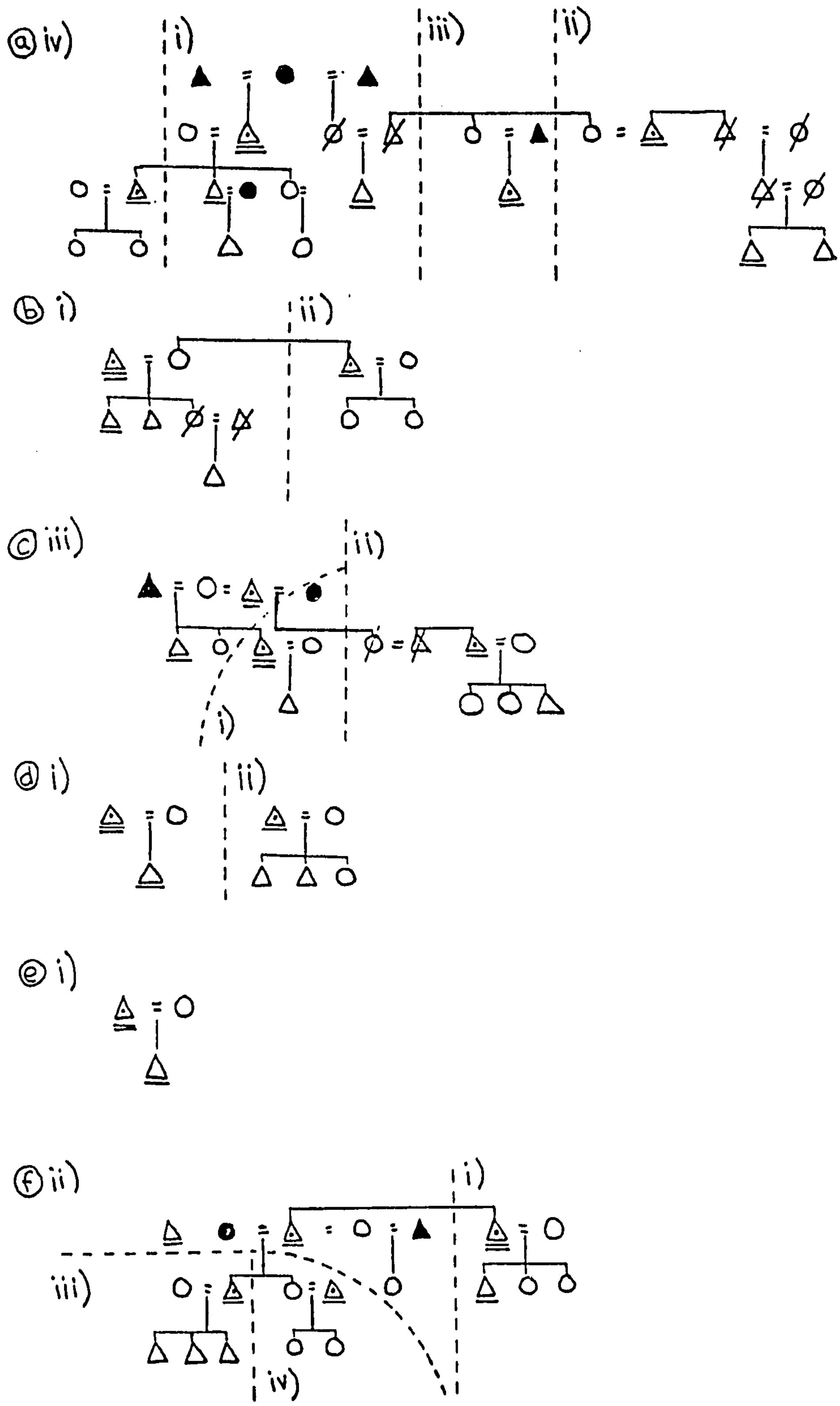


Figure 7-2. Composition of Waswanipi Hunting Groups and Component Commensal Groups, 1969-70[1] Continued

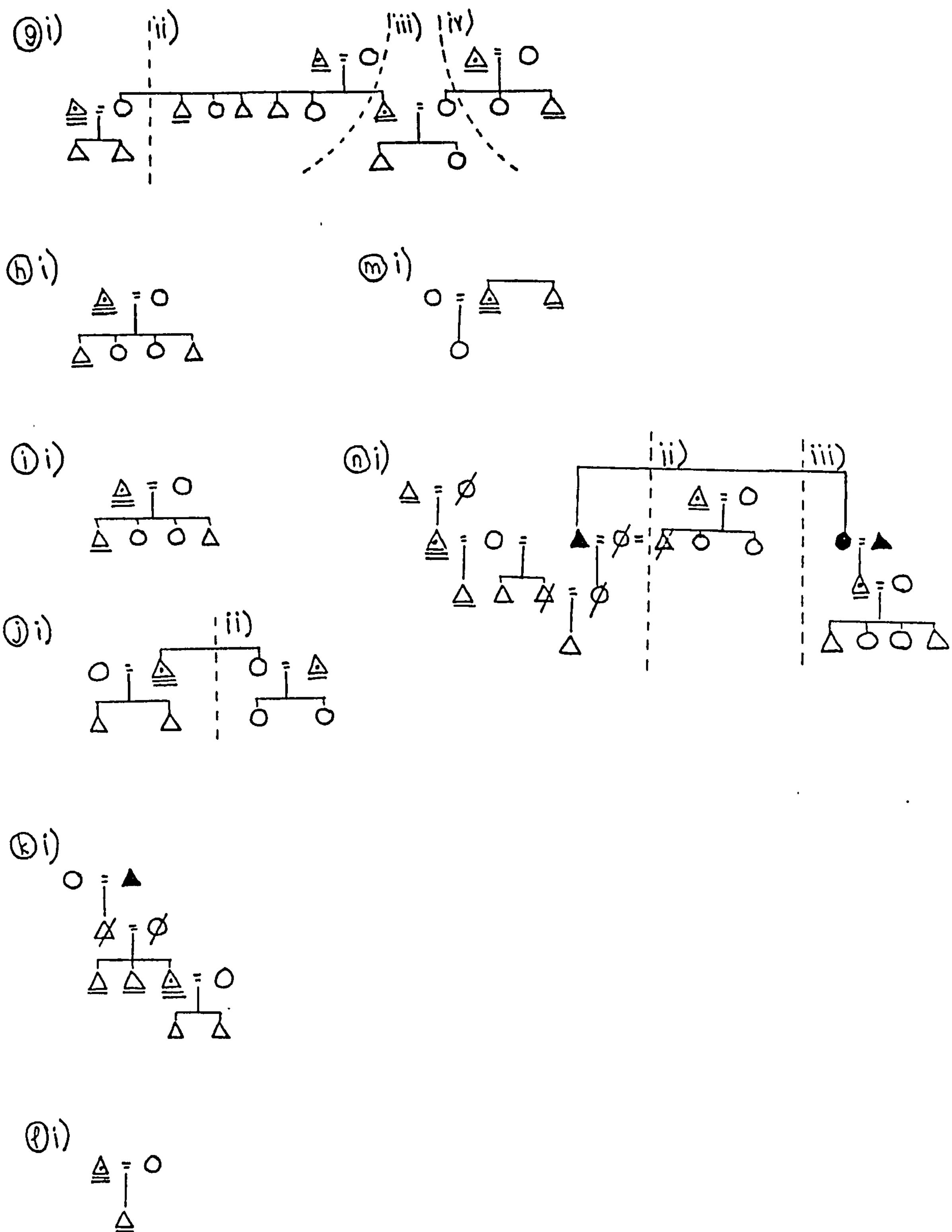


Figure 7-2. Composition of Waswanipi Hunting Groups and Component Commensal Groups, 1969-70[1] Continued

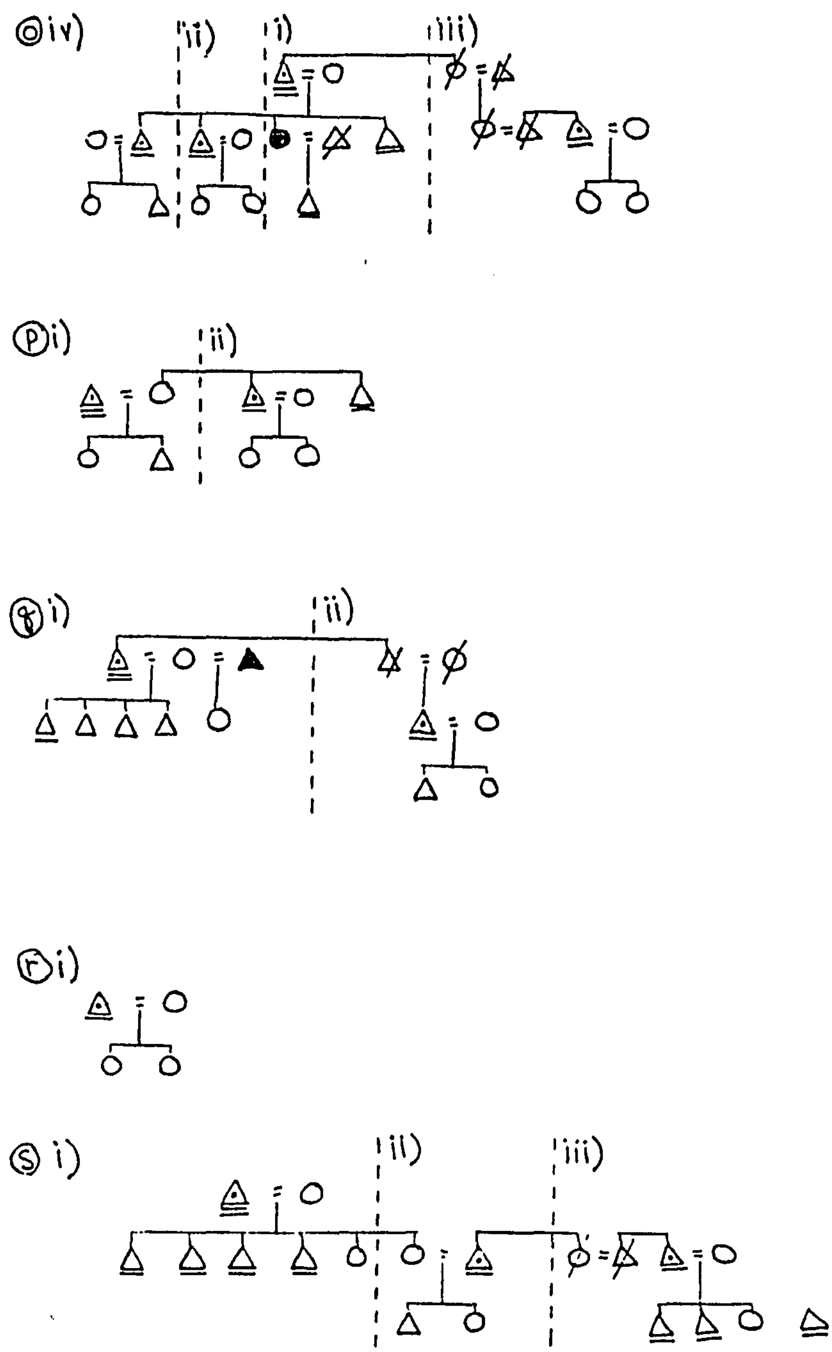


Figure 7-2. Composition of Waswanipi Hunting Groups and Component Commensal Groups, 1969-70[1] Continued

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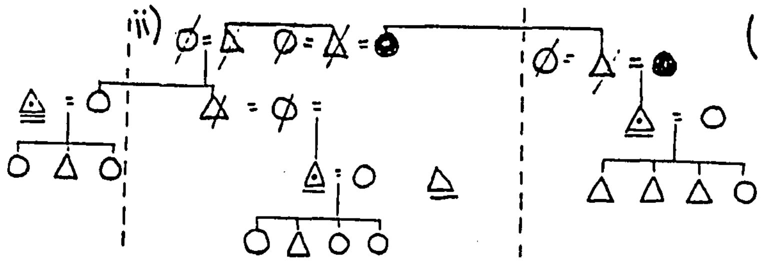
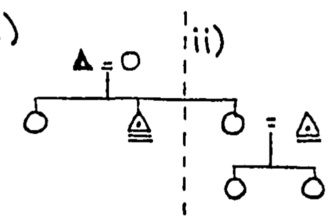


(u) i) ii)



Footnote:

1. The data are complete for all people in the bush; those individuals not present are only included to the extent necessary to indicate relationships between heads of commensal units. The children shown are those in the bush, those who did not go to the bush do not appear on the Figure.

of one of the couple, in three cases; and a child of a child of a sibling of one of the couple, in one case.

In the four other cases, approximately five percent, a person not related by kinship was a member of a commensal group. One widower from another band, without close living relatives in these settlements, joined a different Waswanipi commensal group in each of the two years under study in order to be able to hunt. As he had neither wife, sisters, parents or married offspring to join he became part of a group formed around an unrelated couple. Although he was included in the formation of commensal groups, this case shades over into the formation of hunting groups, because the individual in question controlled the hunting territory on which the commensal groups of which he became a member hunted. Another man included in a commensal group to which he was not related was one of the oldest bachelors in the band. He usually hunted in a group centering around his parents and four of his adult siblings, the largest adult membership of any commensal group. He spent part of one winter with a commensal unit using an adjacent hunting territory. The last case involved an invitation to a man from a neighboring band, and I have no data on circumstances.

In summary, the commensal units that go to bush camps for winter hunting are always based on a closely related adult man and woman, which three-quarters of the time are nuclear families, with the other one-quarter of the cases comprised of "extensions" to include other relatives, and a few cases of inclusion of persons not related by kinship.

Of the 42 commensal groups that went to winter bush camps in 1968-69, 34 returned to winter bush camps in 1969-70.[4] Of these there were no changes in the composition of fifteen of the groups, and thirteen more were changed only by the addition or departure of children, mostly because of changing commitments to school, see below. Therefore, the great majority of commensal groups for which there is comparable data for both years, underwent no major changes comparing composition in one winter to composition the next winter.

In the winter bush camps, hunters are accompanied by their wives and some of their children. The ideal, when children are old enough, is to have at least one teenage daughter and one teenage son accompany the parents to help them with the adult work. From an early age children are given limited responsibilities to help with the tasks of an adult man or woman. As they grow older, children are often put in charge of their younger siblings. Teenage children can take on major adult responsibilities. When possible a commensal group should have two women, mother and daughter, and two men, a father and son, performing adult roles.

In the winter hunting seasons of 1968-69 and 1969-70, the average size of the commensal groups was between four and five members, 4.5 in 1968-69 and 4.6 in 1969-70 (Tables 7-12 and 7-13). Only individuals who spent more than two months in a commensal group are included in this and the following tabulations. There were somewhat more adult men than adult women per commensal group, 1.6 or 1.7 men versus 1.3 women and about one and a half children per group (Tables 7-12 and 7-13). In summer the number of children per commensal group increases when the children return from residential school. The number of children of the adult members of the commensal groups that were not in the groups in winter was 1.7 to 1.4 (Tables 7-14 and 7-15). The average number of children in the commensal group in summer is therefore double the number in winter.

During the winter most of the children in commensal groups that go to the bush are below school age. The average of about one and a half children per commensal group which were not in the bush were almost all in residential schools. Not all school age children go to school however. Parents often try to keep a teenage son and daughter out of school to help with the work in the bush. On the basis of the general statistics of the school age population of the band and the school enrollments by age it appears that about one quarter of the school age children do not attend school in any one year (Salisbury, Filion, Rawji, and Stewart, 1972:Appendix B).

Table 7-12 Size, Composition and Duration of Commensal Groups That Were in Winter Bush Camps, 1968-69

Commensal Group No.[1]	No. of Adult Men[2]	No. of Adult Women[2]	No. of Children	Total Membership	Duration of Stay in Bush (Months)
68ai	2	2	1	5[3]	7[4]
68bi	2	1	0	3[5]	7
68ci	4	2	0	6[6]	6[7]
68di	2	1	3	6	7[8]
68dii	1	1	1	3	7
68ei	2	1	0	3	7
68eii	1	1	2	4	7
68eiii	1	1	1	3	7
68fi	1	1	3	5	7
68gi	2	3	4	9	7
68gii	1	1	2	4	7
68giii	2	2	0	4	7
68hi	1	1	2	4	7
68hii	1	1	1	3[9]	7
68hiii	2	1	1	4	5
68i-i	2	1	0	3	7
68i-ii	1	1	3	5	7
68ji	1	1	3	5	7
68jii	3	2	2	7	2
68jiii	1	1	3	5	2
68ki	1	2	0	3	7
68kii	1	1	0	2	7
68kiii	1	1	2	4	7
68li	1	1	3	5	7
68lii	3	1	2	6	7
68liii	1	1	1	3	7
68liv	1	2	1	4	5

(CONTINUED)

Table 7-12 Size, Composition and Duration of Commensal Groups That Were in Winter Bush Camps, 1968-69 (Continued)

Commensal Group No.[1]	No. of Adult Men[2]	No. of Adult Women[2]	No. of Children	Total Membership	Duration of Stay in Bush (Months)
68lv	1	1	3	5	7
68lvi	2	2	1	5	7
68mi	1	1	2	4	7
68mii	1	1	2	4	5
68miii	1	1	2	4	7
68miv	1	1	2	4	2
68ni	5	2	0	7	7
68nii	1	1	2	4	7
68niii	3	2	0	5	7
68oi	2	3	0	5	7
68pi	2	1	0	3	5
68qi	2	1	3	6	7
68qii	2	2	0	4	7
68ri	1	1	2	4	7
68rii	1	1	3	5	2
Total (N=42)	68	56	63	187	265
Average	1.6	1.3	1.5	4.5	6.3

Footnotes:

1. Includes all commensal groups that spent two months or more in winter bush camps.
2. Includes all males and females over the age of sixteen plus, in the case of males, those on list of hunters, Table 7-1.
3. One adult hunter (55) who stayed for two months in the commensal group is not included here, see footnote 5.
4. One adult woman stayed only five months.

(CONTINUED)

Table 7-12 Size, Composition and Duration of Commensal Groups That Were in Winter Bush Camps, 1968-69 (Continued)

Footnotes: (Cont'd)

5. One adult hunter (55) who stayed for two months in this commensal group is not included here, see footnote 3.
6. One adult student spent two months with this commensal group and is not included here.
7. One of the active hunters spent four months in this group, and one of the inexperienced hunters spent three months.
8. One of the hunters spent five months in this commensal group.
9. One hunter in training spent one month with this commensal group and is not included here.

Table 7-13 Size, Composition and Duration of Commensal Groups That Were in Winter Bush Camps, 1969-70

Commensal Group No.[1]	No. of Adult Men[2]	No. of Adult Women[2]	No. of Children	Total Membership	Duration of Stay in Bush (Months)
69ai	3	2	2	7	7
69aii	2	1	1	4	7[3]
69aiii	1	1	0	2	7
69bi	2	1	2	5	5
69bii	1	1	2	4	7
69ci	1	1	1	3	7
69cii	1	1	3	5[4]	7
69di	2	1	0	3	7[5]
69dii	1	1	3	5	2
69ei	2	1	0	3	7
69fi	2	2	1	5	7
69fii	2	2	0	4	7[6]
69fiii	1	1	3	5	7
69fiv	1	1	2	4	7
69gi	1	1	2	4	7
69gii	2	2	3	7	7
69giii	1	1	2	4	2
69giv	2	2	0	4	2
69hi	2	1	3	6	7
69i-i	2	3	1	6	7
69ji	1	1	2	4	7
69jii	1	1	2	4	2
69ki	2	2	2	6[7]	7[8]
69li	2	1	0	3	7
69ni[9]	3	1	1	5[10]	7
69nii	1	1	4	6	3
69niii	1	3	0	4	2
69oi	3	1	1	5	7

(CONTINUED)

Table 7-13 Size, Composition and Duration of Commensal Groups That Were in Winter Bush Camps, 1969-70 (Continued)

Commensal Group No.[1]	No. of Adult Men[2]	No. of Adult Women[2]	No. of Children	Total Membership	Duration of Stay in Bush (Months)
69oii	1	1	2	4	2
69oiii	1	1	2	4	2
69pi	1	1	2	4	6
69pii	1	1	1	3[11]	2
69qi	3	2	0	5[12]	7[13]
69qii	1	1	2	4[14]	5
69si[15]	4	2	0	6[16]	7
69sii	1	1	2	4	7
69siii	4	1	1	6[17]	7
69ti	1	1	3	5	7
69tii	2	1	4	7	2
69ui	1	2	0	3	7
69uii	1	1	2	4	7
Total (N=41)	68	54	64	186	233
Average	1.7	1.3	1.6	4.6	5.7

Footnotes:

1. Includes all commensal groups that spent two months or more in winter bush camps.
2. Includes all males and females over the age of sixteen plus, in the case of males, those on the list of hunters, Table 7-1.
3. Includes one training hunter who was in this commensal group only five months.
4. Includes one young child which died in mid-winter.
5. Includes one training hunter who was in this commensal group only five months.

(CONTINUED)

Table 7-13 Size, Composition and Duration of Commensal Groups That Were in Winter Bush Camps, 1969-70 (Continued)

Footnotes: (Cont'd)

6. One hunter who was part of this commensal group for two months is not included. One hunter (99) who is included was part of the group for four months, see footnote 16.

7. One hunter who was part of this commensal group for two months is not included.

8. One adult man and woman were part of this commensal group for only six months.

9. The commensal group numbered 69mi joined another hunting group after two months by itself and was renumbered 69qii.

10. One inexperienced hunter who was part of this commensal group for two months is not included.

11. One hunter (61) was part of this commensal group for one month but is not included here, see footnote 14.

12. One hunter who was part of this commensal group for two months, and one inexperienced hunter who was part of this commensal group for one month are not included.

13. One inexperienced hunter was part of this group for only 3 months, but is included.

14. One hunter (61) who was part of this commensal group for two months is not included, see footnote 11.

15. Commensal group 69ri hunted by itself for two months then joined another hunting group and was renumbered 69fiv.

16. One hunter (99) was part of this commensal group for three months, but is not included here because he spent four months in commensal group 69fii, see footnote 6.

17. This commensal unit included one Mistassini hunter whom I was unable to meet. He is included in the tabulations on commensal and hunting groups in this chapter, but is excluded from all successive analyses. He does not appear on Table 7-1, or in derivitive calculations.

Table 7-14 People per Hunter and Children in School for 1968-69 Commensal Groups

Commensal Group No.[1]	No. of Adults in Bush	No. of Children in Bush	No. of Hunters[2]	Consumers/ Hunters Ratio	Yr. of First Birth of a Child[3]	No. of Children Not in Bush
68ai	4	1	2	2.5	1968	0
68bi	3	0	2	1.5		0
68ci	6	0	2	3.0		3
68di	3	3	2	3.0	1964	1
68dii	2	1	1	3.0	1966	0
68ei	3	0	2	1.5		2
68eii	2	2	1	4.0	1968	0
68eiii	2	1	1	3.0	1955	6
68fi	2	3	1	5.0	1956	3
68gi	5	4	2	4.5	1956	1
68gii	2	2	1	4.0	1965	0
68giii	4	0	2	2.0		6
68hi	2	2	1	4.0	1954	1
68hii	2	1	1	3.0		0
68hiii	3	1	2	2.0		0
68i-i	3	0	2	1.5		2
68i-ii	2	3	1	5.0	1958	2
68ji	2	3	1	5.0	1961	2
68jii	5	2	1	7.0		5
68jiii	2	3	1	5.0	1961	2
68ki	3	0	1	3.0		0
68kii	2	0	1	2.0		3
68kiii	2	2	1	4.0	1962	1
68li	2	3	1	5.0	1958	2
68lii	4	2	3	2.0		3

(CONTINUED)

Table 7-14 People per Hunter and Children in School for 1968-69 Commensal Groups (Continued)

Commensal Group No.[1]	No. of Adults in Bush	No. of Children in Bush	No. of Hunters[2]	Consumers/ Hunters Ratio	Yr. of First Birth of a Child[3]	No. of Children Not in Bush
68liii	2	1	1	3.0	1956	2
68liv	3	1	1	4.0		0
68lv	2	3	1	5.0	1965	0
68lvi	4	1	2	2.5		0
68mi	2	2	1	4.0	1966	0
68mii	2	2	1	4.0	1956	3
68miii	2	2	1	4.0	1964	0
68miv	2	2	1	4.0	1966	0
68ni	7	0	4	1.8		0
68nii	2	2	1	4.0	1966	0
68niii	5	0	3	1.7		4
68oi	5	0	2	2.5		6
68pi	3	0	2	1.5		3
68qi	3	3	2	3.0		4
68qii	4	0	2	2.0		0
68ri	2	2	1	4.0	1957	3
68rii	2	3	1	5.0	1955	2
Total (N=42)	124	63	63	-		72
Average	2.9	1.5	1.5	3.3		1.7

1. Includes all commensal groups that spent two months or more in winter bush camps.

2. Includes all Active Hunters (categories A,P,T and R) on Table 7-1. Does not include inexperienced hunters who resided in bush camps.

3. If first child was born during or after 1954.

Table 7-15 People per Hunter and Children in School for 1969-70 Commensal Groups

Commensal Group No.[1]	No. of Adults in Bush	No. of Children in Bush	No. of Hunters[2]	Consumers/ Hunters Ratio	Yr. of First Birth of a Child[3]	No. of Children Not in Bush
69ai	5	2	3	2.3		1
69aii	3	1	2	2.0		0
69aiii	2	0	1	2.0		1
69bi	3	2	2	2.5		4
69bii	2	2	1	4.0	1956	3
69ci	2	1	1	3.0	1956	2
69cii	2	3	1	5.0	1958	3
69di	3	0	2	1.5		2
69dii	2	3	1	5.0	1961	2
69ei	3	0	2	1.5		0
69fi	4	1	2	2.5		0
69fii	3	0	1	3.0		1
69fiii	2	3	1	5.0	1965	0
69fiv	2	2	1	4.0	1965	0
69gi	2	2	1	4.0	1958	3
69gii	4	3	2	3.5		1
69giii	2	2	1	4.0	1965	0
69giv	4	0	2	2.0		2
69hi	3	3	2	3.0	1956	4
69i-i	5	1	2	3.0		5
69ji	2	2	1	4.0	1966	0
69jii	2	2	1	4.0	1966	0
69ki	4	2	2	3.0	1957	3
69li	3	0	2	1.5		3
69ni	4	1	3	1.7		1

(CONTINUED)

Table 7-15 People per Hunter and Children in School for 1969-70 Commensal Groups (Continued)

Commensal Group No.[1]	No. of Adults in Bush	No. of Children in Bush	No. of Hunters[2]	Consumers/ Hunters Ratio	Yr. of First Birth of a Child[3]	No. of Children Not in Bush
69nii	2	4	1	6.0	1956	2
69niii	4	0	1	4.0		2
69oi	4	1	3	1.7		2
69oii	2	2	1	4.0	1955	5
69oiii	2	2	1	4.0	1968	0
69pi	2	2	1	4.0	1969	0
69pii	2	1	1	3.0	1968	0
69qi	5	0	1	5.0		0
69qii	2	2	1	4.0	1966	0
69si	7	0	5	1.4		0
69sii	2	2	1	4.0	1966	0
69siii	5	1	4	1.5		3
69ti	2	3	1	5.0	1964	1
69tii	3	4	2	3.5	1964	1
69ui	3	0	1	3.0		0
69uii	2	2	1	4.0	1962	1
Total (N=41)	122	64	66	-		58
Average	3.0	1.6	1.6	3.3		1.4

Footnotes:

1. Includes all commensal groups that spent two months or more in winter bush camps.
2. Includes all Active Hunters (categories A,P,T and R) on Table 7-1. Does not include inexperienced hunters who resided in bush camps.
3. If the first child was born during or after 1954.

Among the commensal groups that went to the bush there were 8 children in 1968-69 and 10 in 1969-70 between the ages of 7 and 15 inclusive. Most of these children were between 13 and 15 years of age (Table 7-16). The importance of having help from teenage children is spoken of frequently as a reason for taking one or another child out of school to keep them in the bush. Sometimes a child who does not like school and prefers the bush will be taken out of school before reaching 16 and will join their parents to help them in the bush. Sometimes one of a group of teenage children from a family will be kept out of school each year, but not the same one. Sometimes parents will decide which of their children will leave school early and live in the bush with them on a continuing basis. On occasion the child chosen will not be happy with this decision.

The majority of children in the bush however are pre-school children, and young families with many young children and no teenagers to help may find themselves with heavy work loads. This was reflected in some of the responses I heard to one of the recommendations of the McGill-Cree Project, namely that the school year be altered so that courses were offered in summer when parents were in the villages, and so that children could have holidays in winter to join their parents in the bush. While this suggestion received generally favorable responses from the Waswanipi with whom I discussed it, some families said it would be difficult to keep all their children in the bush for the winters. Several young adults said that when their families were young it was the hardest time to hunt. One man said "before when I had one or two children it was easy." At the time of this study he had five under eight years of age, including two pairs of twins, two and three years old respectively. The developmental cycle of the family therefore affects the composition of the winter commensal groups. Parents are often willingly sending young children off to school while being anxious to have some of the teenagers back to help them.

The impact of these factors may be seen in the composition of the commensal groups. While overall the average number of consumers per hunter was 3.3

Table 7-16 School Age Children in Commensal Groups in the Bush in the Winters of 1968-69 and 1969-70

Age of Child for Majority of Winter Season (Years)	Number of School Age Children in the Bush 1968-69	1969-70
7	1	0
8	0	0
9	0	0
10	0	1
11	1	1
12	1	1
13	2	2
14	3	3
15	0	2

in both winters studied, the average for commensal groups in which the first offspring was born in 1954 or later was 4.1 in both winters. By comparison, in those commensal groups in which the first offspring was born before 1954, the average number of consumers per hunter was 2.5 in 1968-69 and 2.4 in 1969-70. The distinction between those commensal groups which have children old enough to send to school and those which do not is also clear. No group in which the first offspring was born after 1961 have one or more children not in the bush with them (Tables 7-14 and 7-15).

The age structure of the commensal groups that go to the bush is heavily weighted with adults and young children, and thin in the middle with older children and young adults. In summer, of course, the commensal units are swelled by the return of the children from residential schools.

In winter the commensal groups have from one to five hunters, those with the largest numbers of hunters being groups of siblings living with their fathers and hunting together. As would be expected, given the frequency of commensal groups being composed of nuclear family members, the most frequent bond between the hunters of a commensal unit is fa-so, which occurred in fifteen commensal groups in each of 1968-1969 and 1969-70.

iii) Hunting Groups

In winter the commensal groups that go to bush camps to hunt form larger social groups, hunting groups. The hunting groups are winter co-residential groups comprised of one or more commensal groups that live together at the same camp site, and that generally hunt on the same hunting territory or section thereof. Some camps are established so as to provide access to two hunting grounds or sections. At the camp the entire hunting group may live in a single building, usually a tent frame, or a lodge constructed of local materials. However, as mentioned previously, each commensal group will have its own stove, larder and sleeping area. Sharing is extensive among the commensal groups within a hunting group, but each commensal group keeps and maintains its own possessions. The women and the men in the hunting group from different commensal groups often work together as sexually divided groups. Men may trap together as a team, travelling together each day, and each setting a trap at each lodge. This is especially the case when there is only one hunter in each commensal group. The members of the team of hunters however each set their own traps, and each catch their own animals. Although the kill is individually owned extensive gift exchanges of foods may take place among hunters. Similarly women often work together gathering firewood and boughs, and in other tasks.

Hunting groups are units of important economic cooperation, but they do not usually stay together through all seasons of the year or from year to year, although they may do so. In general they are considerably more fluid than are the component commensal groups. Some of the reasons for this will be discussed in a later chapter.

June Helm has described a "bilateral primary linkage principle" which she claims operates in place of explicit rules as a covert directive and determinate limit on local and regional band residence among Athapascan speaking Indian peoples of the Western sub-arctic region of Canada. She states,

> "almost without exception, no married pair is residing with a local band or within a regional band domain unless at least one spouse of that pair, male or female, had at time of entry a primary consanguine of either sex, already resident within the band" (Helm, 1968: 121 and 124).

The resultant social groups take the form of a chain of primary relative bonds, consanguineal and conjugal, "by which each individual is linked once or several times into the community whole" (Helm, 1965:365). Some researchers have recently challenged this model of sub-arctic Athapascan social organization (Sharp, 1977), and others have indicated that it does not apply to the data on Algonkian social organization in the eastern sub-arctic (Bernier, n.d.; Turner, 1977). Bernard Bernier did an analysis of the data on Waswanipi social organization collected by members of the McGill Cree

Project in the mid-1960's and he showed that while primary kinship bonds were important, either consanguineal or conjugal, they do not explain all cases of hunting group formation, because seemingly unrelated hunters were also incorporated in some hunting groups (Bernier, n.d. 21-22). The data on Waswanipi for 1968-69 and 1969-70 confirm Bernier's analysis. As indicated previously there were four commensal groups formed during 1968-69 and 1969-70 which included members unrelated by any traceable kinship linkage to other members. Furthermore, there was a high frequency of non-primary linkages among members of the same hunting groups. In 1968-69 at least eight hunting groups of the eighteen formed included commensal groups not linked by primary kinship bonds to other commensal groups (groups 68d, 68e, 68f, 68h, 68i, 68m, 68n and 68q). And, in 1969-70 eight hunting groups of twenty-one included commensal groups without primary kinship linkages to other commensal groups (69a, 69c, 69d, 69n, 69o, 69q, 69s, 69t). Therefore, over the two years, forty-one percent of hunting groups did not conform to the bilateral primary linkage principle, and if hunting groups comprised of single commensal groups which themselves do not conform to the rule are included, then the percentage approaches fifty percent.

The fact however that such a rule did not coincide with actual groupings for much more than fifty percent of the groups formed would not be proof that such a rule did not exist and was not used in practice. The key evidence is that informants do not explain their participation in hunting groups by reference to such a rule. The heads of commensal groups generally say they participate in a hunting group because they traditionally hunt with the head of the hunting group, or because they were invited to do so. In the former case they usually have a right to use of the hunting territory, in the latter they have been granted a privilege by the head of the hunting group. Heads of commensal groups in the latter category will in fact refer to the invitation from the head of the hunting group even when other primary kinsmen may be part of the same hunting group, but not its head. In cases such as these, both a father and his married son will separately say they joined the same hunting group because they were invited by the head of the hunting group, a man who may be distantly linked to them through consanguineal or affinal links, or who may on occasion have no effectively traceable kinship linkage. The formation of hunting groups in the eastern sub-arctic therefore appears to be more closely related to use of and rights to hunting territories, as I will discuss in more detail in Chapter 11.

The commensal groups that established winter bush camps in 1968-69 and 1969-70 were organized into 18 hunting groups in 1968-69 and 21 groups in 1969-70. In 1969-70 however, two of the groups joined others after Christmas-New Year's so only 19 distinct hunting groups were formed during mid-winter. On average there were 9 to 10 people per hunting group in the two years. The hunting groups were comprised on average of 2.3 and 1.9 commensal units each in 1968-69 and 1969-70 respectively, and averaged 3.5 and 3.1 hunters respectively. The size and composition of the hunting groups is summarized on Tables 7-17 and 7-18. In 1968-69 six of 18 hunting groups were comprised of a single commensal group, and in 1969-70, eight of 21 were, for a two year average of 36 percent. These include four comprised of nuclear families in 1968-69 and seven in 1969-70 or thirty-three percent of all hunting groups.

The hunting groups form around a commensal group leader who has a right or permission to hunt on a given hunting territory or section thereof, and he invites the other heads of commensal groups which do not have rights to that territory to join. Some single hunters may be asked to join, but when this happens it appears that they are effectively also being invited to join the commensal groups of the hunting group leader. Only one case like this was encountered, as reported above.

The commensal groups therefore generally join a hunting group as a unit, either on the basis of rights or privileges to use a given hunting territory. The bonds between the heads of the commensal groups that comprise a hunting group do not appear to conform to any single kinship rule. Father-son and brother-brother relationships are important, but so are affinal ties. Furthermore, a substantial number of cases of commensal units in a

Table 7-17 Size, Composition and Duration of Hunting Groups That Were in Winter Bush Camps, 1968-69

Hunting Group No.[1]	No. of Adult Men[1]	No. of Adult Women[1]	No. of Children[1]	No. of Hunters[1]	No. of Commensal Groups[1]	Duration of Stay in Bush (Months)[1,2]
68A	2	2	1	2	1	7
68B	2	1	0	2	1	7
68C	4	2	0	2	1	6
68D	3	2	4	3	2	7
68E	4	3	3	4	3	7
68F	1	1	3	1	1	7
68G	5	6	6	5	3	7
68H	4	3	4	4	3	7
68I	3	2	3	3	2	7
68J	5	4	8	3	3	7
68K	3	4	2	3	3	7
68L	9	8	11	9	6	7
68M	4	4	8	4	4	7
68N	9	5	2	8	3	7
68O	2	3	0	2	1	7
68P	2	1	0	2	1	5
68Q	4	3	3	4	2	7
68R	2	2	5	2	2	7
Total (N=18)	68	56	63	63	42	-
Average	3.8	3.1	3.5	3.5	2.3	6.8

Footnotes:

1. From Tables 7-12 and 7-14.
2. Longest duration of stay of any commensal group. For duration of stay of each composite commensal group see Table 7-15.

Table 7-18 Size, Composition and Duration of Hunting Groups That Were in Winter Bush Camps, 1969-70

Hunting Group No.[1]	No. of Adult Men[1]	No. of Adult Women[1]	No. of Children[1]	No. of Hunters[1]	No. of Commensal Groups[1]	Duration of Stay in Bush (Months)[1,2]
69A	6	4	3	6	3	7
69B	3	2	4	3	2	7
69C	2	2	4	2	2	7
69D	3	2	3	3	2	7
69E	2	1	0	2	1	7
69F[3]	5	5	4	4	3	7
69G	6	6	7	6	4	7
69H	2	1	3	2	1	7
69I	2	3	1	2	1	7
69J	2	2	4	2	2	7
69K	2	2	2	2	1	7
69L	2	1	0	2	1	7
69M[4]	1	1	2	1	1	5
69N	5	5	5	5	3	7
69O	5	3	5	5	3	7
69P	2	2	3	2	2	6
69Q[4]	3	2	0	1	1	7
69R[3]	1	1	2	1	1	7
69S	9	4	3	10	3	7
69T	3	2	7	3	2	7
69U	2	3	2	2	2	7
Total (N=21)	68	54	64	66	41	-
Average	3.2	2.6	3.1	3.1	1.9	6.9

Footnotes:

1. From Tables 7-13 and 7-15.
2. Longest duration of stay of any commensal group. For duration of stay of each composite commensal group see Table 7-13.
3. The commensal group which was a member of both of these hunting groups is included here with hunting group 69R.
4. The commensal group which was a member of both of these hunting groups is included here with hunting group 69M.

hunting group do not have primary kinship linkages. While in many of these cases more distant kinship can be traced this is not always the case. Furthermore informants sometimes say they are together because they are friends, as opposed to kinsmen, although in some cases they can trace a link through kinsmen.

The genealogical charts of the linkages among hunting group members appear as Figures 7-1 and 7-2. The charts are complete for all people in the bush, but only include individuals not present and deceased individuals to the extent necessary to indicate the linkage between members. In some cases, as mentioned above, the individuals themselves did not trace any linkages, although the links could be reconstructured with general genealogical data.

Considering all the hunting groups that were comprised of more than one commensal group there were a total of 28 and 26 pairs of relationships in each of the two years 1968-69 and 1969-70 respectively between the heads of the hunting groups and the heads of the other commensal groups in that hunting group. Father/Son relationships accounted for three cases in 1968-69 and five in 1969-70, fifteen percent of the total. Father-in-law/Son-in-law relationships accounted for three cases in 1968-69 and two cases in 1969-70 or nine percent of the cases. Wife's-brother/Sister's-husband relationships accounted for seven cases in 1968-69 and five in 1969-70, twenty-two percent of the total. Brother/Brother relationships accounted for only one case each year. Of the remaining cases, other more distant, non-primary, kinship linkages accounted for five cases in 1968-69 and for seven cases in 1969-70; and, eight cases in 1968-69 were said not to be related by kinship whereas seven were said not to be related by kinship in 1969-70. In total then, nineteen percent of cases were primary consanguineal bonds, thirty-one percent were primary conjugal bonds, twenty-two percent were linked by non-primary kin linkages, and twenty-eight percent were not clearly related by kinship according to informants reports. This suggests a highly fluid system of formation of hunting groups, with both primary linkages playing a role (7-19).

Table 7-19 Relationships Between Heads of Hunting Groups and the Heads of Commensal Units in the Same Hunting Group, 1968-69 and 1969-70.

Hunting Group No.[1]	Relationship Between Head of Hunting Group and Heads of Other Commensal Groups				
	1st	2nd	3rd	4th	5th
68A	none				
68E	Fa/So	non-primary[2]	none		
68F	none				
68G	Fa/So	DaHu/WiFa			
68H	non-primary	none			
68I	non-primary				
68J	Fa/So	SiHu/WiBr			
68K	SiHu/WiBr	SiHu/WiBr			
68L	SiHu/WiBr	WiBr/SiHu	WiFa/DaHu	none	none
68M	SiHu/WiBr	non-primary	none	none	
68N	DaHu/WiFa	none			
68O	Br/Br				
68Q	non-primary				
68R	SiHu/WiBr				
69A	Fa/So	non-primary	non-primary		
69B	WiBr/SiHu				
69C	Fa/So	non-primary			
69D	none				
69F	Br/Br	non-primary	non-primary		
69G	WiFa/DaHu	WiBr/SiHu	none		
69J	SiHu/WiBr				
69N	none	none			
69O	Fa/So	Fa/So	none		
69P	WiBr/SiHu				
69Q	non-primary				
69S	DaHu/WiFa	none			
69T	non-primary	none			
69U	SiHu/WiBr				

(CONTINUED)

Table 7-19 Relationships Between Heads of Hunting Groups and the Heads of Commensal Units in the Same Hunting Group, 1968-69 and 1969-70 (Continued)

Footnotes:

1. Only hunting groups comprised of more than one commensal group are listed.
2. "Non-primary" linkages mean that neither spouse had a primary consanguineal link to the head of the hunting group.

Although the harvests of animals are each individually owned, in each commensal group the animals killed by all members are consumed collectively, and while the adult men provide most of the animals, the adult women do most of the butchering, preparation and cooking of food and preparation of the by-products. Therefore, the productive process, as well as the consumption processes, imply the commensal group as a minimal unit of analysis. For some purposes however, the hunting group may be the appropriate level of analysis. This is so because there is extensive sharing, especially of access to animals, of food and of equipment, within hunting groups, and because the hunters who comprise a hunting group generally follow a consistent strategy of hunting under the direction of the head of the group. The evaluation of food production relative to need, and the analysis of hunting decisions and strategies are therefore done most appropriately at the level of the hunting group. In this and the chapters that follow I will move back and forth in the analysis between the individual hunter, the commensal group, the hunting group and the community, as is appropriate to the question being examined.

D - Production for Use and Needs for Commercial Products

The continued importance of hunting groups as units of production and consumption suggests that the present economy of the Waswanipi hunters is not one dominated by production for market or by exchange relations with markets, although the Waswanipi very clearly depend on market exchanges for certain goods and services.

The models of acculturative processes among the northeastern Algonkians proposed by some ethnohistorians and cultural ecologists, particularly Eleanor Leacock (1954) and Robert F. Murphy and Julian H. Steward (1956) hypothesize a process of slow but more or less continuous domination of the Indian economy by production for market. While a full treatment of the issues raised by these authors would require a more extended treatment of household economies and the history of consumerism than is appropriate in the context of the present study, a brief review of their position and of the Waswanipi data can indicate the present relationship of the Waswanipi to the market economy.

Leacock analyzed ethnographic and ethnohistorical evidence on the societies and economies of the Indian peoples of central, southeastern and western Labrador and northern Quebec, in order to propose a model of the post-contact development of the family hunting territory systems. One of the groups she specifically included in her analysis were the Mistassini Cree, the neighbors to the northeast of the Waswanipi. Leacock argued that private ownership of specific resources developed in response to the introduction of sale and exchange into the Indian economy through the fur trade (1954:2). Previously, several families were necessarily dependent on each other because of the uncertainties of the hunt, and the need to provide greater subsistence security than an individual family could achieve (Leacock, 1954:7). However, in Leacock's view, production for trade, as opposed to production for use, led to the transfer of the individual's most important economic ties from those with other hunting families to the fur trader, on whom the Indian became dependent for survival. This changed the objective relationship between band members from one of cooperation to competition, because families were able to survive without depending on one another as the result of increased dependence on purchased food supplies (Leacock, 1954:7). In this process, "material needs became theoretically limitless", and larger hunting groups became not only superfluous but "a positive hindrance to the personal acquisition of furs" (Leacock, 1954:7), and the family hunting territory system developed as a response to these changes. At the final stage of development the Indian trappers:

> "differ from white trappers only in the carry-over of some material traits, including at times a slightly, but hardly significantly, greater dependence on natural products and, more markedly, in the retention of attitudes and personal relationships more closely correlated with their past than their present way of life" (Leacock, 1954:24).

Murphy and Steward, building on Leacock's analysis of the northeastern Algonkians, and their own of the Mundurucú of Brazil, generalize her findings and the three-step process of transformation from aboriginal economy and society to a phase of "convergence and culmination." Very briefly, they argue that at the initial stage of contact trapping is secondary to subsistence hunting and basic social patterns exist (cf., Steward and Murphy, 1977:171). In a transitional phase, increased fur production interferes with subsistence production, individual trade conflicts with group solidarity, and the displacement of native crafts results in increased dependence on the trader (Steward and Murphy, 1977:171). In the final stage, fur trapping predominates, winter provisions are purchased, family or individual hunting predominates, and hunting territories are exploited only by the owner's family. Summarizing their argument they claim that:

> "When the people of an unstratified native society barter wild products found in extensive distribution and obtained through individual effort; the structure of native culture will be destroyed, and the final culmination will be a culture type characterized by individual families having delimited rights to marketable resources and linked to the larger nation through trading centers (Steward and Murphy, 1977:178; italics in original).

This happens because:

> "When goods manufactured by the industrialized nations with modern techniques become available through trade to aboriginal populations, the native people increasingly give up their home crafts in order to devote their efforts to producing specialized cash crops or other trade items in order to obtain more of the industrially made articles" (Steward and Murphy, 1977:171; italics in original).

Several studies of Indians and Inuit peoples in northeastern Canada have claimed to discern acculturative trends that parallel those outlined by Leacock and Murphy and Steward (Pothier, 1965; and Désy, 1968). Others have questioned various aspects of the model (Rogers, 1963; Knight, 1965; Bishop, 1970). Rogers distinguishes the hunting group complex from the hunting territory complex, and Knight argues that fur-bearing animals do not only provide fur, they provide food, and bush food remains important even after the introduction of purchased foods (Knight, 1965:34-35). The wide range of issues raised by these debates are beyond the scope of the present study. However, it may be appropriate to examine some of the issues raised that are directly related to the concerns of the present study.

The Waswanipi themselves, on several occasions, explicitly raised the issue of the differences between how they hunt and how non-Native trappers trap. In a sense the main elements of Part II of this study are an extended account of those differences. The Waswanipi, however, also note several specific differences between their own practices and those of non-Native trappers that are of significance for the hypothesis put forward by Leacock.

The Waswanipi themselves emphasize four differences between their hunting activities and those of white trappers: first, they live with their families in the bush and in groups with several hunters together; second, they hunt many animals not just fur-bearers, and they use the flesh of the animals they harvest to feed themselves and their families; third, they make many of the items of equipment that they need to conduct their activities; and finally, they prepare the pelts of the fur-bearing animals for sale much more elaborately and carefully than do White trappers, and their pelts are recognized to be of better quality and more desirable and usually receive a higher price. This in effect constitutes the Waswanipi strategy for choices among productive hunting activities and among alternative exchanges with the Canadian economy.

I will deal with each of these four issues in turn. The first, is the present form of social organization of the hunters; the second is the extent to which production for use or trade dominates hunting activities; the third is the extent of dependence on goods and services from the Canadian economy; and the fourth is the sources of cash incomes from the Canadian economy. In each of these respects the Waswanipi do not appear to have reached, or to be moving towards, the acculturative end points formulated by Leacock and by Murphy and Steward.

The issue of the social organization of productive activities has already been discussed. To review the conclusions here: hunters do not generally work individually but in teams; the basic unit of production and consumption is the commensal group, of which 75 percent are nuclear families; the unit within which extensive sharing occurs is the hunting group, two-thirds of which are larger than nuclear families; hunting territories which are "owned" by individuals are not used exclusively by the same group of individuals; and by implication access to resources is not solely a matter of individual ownership. I will discuss the latter points at greater length in Chapter 11. Overall however, the data on Waswanipi social organization do not indicate the degree of individualization, nor the extent of break down of effective cooperation, nor the degree of individualized control of resources indicated in the acculturation model.

On the second issue, the relative importance of fur pelt production for market versus the production of food for use, this has been discussed on a community-wide basis in Chapter 2. It is however necessary to give a more precise formulation to the relative importance of food production for use and fur pelt production for sales for those men who are active hunters from winter bush camps.

It is important to note at the beginning, as Knight has argued before, that production for use and for market often involves the harvest of the same species and therefore often involves some of the same activities. Thus, as has been indicated previously beaver, lynx and muskrat are all considered desirable foods, and otter is considered edible although less desirable. Thus, while each of these species is important as a source of fur pelts for sale, each is also a source of food that is regularly consumed. Beaver is the most important species in this respect, it accounts for 84 percent of the value of all fur pelts sold by all Waswanipi hunters, in a year (Table 7-20), and it accounts for 25 percent of all harvested bush foods (Table 2-18). In order to compare the importance of the two products produced from these activities I have calculated the value of the products in cash equivalent values for each hunting group.

I have estimated incomes from the sales of fur pelts from a number of reports of actual prices received. It was necessary to make an estimate because pelts were sold frequently by hunters, and often to such a diverse range of buyers that it was particularly difficult to reconstruct comprehensive records of actual incomes derived from such sales by each hunter. I have therefore

Table 7-20 Fur Income By Species For All Hunters, 1968-69 and 1969-70

Species	Total Value in Dollars[1]		Percentage of Value		Average Income Per Hunter[2]	
	1968-69	1969-70	1968-69	1969-70	1968-69	1969-70
Beaver	$30,558.00	$23,346.00	84.5	84.6	$436.97	$307.18
Otter	1,854.00	990.00	5.1	3.6	26.49	13.03
Marten	1,036.00	852.00	2.9	3.1	14.80	11.21
Mink	420.00	595.00	1.2	2.1	6.00	7.83
Weasel	144.50	122.00	0.4	0.4	2.06	1.61
Muskrat	992.25	800.25	2.7	2.9	14.18	10.53
Lynx	1,144.00	880.00	3.2	3.2	16.34	11.58
Non-Beaver Sub-Total	5,590.75	4,239.25	15.5	15.4	79.87	55.79
All	$36,148.75	$27,585.25	100	100	$516.84	$362.97

Footnote:

1. This list does not include fisher, red fox, black bear or squirrel pelts. The Quebec, Fur Division of the Department of Tourism, Fish and Game has records of 1,2,4 and 37 respectively of the above pelts having been sold in 1968-69 and 0,13,0, and 2 having been sold in 1969-70, with a total market value of $195.55 in 1968-69 and $143.20 in 1969-70. (Source: "Fourrures piègées sur les lignes de trappe enregistrées").
2. In 1968-69 70 hunters reported harvests of fur mammals, in 1969-70 76 hunters reported harvests. Some may not have sold the pelts, but there is no record of these men.

sought to derive a standard series of values for fur pelts sold in the fur trade and to apply this to the numbers of fur-bearing animals caught. This was complicated by the fact that various furs were typically sold together and a total price was offered and paid for the lot rather than setting a price for each pelt or for each kind of animal pelt separately. I have thus selected those cases in the records available when a price was established for one or a specified number of pelts from a single species. On the basis of the available reports of sales of one or more of a specific kind of pelt, I have calculated an approximate average price for each kind of pelt, Table 7-21. In the case of beaver, I have calculated a separate price for each season of each year to arrive at an annual average for each year (Table 7-22).[5]

For purposes of placing a value on the fur harvest, I have multiplied the number of specimens of each fur bearing animal caught by each hunting group only (Tables 7-23 and 7-24) by the average value of each pelt of that species that was sold in the fur trade. This is an approximation of the value of the fur harvest. There is an assumption in this procedure because not all the pelts of harvested fur-bearers are in fact sold as pelts in the fur trade. Some pelts are used for domestic purposes such as for trim on clothing for personal use, and for ritual purposes such as the burning of a beaver at the beginning of each hunting season. Some pelts are damaged or of so little value that they may not be processed at all. And some pelts bring in cash as handicrafts sold to non-Natives, either as items of sale themselves, or as trim on domestically produced handicrafts, such as moose hide mitts and moccasins. Those used personally as well as those not processed bring in no cash, although the former have a value in use. Those sold as or on handicrafts generally bring more cash than would be received if they were sold to the fur trade market. Using the fur trade value for all pelts is therefore an estimate of the value of the fur pelt harvest, although it may be a high estimate of the actual cash received. Furthermore, treating the value of all fur-bearer pelts as a value for exchange, rather than use, slightly over-estimates production for exchange. Nevertheless, it is a reasonable approximation because personal use of beaver pelts, the most valuable market item is quite limited. Tables 7-25 and 7-26 indicate the total estimate of the market value of fur pelts produced

Table 7-21 Reported Prices Received for Fine Fur Pelts, and Average Price Per Pelt, 1968-1970

Individual	Fine Fur Species					
Number	Otter	Marten	Mink	Weasel	Muskrat	Lynx
14		$5.00				
87		7.00		$0.10		$38.00
53	$15.50				$0.75	
25		2.00		2.00	0.25	35.00
95		2.00	$4.50	0.20	1.00	40.00
56		3.00		0.25	0.75	31.00
93		3.00				
85	22.00	3.00	3.00	0.50	1.50	
65	22.00			0.75		
45	15.00	6.00	4.00			
97	15.00				1.00	
52	20.00	4.00			0.50	
91	15.00	5.00		0.20	0.75	
Average	$17.79	$4.00	$3.83	$0.57	$0.81	$36.00
Approximate Average Used in Calculations	$18.00	$4.00	$3.50	$0.50	$0.75	$22.00[1]

Footnote:

1. Because informants reported that prices quoted were for large specimens a reduction of 40 percent was applied to estimate an approximate average for general application. This is a conservative calculation.

Table 7-22 Average Prices Received for Beaver Pelts by Year and Season of Sale, 1968-69 and 1969-70

Year	Average Price				Approximate Value Used in Calculations
	Season			Annual	
	Early Winter	Late Winter	Spring		
1968-69	$9.40	$12.80	$13.60	$11.47	$11.00
1969-70	$8.75	$ 8.35	$ 7.50	$ 8.53	$ 9.00

Table 7-23 Harvest of Moose, Beaver and Fine Fur Mammals Hunting Group, 1968-69

Hunting Group	Harvests by Species							
	Moose	Beaver	Otter	Marten	Mink	Weasel	Muskrat	Lynx
68A	9	174	6	33	2	10	18	0
68B	5	69	4	8	2	4	27	0
68C	2	38	1	7	0	1	14	0
68D	3	76	1	15	2	4	41	0
68E	8	119	3	9	3	9	187	8
68F	4	120	4	7	3	3	2	0
68G	3	145	1	21	11	25	30	2
68H	3	185	6	7	1	16	92	2
68I	4	170	2	5	9	34	120	0
68J	2	68	4	14	6	25	35	1
68K	4	109	3	8	6	5	28	2
68L	13	365	20	16	33	63	144	4
68M	9	206	11	10	4	6	52	30
68N	21	274	8	6	9	3	124	0
68O	3	112	10	22	2	10	0	0
68P	3	113	3	25	1	9	44	0
68Q	7	210	3	10	11	19	93	1
68R	1	41	1	22	3	6	44	0
Totals	104	2594	91	245	108	252	1095	50

Table 7-24 Harvests of Moose, Beaver and Fine Fur Mammals by Hunting Group, 1969-70

Hunting Group	Harvests by Species							
	Moose	Beaver	Otter	Marten	Mink	Weasel	Muskrat	Lynx
69A	3	174	3	10	15	12	95	1
69B	0	103	0	7	12	10	41	0
69C	9	298	3	9	11	30	86	11
69D	2	70	0	5	16	20	46	0
69E	3	100	1	0	3	0	50	0
69F	5	202	8	19	12	23	100	11
69G	5	159	9	9	17	48	33	1
69H	1	109	2	4	4	6	22	0
69I	3	129	6	37	5	10	0	0
69J	0	57	2	3	1	0	10	1
69K	2	102	0	18	3	7	6	0
69L	2	70	2	12	7	4	45	9
69M	2	47	0	2	0	0	3	0
69N	3	143	0	11	5	15	55	0
69O	3	103	0	5	4	4	68	0
69P	2	52	2	4	0	1	20	0
69Q	5	110	0	13	4	0	9	0
69R	0	22	1	0	0	0	6	0
69S	26	300	12	21	23	33	201	0
69T	2	34	1	7	1	5	2	5
69U	2	56	1	3	6	7	35	1
Totals	80	2440	53	199	149	235	933	40

Table 7-25 Fur Income By Hunting Group, Total and Per Hunter Season, 1968-69

Hunting Group Number	Total Fur Income	Income Per Hunter-Season (Seven Man-Months)
68A	$2,276.93	$ 838.87
68B	1,058.82	463.23
68C	491.00	343.70
68D	953.75	392.72
68E	1,730.25	465.83
68F	1,433.50	1,114.94
68G	1,814.50	453.63
68H	2,295.50	642.74
68I	2,064.50	688.16
68J	957.75	609.48
68K	1,373.50	457.83
68L	5,002.00	574.00
68M	3,220.00	980.00
68N	3,583.00	447.88
68O	1,512.00	1,176.00
68P	1,504.00	752.00
68Q	2,543.75	847.92
68R	375.75	375.75
Average Per Group	$1,899.47	$ 645.82
Per Active Hunter	$ 759.79	

Table 7-26 Fur Income By Hunting Group, Total and Per Hunter Season, 1969-70

Hunting Group Number	Total Fur Income	Income Per Man-Season (Seven Man-Months)
69A	$1,811.75	$ 301.96
69B	1,032.75	722.93
69C	3,138.25	1,220.43
69D	912.50	456.25
69E	966.00	483.00
69F	2,408.50	526.86
69G	1,759.25	492.59
69H	1,066.50	533.25
69I	1,439.50	719.75
69J	594.00	462.00
69K	1,098.50	512.63
69L	972.25	486.13
69M	433.25	758.19
69N	1,397.25	349.31
69O	834.00	278.00
69P	589.50	589.50
69Q	747.75	523.43
69R	220.50	771.75
69S	2,851.25	386.61
69T	469.50	273.88
69U	606.75	424.73
Average Per Group	$1,207.12	$ 536.82
Per Active Hunter	$ 679.98	

by hunting groups, by hunter-season, defined as seven man-months of winter hunting, and by active hunter. The average value of fur pelts harvested per active hunter in the bush camps was $645.82 and $536.82 in 1968-69 and 1969-70 respectively.

I have estimated the value of the food harvests of the hunters in winter hunting camps on the basis of moose and beaver harvests. The number of moose and beaver harvested per hunting group is listed on Tables 7-23 and 7-24, and the total pounds of butchered meat available from moose and beaver has been calculated for each hunting group as in Chapter 2. On the basis of data from a sample of four hunting groups I have calculated that other bush food harvests during the winter season amounted to just over 25 percent of moose and beaver food production. I have assumed that on an annual basis other harvested food would provide at least as much bush food as during winter, or at least one-half as much food as winter moose and beaver. This is a minimum estimate because it assumes other foods are harvested at nearly the same rate in summer as in winter, and it therefore does not take account of increased fish and waterfowl harvests in summer. Nor does it take account of summer moose kills. The weights of food are then valued, as in Chapter 2, at $1.00 a pound for moose and beaver and $0.75 a pound for other meats, i.e., small game, fish and waterfowl (Tables 7-27 and 7-28). The substitution value of the food produced averaged $2,562.97 per hunter-season (seven man-months) in 1968-69 and $2,506.91 in 1969-70.

Comparing the average value of fur pelts for exchange and the average substitution value of food produced for use per hunter-season of men who participated in winter hunting groups (Table 7-29), food production accounts for 80 percent of the total value of food plus fur pelts produced from harvested animals. The predominance of the food value for use over the fur pelt value for exchange in the economies of the winter bush camps hunters is clear.

This implies that production for exchange has not come to dominate production for use, despite probably a 300-year history of involvement in the fur trade, and the presence of a fur trade post for the last 150 years. And, if

Table 7-27 Value of Bush Foods Harvested by Hunting Groups, 1968-69

Hunting Group	Pounds of Butchered Meat Harvested: Moose 1	Beaver 2	Moose Plus Beaver (3=1+2)	Other (4=3x.5)	Value of Butchered Meat Harvested
68A	3996	3584.4	7580.4	3790.2	$10,460.95
68B	2220	1421.4	3641.4	1820.7	5,025.13
68C	888	782.8	1670.8	835.4	2,305.70
68D	1332	1565.6	2897.6	1448.8	3,998.69
68E	3552	2451.4	6003.4	3001.7	8,284.69
68F	1776	2472.0	4248.0	2124.0	5,862.24
68G	1332	2987.0	4319.0	2159.5	5,960.22
68H	1332	3811.0	5143.0	2571.5	7,097.34
68I	1776	3502.0	5278.0	2639.0	7,283.64
68J	888	1400.8	2288.8	1144.4	3,158.54
68K	1776	2245.4	4021.4	2010.7	5,549.53
68L	5772	7519.0	13291.0	6645.5	18,341.58
68M	3996	4243.6	8239.6	4119.8	11,370.65
68N	9324	5644.4	14968.4	7484.2	20,656.39
680	1332	2307.2	3639.2	1819.6	5,022.10
68P	1332	2327.8	3659.8	1829.9	5,050.52
68Q	3108	4326.0	7434.0	3717.0	10,258.92
68R	444	844.6	1288.6	646.3	1,778.27
Average					
Per Group					$ 7,538.16
Per Hunter-Season					2,562.97
Per Active Hunter					3,015.26

Table 7-28 Value of Bush Foods Harvested by Hunting Groups, 1969-70

Hunting Group	Pounds of Butchered Meat Harvested: Moose 1	Beaver 2	Moose Plus Beaver (3=1+2)	Other (4=3x.5)	Value of Butchered Meat Harvested
69A	1332	3584.4	4916.4	2458.2	$ 6,784.63
69B	0	2121.8	2121.8	1060.9	2,928.08
69C	3996	6138.8	10134.8	5067.4	13,986.02
69D	888	1442.0	2330.0	1165.0	3,215.40
69E	1332	2060.0	3392.0	1696.0	4,680.96
69F	2220	4161.2	6381.2	3190.6	8,806.06
69G	2220	3275.4	5495.4	2747.7	7,583.65
69H	444	2245.4	2689.4	1344.7	3,711.37
69I	1332	2657.4	3989.4	1994.7	5,505.37
69J	0	1174.2	1174.2	587.1	1,620.40
69K	888	2101.2	2988.2	1494.6	4,123.72
69L	888	1442.0	2330.0	1165.0	3,215.40
69M	888	968.2	1856.2	928.1	2,561.56
69N	1332	2945.8	4277.8	2138.9	5,903.36
69O	1332	2121.8	3453.8	1726.9	4,766.24
69P	888	1071.2	1959.2	979.6	2,703.70
69Q	2220	2266.0	4486.0	2243.0	6,190.68
69R	0	453.2	453.2	226.6	625.42
69S	11544	6180.0	17724.0	8862.0	24,459.12
69T	888	700.4	1588.4	794.2	2,191.99
69U	888	1153.6	2041.6	1020.8	2,817.41
Average					
Per Group					$ 5,637.17
Per Hunter-Season					2,506.91
Per Active Hunter					3,175.44

Table 7-29 Comparative Value of Fur Pelts and Bush Foods Produced per Man-Season by Hunters in Winter Hunting Groups, 1968-69 and 1969-70

Items	1968-69		1969-70	
	Value	Percentage	Value	Percentage
Fur Pelts	$ 645.82	20	$ 536.82	18
Bush Food	2,562.97	80	2,506.91	82
Total	$3,208.79	100	$3,043.73	100

production for exchange has not become the predominant goal of production, then this is presumably because the Waswanipi have not desired to become predominantly commercial trappers. Leacock would appear to assume a coincidence between an acquisitive desire on the part of the clients and the profit interests of the fur trader. The Waswanipi on the other hand are explicitly concerned about their self-sufficiency and the exchanges they depend on with the Canadian economy, and the seek to limit the latter while pursuing the former. And, in general they appear to have some success pursuing this goal.

The first step is that people do not depend on purchased foods for most of their subsistence needs. One measure of the dependence on purchased food among the active hunters is to consider the proportion of food weight available for consumption to hunting groups in winter. For a sample of four families who will be discussed at greater length in the next chapter, I have full records on animal harvests and on food purchases for the winter hunting season. For this four hunting group sample, purchased foods provided no more than 25 percent of available food, by weight (Table 7-30), and averaged only 17 percent of available food. The food produced was not only of higher value than the furs produced by hunting groups, the food was of considerably more importance than the purchased foods for those families that practiced intensive hunting from bush camps. It should be noted however than since almost all purchased foods were purchased to be eaten, whereas some bush foods were harvested to be given away, as I will indicate in detail in Chapter 8, purchased foods probably accounted for more than 17 percent of consumed foods, especially on an annual basis. Nevertheless, bush foods were clearly more important.

It should be noted however that some purchased food has become a "traditional" part of the diet, and purchased foods are valued because they offer security if there is a break down in the hunting activities of a hunting group. But, despite this use of purchased foods, bush foods are adequate for subsistence needs, and the cash cost of the purchased foods used by families in winter hunting groups is very modest. Using a list of prices I collected in local stores in the Waswanipi region in the fall of 1970 (Table 7-31), I have calculated the cost of the foods purchased by each of the four hunting groups

Table 7-30 Percentage of Food Weight Available From Bush Food Sources and Purchased Foods in Four Hunting Groups, 1968-69

Hunting Group	Percentage of Food Weight					
	Moose	Beaver	Moose and Beaver	Other Bush Food	All Bush Food	Purchased Food
68A	49.2	37.3	86.5	5.2	91.7	8.2
68B	55.3	30.0	85.3	5.2	90.6	9.4
68C	25.4	19.0	44.4	31.0	75.3	24.7
68J	21.1	28.2	49.3	26.7	76.0	24.0
Average	37.7	28.6	66.4	17.0	83.4	16.6

Table 7-31 Cost of Food in the Waswanipi Region, October, 1970

Item	Unit Priced	Price
Flour	50 lbs.	$5.75
Sugar	50 lbs.	6.00
Oats	25 lbs.	3.25
Lard	20 lbs.	6.50
Tea	1 lb.	1.29
Baking Powder	1 lb.	.55
Rice	2 lbs.	.51
Macaroni	2 lbs.	.53
Carnation	Case 24 cans	9.00
Coffee (Ground)	1 lb.	1.21
Coffee (Instant)	Jar - 6 oz.	1.29
Soup	Can	.20
Potatoes	50 lbs.	2.50
Butter	1 lb.	.84
Soup - Package	Package	.17
Hot Chocolate (Quick)	2 lbs.	.95
Cheeze Whiz	1 lb.	.78
Rasins	2 lbs.	.72
Saltine - Crackers	1 lb.	.48
Pancake Mix	2 lbs.	.51
Bacon	1 lb.	.63
Cereal	12 oz.	.33
Cookies	1 lb.	.55
Hot Dogs	12	.63
Bologna	1 lb.	.69
Chocolates	1 lb.	2.09
Chicken Necks	1 lb.	.28
Pork Chops	1 lb.	.89
Peanut Butter	1 lb.	.53
Salt	5 lbs.	.36

(CONTINUED)

Table 7-31 Cost of Food in the Waswanipi Region, October, 1970 (Continued)

Item	Unit Priced	Price
Apples	1 lb.	.20
Peas Canned	14 oz.	.26
Bread	Loaf	.38
Strawberry Jam	12 oz.	.41

for which I have complete records. These groups spent from $81.63 to $352.57 per group per winter hunting season on the purchase of foods (Table 7-32).

The Waswanipi who have continued to be intensively involved in hunting as opposed to employment activities have remained subsistence hunters first, and fur pelt trappers second. This does not mean that the cash derived from the sale of fur pelts is not important, as I will indicate below, but it does mean that the major productive activity is production of food for use, not the production of pelts for exchange. An implication of this finding is that production for exchange is practiced to support production for use. And, another implication is that the choice to hunt as opposed to working for wages in winter is a choice that maintains greater self-sufficiency.

As I have indicated above, the Waswanipi are aware of important dimensions and consequences of these choices. One other example they use is to compare the cost of feeding a family in summer when a man is employed, to the cost of purchased foods in winter when living in bush camps and hunting. The purchased food costs of a sample of four families over a several week period during the summer, while the men were working, amounted to $91.63 per adult consumption unit per month (Table 7-33). By comparison, the winter food cost per adult consumption unit month was $7.97 (Table 7-32) or nine percent of the summer costs. In terms of subsistence then, hunting is clearly a means of reducing depency on purchased foods.

In summary then, food production for use is four times the value of fur production, food produced is approximately 83 percent of all food available in winter bush camps, and the cost of purchased food in winter bush camps is only 9 percent of the cost of purchased foods required to feed a family when a man is working. Therefore subsistence food production is substantial both with respect to the values of the furs produced and with respect to the use of purchased foods. This helps to explain why the social organization of hunting has not acculturated to the model of exclusive individual use of resources, non-cooperation in production, and nuclear families as the sole units of production and consumption.

Table 7-32 Cost of Food Purchased for Winter Bush Camps by Four Hunting Groups, 1968-69

Hunting Group	Cost of Food Purchased for Winter Bush Camps	Winter Cost Per Adult-Month
68A	$220.11	$ 7.89
68B	81.63	3.70
68C	217.45	7.18
68J	352.57	12.07
Average		$ 7.97

Table 7-33 Cost of Food Purchased for Summer Consumption by Four Families, 1969

Family	Cost of Food Purchased Per Week in Summer	Adult Consumption Units	Summer Cost Per Adult-Month
1	$ 65	3.67	$ 76.16
2	65	2.33	119.96
3	85	4.33	84.41
4	100	5.00	86.00
Average			$ 91.63

The implication of this analysis is that the Waswanipi belief system is not an anachronism in their present economic circumstances, but adequate definition of reality and adequate guide to action for those Waswanipi who practice intensive hunting. This will be described in the following chapters. Waswanipi indicate clearly that they find self-sufficiency and integrity through the practice of hunting, and they speak of the meaning and productivity of hunting activities as intimately linked together. But the Waswanipi also note that they are not completely self-sufficient, and that there is a degree to which they now depend on exchanges with the Canadian economy.

Increases in the use of consumer goods and services in the Waswanipi communities were growing but appeared to be growing only slowly among the population as a whole. I have no quantitative data on the topic however. What is clear I think is that hunting was a highly valued way of life and that among that sector of the population that chose to continue hunting as their major activity, desire for consumer goods and services was restricted. The very choice of hunting itself is a commitment to limited cash incomes and therefore to limited consumption of consumer goods and services. Nevertheless, from the individual's point of view, the choice of hunting is more a commitment to certain activities and values than a total rejection of others.

Those people who do hunt intensively, while having few demands for consumer goods, were using certain goods and services in order to carry on productive and efficient hunting activities, and some of these goods and services were considered essential to the conduct of the activity.

Hunters generally spoke of the equipment, supplies and services they now used as having made their lives considerably less difficult and somewhat more secure than those of their fathers and grandfathers. The Waswanipi considered that in general the introduction of new equipment and services had improved the conditions for hunting significantly during the course of the present century. However, this improvement was seen as having to offset the effects of the increasing intrusion of non-Natives onto their lands during the 1950's and 1960's. Nevertheless, the general sense was that it was a good time to be a hunter, relative to conditions which had existed in the past.

The use of equipment and services to aid hunting was however seen as having its costs, in a general and a specific sense. The Waswanipi were carefully selecting those items they would adopt for regular use. Steel tools, cooking equipment, traps and muzzle loading guns, as well as clothing were adopted in the previous century. Tents, breech-loading rifles, canvas canoes, and larger dogs for hauling were all adopted in the early decades of this century.

Where imported goods were not judged to be better and more practical than local items they were not used. Thus, for example, outboard motors, which were known since the 1920's were purchased by only a minority of the men, usually those who did not have far to travel to their hunting territories. They were considered impractical because the gasoline to run the motors was costly and because it came in light-weight tins that tended to spring leaks easily on portages. Only when sturdy ten gallon drums became available, and incomes rose in the late 1940's and 1950's, did the use of outboard motors come into common use.

The Waswanipi not only carefully considered the new items of equipment they adopted for common use, they sought various means of provisioning themselves outside the market with comparable items, replacements or repairs.

Thus some men used sheet metal left over from construction projects to build light-weight wood stoves for use in the bush. An alternative was the use of cut down 45-gallon drums as effective, light-weight, wood burning stoves. Many commercially bought items were repaired locally. For example, when canoe ribs broke, replacements were shaped by the men and installed to make repairs. Considerable use was made of scrap and surplus goods from around the new town sites. Individual families had "caches" at the Matagami garbage dump where they collected useful items and materials.

Another example is housing. Because the Waswanipi had moved off the reserve at Waswanipi post and were living on the outskirts of towns as squatters on town or crown lands, they received no assistance for housing from the Department of Indian and Northern Affairs, or any other government agency. The majority of their homes were therefore built by themselves out of left-over construction materials collected around the non-Native settlements. This was expected to be a temporary situation, but in fact, it has only been since a new reserve was established in 1976 that an assisted housing program was begun at the site of the reserve.

In winter bush camps, of course, housing was constructed by the families from logs and bush materials or from scrap construction materials salvaged from the town sites and transported to the bush.

Wherever no purchasable goods were judged to be better and more practical than goods of local manufacture, local production was continued. Thus moose hide moccasins, mittens and snowshoes were all considered better than any commercially manufactured alternatives and were made by each household. Many sleds and toboggans were locally made. Basic tools such as "crooked" knives, fleshing tools, and some ice chisels were made locally. Women made or modified commercial clothing for use, and an extensive range of types of pouches and carrying bags were made locally. A particular kind of moss was gathered locally and dried for use as baby diapers. And, the branches of coniferous trees were collected weekly and used to cover the floors of bush camps to provide a clean and odoriferous flooring.

What these cases indicate is that local production of materials and services related to hunting was not globally replaced by goods produced industrially. Rather a careful testing and evaluation of goods and services was undertaken before items were adopted. Where a new item could be produced locally of local materials or scrap materials it often was produced, and where an item could be repaired locally, this was done in preference to paying for repairs.

The key factors that appear to have been taken into account in deciding to adopt an item was whether it facilitated hunting activities, and whether it could be afforded. Where items were not improvements or where they could not be afforded then, in general, locally produced items continued in use. Many new items were, in fact, adopted but in the Waswanipi view, and in fact, they facilitated rather than supplanted hunting activities and local food production.

The goods and services that were adopted by men as regular items and services did however create a real need for a limited, but regular cash income. Some of these goods and services were effectively considered by most hunters to be essential to the conduct of hunting activities. And the cash needed to purchase, repair or transport these items was also considered essential to the conduct of hunting activities. Thus, while hunting remained highly productive of foods, hunting did depend on access to certain levels of cash income. And, while various techniques were used to keep this need for cash low, expectations had changed sufficiently that certain levels of cash income were necessary. As I will indicate below it was not only the cash amount but the scheduling of incomes that was important.

I have therefore attempted to estimate the basic minimum cash requirements for the conduct of hunting activities by Waswanipi hunters during the period from 1968 to 1970. I have grouped the costs into four categories: equipment measured as a depreciation cost, outfitting costs, food costs, and transportation costs.

In 1968-1970 the basic hunting equipment of the Waswanipi men included traps, rifles, canoes and outboard motors and nets. A survey of the equipment owned by 40 active or newly retiring hunters indicated that they owned on average: 16 beaver traps and a similar number of smaller traps for fur-bearing animals; one .22 calibre rifle for small game hunting; one high power rifle, usually a 30-30 or .303, for big game hunting; one shot gun for waterfowl hunting; one square-end canoe to which an outboard motor could be attached; one outboard motor; and one fish and one beaver net (Table 7-34). Other items not surveyed include tents, wood stoves, naphtha stoves mainly for summer cooking, naphtha lanterns for some use in winter camps, chain saws, and

Table 7-34 Hunting and Trapping Equipment Used by Waswanipi Hunters, 1968-1970

Hunter Number	Activity Category	Traps: Beaver: Regular Leg-hold	Traps: Beaver: Conibear Body-grip	Traps: Small	Guns: .22 Rifle	Guns: High-power Rifle	Guns: Shotgun	Canoes & Motors: Canoes: Square End	Canoes & Motors: Canoes: Paddle	Canoes & Motors: Outboard Motors	Nets: Fish	Nets: Beaver	Skidoo: Skidoo	Skidoo: Sleds
11	A	6	3	11	1	1	1	2	0	2	1	1	0	0
13	A	6	0	15	1	1	1	1	-	-	1	1	0	0
14	A	19	3	25	2	1	2	1	1	1	1	1	0	0
15	A	19	0	12	2	0	0	1	0	0	0	1	0	0
21	A	25	2	14	1	1	1	1	1	1	1	2	0	0
22	A	12	0	20	-	-	-	-	-	-	-	-	-	-
25	A	20	4	15	1	1	1	1	1	1	1	2	-	-
27	A	13	0	2	1	0	1	1	0	1	0	1	-	-
28	A	10	4	15	1	1	1	1	0	0	1	1	0	0
31	A	20	0	25	1	0	1	0	0	0	1	1	0	0
34	A	20	8	30	2	1	2	1	0	3	1	2	0	0
36	A	35	1	30	1	1	1	1	0	1	1	1	0	0
37	A	20	2	15	2	1	2	3	0	2	1	1	0	0
42	A	29	3	30	1	1	1	1	1	1	2	0	0	0
43	A	12	0	3	1	1	1	1	0	1	1	1	0	0
44	A	7	0	12	-	-	-	-	-	-	1	1	0	0
45	A	18[1]	2	10	1	1	1	1	0	1	0	0	0	0
50	A	18	2	7[2]	2	1	2	1	0	1	1	1	0	0
52	R	9	3	20	1	1	1	1	0	1	1	1	0	0
53	R	15		20	1	1	1	1	0	1[3]	2	1	0	0

(CONTINUED)

Table 7-34 Hunting and Trapping Equipment Used by Waswanipi Hunters, 1968-1970 (Continued)

Hunter Number	Activity Category	Traps: Beaver: Regular Leg-hold	Traps: Beaver: Conibear Body-grip	Traps: Small	Guns: .22 Rifle	Guns: High-power Rifle	Guns: Shotgun	Canoes & Motors: Canoes: Square End	Canoes & Motors: Canoes: Paddle	Canoes & Motors: Outboard Motors	Nets: Fish	Nets: Beaver	Skidoo: Skidoo	Skidoo: Sleds
55	A	6[4]	0	0	1	1	0	0	0	0	0	0	0	0
56	A	5	0	0	1	1	1	0	0	0	1	0	0	0
57	A	15	0	6	1	1	1	1	0	1	1	1	0	0
58	A	4[5]	0	0	1	1	1	1	0	1	0	1	0	0
61	A	0	5	10	1	0	1	1	0	1	0	0	-	-
65	A	12	9	20	1	1	1	1	0	1	1	1	-	-
68	A	10	1	5	1	1	2	1	0	1[6]	1	1	-	-
69	A	20	0	15	1	1	1	1	0	-	-	-	-	-
72	A	10	0	15	1	1	1	1	0	0	0	1	-	-
73	A	20	3	35	1	1	1	1	1	1	1	1	-	-
74	A	7	3	5	3	1	1	1	0	0	0	0	-	-
75	A	6	0	10	1	1	1	0	0	0	0	1	-	-
76	A	5	0	10	1	1	1	0	0	1	0	1	-	-
81	R	25	0	20	1	1	1	1	0	1[7]	1	1	0	0
83	A	40	20	70	1	1	1	2	2	2	1	1	-	-
85	A	20	0	15	1	1	1	1	0	1	0	1	0	0
93	A	16	0	16	1	2	1	2	0	1	1	2	0	0
94	A	10	0	17	1	1	1	0	0	0	0	1	0	0
95	A	20	0	15	0	1	1	1	0	1[8]	0	1	0	0
97	A	6	-	10	1	1	1	1	0	0	1[10]	1	0	0
Average		14.7	2.1	15.6	1.2	0.9	1.1	1.0	0.2	0.9	0.7	0.9	0.0	0.0

(CONTINUED)

Table 7-34 Hunting and Trapping Equipment Used by Waswanipi Hunters, 1968-1970 (Continued)

Footnotes:

1. Belongs to #41.
2. Lost 23 small traps 1968-69.
3. Broken 1969-70.
4. 4 belong to #50, 2 belong to #58. Lost traps 10 years ago, owned none since then.
5. Purchased 12 in 1968 - 5 to #97 - 2 to #55.
6. Broken.
7. Broken.
8. Broken.
9. Belong to #52.
10. Belong to #58.

toboggans, snowshoes and sleds produced locally. Only chain saws would have added substantially to the calculations made below, but in 1968-1970 chain saws were owned primarily by men who worked at wood cutting in summer rather than for hunting. They were too heavy for most women to use.

Equipment was generally cared for well, and the main items were said to last ten years or more (Table 7-35). At an extreme, one hunter was still using a rifle his father had bought him when he began to hunt, about 1915.

The total value of the basic hunting equipment owned per hunter has been calculated as the cost of replacing the equipment owned at the cost prices recorded in the Waswanipi region in the summer of 1970. The total replacement cost of the average trapping equipment per hunter would have been less than $850 (Table 7-36). This, it should be noted, was not the actual current value, because much of the equipment listed was not in new condition and would have had a current value below replacement cost.

To determine an annual cost, the annual depreciation on replacement costs has been calculated (Table 7-37). Annual depreciation amounts to $81.72. As a measure of annual costs this is somewhat inaccurate, because annual real costs will vary with the item needing to be purchased, and with the credit arrangements made. Most items were purchased for cash, and frequently when a big item had to be purchased a man would take a very large fur harvest, or more commonly, would try to work for longer during the summer to pay for the item needed. For example, one attraction of working for the Indian Affairs run commercial fisheries was that it was a means of acquiring new canoes and outboard motors without having to increase incomes from the sale of furs. The items were well priced, were deducted from earnings, and any debt remaining at the end of the summer could be carried over. Canoes and outboard motors were the largest single expenses for equipment commonly being incurred at that time.

If an item was needed, hunters could also attempt to delay purchases by borrowing equipment. Loans were quite common. Some loans extended over many

Table 7-35 Average Annual Depreciation on Items of Capital Goods

Items	Cost New	Typical Number of Years of Use	Annual Depreciation
Traps			
Beaver			
Regular Leg-hold	$ 4.50	10	$ 0.45
Conibear Body-grip	13.50	10	1.35
Small	1.00	5	0.20
Guns			
.22 Rifle	20.00	15	1.33
30-30 or .303 Rifle	120.00	15	8.00
Shotgun	35.00	15	2.33
Canoes and Motors			
Square End	325.00	10	32.50
Paddle	200.00	10	20.00
Outboard Motors	300.00	10	30.00
Nets			
Fish	12.00	4	3.00
Beaver	-[1]	-	-
Skidoo			
Skidoo	1000.00	(4)[3]	250.00
Sleds	-[2]	-	-

Footnotes:

1. Home made from twine, no data.
2. No data.
3. Estimate.

Table 7-36 Replacement Cost of Capital Goods Owner Per Hunter in Winter Bush Camps

Item	Cost New Per Unit	Average Number Owned Per Hunter[1]	Replacement Cost Per Hunter
Traps			
Beaver			
Regular Leg-hold	$ 4.50	14	$ 63.00
Conibear Body-grip	13.50	1.6	21.60
Small	1.00	15	15.00
Guns			
.22 Rifle	20.00	1	20.00
30-30 or .303 Rifle	120.00	1	120.00
Shotgun	35.00	1	35.00
Canoes and Motors			
Square End	325.00	1	325.00
Paddle	200.00	0	0.00
Outboard Motors	300.00	0.8	240.00
Nets			
Fish	12.00	0.7	8.40
Beaver	-[2]	-	-
Skidoo			
Skidoo	1000.00	0.0	0.00
Sled	-[3]	-	-
All Item Total			$848.00

Footnotes:

1. These averages are slightly adjusted from the actual inventory because the inventory sampled the most active hunters more thoroughly than partly active hunters and men in training.
2. Home made from twine, no data.
3. Estimate.

Table 7-37 Average Annual Depreciation on Capital Goods Per Hunter in Winter Bush Camps

Item	Annual Depreciation Per Unit	Average Number Owned Per Hunter[1]	Annual Depreciation Per Hunter
Traps			
Beaver			
Regular Leg-hold	$ 0.45	14	$ 6.30
Conibear Body-grip	1.35	1.6	2.16
Small	0.20	15	3.00
Guns			
.22 Rifle	1.33	1	1.33
30-30 or .303 Rifle	8.00	1	8.00
Shotgun	2.33	1	2.33
Canoes and Motors			
Square End	32.50	1	32.50
Paddle	20.00	0	0.00
Outboard Motors	30.00	0.8	24.00
Nets			
Fish	3.00	0.7	2.10
Beaver	-[2]	-	-
Skidoo			
Skidoo	250.00	0.0	0.00
Sled	-[3]	-	-
All Item Total			81.72

Footnotes:

1. These averages are slightly adjusted from the actual inventory because the inventory sampled the most active hunters more thoroughly than partly active hunters and men in training.
2. Home made from twine, no data.
3. Estimate.

years, and some second-hand items were exchanged or sold locally.

The depreciation cost may however also under-estimate annual equipment costs because many men were slowly increasing their equipment rather than just replacing it. Conibear traps, which became available about 1967-68 were widely and rapidly recognized to be more efficient and more effective to use than regular leg-hold traps. The Waswanipi preferred them both because they caught animals quicker, and because they caused less suffering to the animals caught. However, the conibear traps cost three times as much as leg-hold traps, $13.50 each, and hunters were purchasing supplies of them very slowly.

Another item known about but not widely used was the skidoo. Only three hunters owned them for use in hunting. At $1000 each, and a high annual depreciation (Table 7-37) few hunters could afford them. All the basic hunting equipment together would be replaced for less than the purchase cost of this item (Table 7-36). They were not only expensive to purchase, repair and replace, but also to run. In the winter of 1970-71, when the commercial fisheries operation was closed down, the Indian Affairs administrator in charge of the project had a balance in his account which he determined to return to the approximately six fishermen who were then out hunting on their traplines. To encourage and support their trapping he bought each a skidoo, plus a couple of 45-gallon drums of gasoline, plus approximately a half a dozen conibear traps. All this was delivered to the bush camps. Reports back from the hunters the next summer indicated the traps were appreciated, but the skidoos used too much gasoline, and eventually broke down and could not be repaired in the bush.

The Waswanipi use of capital goods was limited by the availability of cash. It was clear that people desired more equipment than they had, and that they would purchase additional goods as cash became available. In 1976, a project team set up to establish a Cree Trapper's Association for the hunters in the seven Cree communities did an inventory of hunting and camp equipment owned by Waswanipi hunters, and of the goods they considered they would need to be fully equiped. The inventory of equipment in 1976 indicated that an average of 0.7 skidoos were owned per hunter, and that the number of conibear traps per hunter had increased from 2.1 to 7.7 (Bearskin et al., 1977, and Table 7-38). Other equipment owned had not altered significantly during the period.

An estimate of equipment needs however indicated that in the hunters' view they still did not possess a full complement of traps and skidoos. Because of some ambiguities in the interpretation of this question which were apparent in the responses, only the reported needs of men who did not have any of a given item were tabulated. From the average numbers desired it is clear that hunters considered their existing complement of traps, approximately 35 per hunter in 1976, up from 32 in 1970, was just over half of the 63 they would desire to have and use (Table 7-38). And, it was also clear that hunters desired to have one skidoo each, whereas 27 of 60 hunters did not own skidoos in 1976.

The annual depreciation costs for equipment indicated above should therefore be considered a minimum which reflects the actual level of equipment the Waswanipi had been able to purchase up to 1968-70.

Other annual hunting expenses include an outfit of hunting supplies, the purchase of foods, and the costs of transportation from the settlements to the bush camps.

The annual outfit expenses for hunting included; ammunition, gasoline mixed with oil for the outboard motors, sheet metal stoves, axes, files for making "crooked" knives, snare wire, twine and string, candles, matches and sunlight soap for processing hides. Based on the number of items reported purchased by six hunters, and on average local prices, the total cost of an annual outfit would be just over $75 per year (Table 7-39).

Another cost was the expense for transportation between settlements and bush camps. The distances from the visually chosen center of a hunting territory to the nearest town site vary from a minimum of six miles to just under 100 miles, the average being 39 miles (Table 7-40). The actual cost varied

Table 7-38 Comparison of Hunting and Trapping Equipment Owned in 1970 and 1976, and Equipment Needed for a Complete Outfit

Item	Average Number Per Hunter 1970	Average Number Per Hunter 1976	Average Number in a Complete Outfit
Traps			
Regular, Leg-hold			
#4	-[2]	7.8	9.4
#3	-	5.8	10.3
Both	14.7	13.6	19.7
Conibear, Body-grip			
#330	-	6.3	6.7
#220	-	0.4	8.0
#110-120	0	1.0	11.3
All	2.1	7.7	26.0
Small, Regular			
#1	15.6	13.7	17.0
Guns			
.22 Rifle	1.2	1.3	1.0
Shotgun	1.1	1.1	1.0
High-power Rifle	0.9	0.9	1.0
Canoes and Motors			
Canoes	1.2	1.1	1.0
Outboard Motors	0.9	0.9	1.0
Toboggans and Snowshoes			
Toboggans	-	1.1	1.0
Snowshoes	-	2.5	2.5
Skidoos			
Skidoos	0.0	0.7	1.0
Sleds	0.0	0.8	1.0

(CONTINUED)

Table 7-38 Comparison of Hunting and Trapping Equipment Owned in 1970 and 1976, and Equipment Needed for a Complete Outfit (Continued)

Item	Average Number Per Hunter 1970	Average Number Per Hunter 1976	Average Number in a Complete Outfit
Nets			
Fish, all sizes	0.7	0.9	2.0
Camp Equipment			
Wood Stoves	-	1.7	1.0
Naphtha Stoves	-	1.0	1.1
Naphtha Lamps	-	1.0	1.1
Sleeping Bags	-	2.3	2.0
Tents	-	1.2	1.0
Tarps	-	0.3	1.1
Power Saws	-	0.8	1.0
First Aid Kit	-	0.3	1.0
Tool Kit	-	0.6	1.0

Table 7-39 Average Winter Trapping Outfit and Costs Per Head of Commensal Group, 1968-1970

Item	Quantity[1]	Price Per Item	Cost
Ammunition			
.22 Calibre	3 boxes	$1.30	$ 3.90
30-30	2 boxes	6.00	12.00
16 Guage	2 boxes	6.00	12.00
Gasoline, mixed with oil for outboard Motor	30 gallons	0.60	18.00
Stove, sheet metal		14.00	14.00
Axe		6.00	6.00
File		0.85	0.85
Wire, for snares	10 rolls	0.15	1.50
Twine	1 roll	0.75	0.75
String	2 rolls	0.25	0.50
Candles	2 boxes	2.00	4.00
Matches	3 cartons	0.25	0.75
Soap, Sunlight	10 cakes	0.43	4.30
Total			$78.55

Footnote:
1. Based on rough mean of six outfits.

Table 7-40 Distance in Miles from Center of Hunting Territory to Nearest Town Site

Hunting Territory	Distance from Center of Territory to Nearest Town (Miles)	Hunting Territory	Distance from Center of Territory to Nearest Town (Miles)
I	37	XIV	23
IIA	72	XV	8
IIB	55	XVIA	19
III	51	XVIB	7
IV	29	XVII	30
V	27	XVIII	12
VI	28	XIX	46
VII	23	XX	7
VIII	25	XXI	20
IX	29	XXII	41
XA	71	XXIII	22
(XB)	(84)	XXIV	24
XC	71	XXV	42
XD	80	XXVI	64
XE	82	XXVII	6
XF	99	XXVIII	24
XG	90	XXIX	18
XH	99	XXX	18
XI	14	XXXI	40
XII	16	XXXII	69
XIII	20	Average	39

significantly depending on whether air transport was used. If a hunting territory was within one day's travel by canoe of a town or highway it was usually reached by ground transport. In these cases expenses could be quite modest, $25 to $50 per year for short taxi runs, and for additional gasoline for outboard motors. If the hunting territory was not so easily reached, then air transportation was used, as I indicated in Chapter 2. On the basis of approximately a 50 percent sample of the costs incurred by hunters using the less accessible hunting territories the average costs were estimated at approximately $110 per hunter per season for hunting territories located less than 50 miles from a settlement, and $200 per hunter per season for hunting territories located over 50 miles (Table 7-41).

On Table 7-42, I have aggregated the hunting groups by access categories based on the distances and possible means of travel, and have then calculated the estimated travel costs per hunting group (Tables 7-43 and 7-44). Travel costs averaged $185 and $150 per hunting group, or $75 and $85 per active hunter in 1968-69 and 1969-70 respectively. As I have indicated in Chapter 2, expenditures on travel were one of the most critical hunting expenses but also one of the most flexible. When cash was short hunters would use more distant hunting territories less frequently to cut costs, when cash increased hunters would disperse more widely by using more distant hunting territories.

To these costs would have to be added $7.97 per adult consumption unit month for purchased food supplies. The purchased food costs have been calculated for each hunting group on Tables 7-43 and 7-44. They average $400 and $300 per group in 1968-69 and 1969-70 respectively, or $160 to $175 per active hunter.

Considering the total of the minimum costs of conducting hunting activities, the estimations made here indicate average costs per hunting were $983.85 in 1968-69 and $746.86 in 1969-70. On a per active hunter per season basis this would be approximately $400. These figures indicate the real, but limited, cash incomes required to conduct harvesting activities. These figures also indicate the productivity of hunting activities. With the expenditure of a minimum annual cost of $400 per active hunter, hunters are able to produce

Table 7-41 Reported Costs of Travel to Some Hunting Territories, 1968-69 and 1969-70

Distance from Nearest Settlement to Hunting Territory	Hunting Group	Number of Hunters Included	Travel Cost
Over 50 Miles	69F	3	$ 555
	68F	1	250
Total		4	$ 805
Average Per Hunter			$ 200
Under 50 Miles, but Off Roads	68A	2	$ 210
	68B	2	70
	68E	3	210
	68M	2	350
	69C	2	370
Total		11	$1210
Average per Hunter			$ 110

Table 7-42 Classification of Hunting Groups by Distance/Means of Travel Categories, and Estimated Cost Per Hunter for Each Category, 1968-69 and 1969-70

Distance/Means of Travel Category	Estimated Cost Per Hunter	Hunting Groups Included 1968-69	Hunting Groups Included 1969-70
Over 50 Miles From Settlement	$200	68F	69F
		68N	69S
Under 50 Miles From Settlement, But Off roads	$110	68A	69C
		68B	69H
		68C	69I
		68E	69K
		68I	69L
		68M	69M
		68O	69O
		68P	69Q
		68Q	
Accessible by Road, or Always Accessed by Water	$ 25	68D	69A
		68G	69B
		68H	69D
		68J	69E
		68K	69G
		68L	69J
		68R	69N
			69P
			69R
			69T
			69U

Table 7-43 Estimated Costs of Hunting By Hunting Group, 1968-69

Hunting Group Number	Food Costs	Trapping Outfit	Depreciation Costs	Travel Costs	Total Costs
68A	$ 220.11	$179.54	$186.79	$241.43	$ 827.87
68B	81.63	179.54	186.79	101.43	549.39
68C	217.45	112.21	116.74	139.29	585.69
68D	299.51	190.76	198.46	60.72	749.45
68E	408.62	213.21	221.81	290.29	1133.93
68F	228.18	100.99	105.07	257.14	691.38
68G	724.15	314.20	326.88	100.00	1465.23
68H	435.40	213.21	221.81	67.86	939.08
68I	334.18	157.10	163.44	220.00	874.72
68J	352.57	123.44	128.42	39.28	643.71
68K	408.94	235.65	245.16	75.00	964.75
68L	1116.84	448.86	466.97	142.86	2175.52
68M	482.34	258.09	268.51	524.00	1532.94
68N	760.98	314.20	326.88	600.00	2002.06
68O	297.12	100.99	105.07	142.57	645.75
68P	167.37	157.10	163.44	110.00	597.91
68Q	445.20	157.10	163.44	220.00	985.74
68R	158.92	78.55	81.72	25.00	344.19
Average Per Group	$ 396.64	$196.37	$204.30	$186.49	$ 983.85
Per Active Hunter/Season	$ 158.66	$ 78.55	$ 81.72	$ 74.60	$ 393.54
Percentage	40	20	21	19	100

Table 7-44 Estimated Costs of Hunting By Hunting Group, 1969-70

Hunting Group Number	Food Costs	Trapping Outfit	Depreciation Costs	Travel Costs	Total Costs
69A	$639.59	$258.09	$268.51	$ 82.14	$1248.33
69B	278.55	112.21	116.74	35.70	543.20
69C	352.67	179.54	186.79	421.71	1140.71
69D	199.09	100.99	105.07	32.14	437.29
69E	167.37	78.55	81.72	25.00	352.64
69F	613.29	280.54	291.86	686.87	1872.56
69G	570.89	201.99	210.14	64.28	1047.30
69H	204.19	78.55	81.72	110.00	474.46
69I	286.12	78.55	81.72	110.00	556.39
69J	190.80	100.99	105.07	37.00	433.86
69K	244.20	168.32	175.11	235.72	823.35
69L	167.37	157.10	163.44	110.00	597.91
69M	58.34	44.89	46.70	62.86	212.79
69N	361.28	134.66	140.09	42.85	678.88
69O	389.97	157.10	163.44	220.00	930.51
69P	108.71	67.33	70.05	25.00	271.09
69Q	334.58	112.21	116.74	35.71	599.24
69R	42.40	22.44	23.35	9.00	97.19
69S	804.41	347.86	361.90	685.71	2199.88
69T	301.90	134.66	140.09	112.71	689.36
69U	212.40	112.21	116.74	35.72	477.07
Average Per Group	$310.86	$139.47	$145.09	$151.43	$746.86
Per Active Hunter/Season	$175.08	$ 18.55	$ 81.72	$ 85.29	$420.63
Percentage	42	19	19	20	100

food for local use valued at $3000 per hunter and fur pelts for market value- at $675 to $750 per hunter. The Waswanipi clearly would not make such a calculation because for them a whole range of other values are important which this calculation fails to take account because many of the values attached to hunting activities and hunting production are not quantifiable in cash terms. Nevertheless, it may be useful to consider this calculation as a minimum estimate.

Given minimum annual cash costs of approximately $400 per active hunter, the issue that remains is the relationship of that cost to sources of incomes. I have already indicated that the value and potential incomes from the sale of fur pelts is on the order of $700 per active hunter per year, or more than the costs of hunting. While it may appear that it is therefore an easy matter for hunters to pay their costs from incomes derived from the sale of fur pelts, there is a problem because it is not only the amount of cash that is needed, but the timing of cash required that is critical. The actual costs of hunting were not paid directly by cash incomes from the sales of fur pelts because a major portion of the expenses have to be paid in September and October when preparing to go to the bush camps, and the first large quantity of furs are sold only in December when hunters return to the settlements. The foods and supplies purchased at the holiday visits at Christmas and Easter may be paid for with the income from furs, but two-way travel costs are also incurred for these visits. In the fall alternative sources of income, specifically savings from summer employment earnings, if any, welfare rations, and credit from the fur traders, were typically critical.

Unfortunately, I do not have accurate monthly or quarterly family budgets, which would be needed to portray the situation of hunters at that particular time of the year. Nevertheless, some general calculations and observations may be offered on transfer payment incomes. Data on summer employment incomes are also limited, see Appendix 2-1. While summer incomes provide some opportunity to save for fall expenses, people generally commented that the high cost of feeding families in summer, especially families swelled by the return of the children from residential schools, made saving difficult, and limited the amounts accumulated. The most effective use of summer employment was for the purchase of equipment used in that work, and for hunting. Summer incomes were clearly a means of meeting some of the costs of hunting, but the data I have are insufficient to determine how extensively they were so used. Without a fur trade store, available credit was limited to a few local grocers.

The transfer payment incomes of hunting groups were therefore critical during this period. They have been estimated on the basis of actual welfare payments to individuals and families, plus the presumed payments received calculated according to standard rate schedules for federal and provincial family allowances and old age pensions, see Appendix 2-1. The calculations indicate that transfer payments amount to about $375 per active hunter per hunting season (Tables 7-45 and 7-46). Transfer payment therefore roughly equalled the direct costs of hunting. The net cash income of hunting groups and hunters are listed on Tables 7-47 and 7-48.

However, although large transfer payments were made in the fall, not the whole payment was made at one time. The only payment that was actually tied to the needs of the hunters in 1968-70 was the band administered welfare, other payments coming simply on monthly or quarterly schedules. Welfare payments were split so as to coincide with needs and were paid before hunters left for the bush camps in the fall, and when hunters visited the settlements, if their sales of furs were not sufficient. Thus the $200 to $160 dollars a year per hunter from the band welfare budget complemented incomes from the sales of fur pelts and other transfer payment programs to provide the cash needed for hunting activities at those times when it was not otherwise available. Credit from the fur trader formerly served this function in part.

Cash needs during this period were therefore of highly specific kinds. The active hunters sought to limit their needs for cash incomes by limiting the levels of goods and services considered to be necessary for the conduct of hunting activities; but these levels were slowly rising. The total minimum direct winter hunting costs per active hunter, approximately

Table 7-45 Estimated Transfer Payment Income During Hunting Season, By Hunting Group, 1968-69

Hunting Group Number	Family Allowances Federal	Family Allowances Provincial	Old Age Pension or Widow's Allowance	Welfare	Total
68A	$ 42.00	$ 15.00	$546.00	$392.00	$995.00
68B	0	0	0	124.00	124.00
68C	0	13.06	0	233.00	246.06
68D	156.00	52.50	0	171.00	379.50
68E	90.00	116.95	0	1090.00	1296.95
68F	164.00	141.67	0	67.00	372.67
68G	268.00	161.11	665.00	1639.00	2733.11
68H	56.00	16.67	665.00	195.00	932.67
68I	126.00	98.89	0	477.00	701.89
68J	270.00	271.95	0	468.20	1010.15
68K	84.00	63.34	760.20	586.00	1493.54
68L	434.00	227.79	0	1633.00	2294.79
68M	276.00	65.00	0	526.00	867.00
68N	140.00	80.00	1520.40	187.00	1927.40
68O	220.00	118.06	0	164.89	503.04
68P	0	19.72	0	455.00	474.72
68Q	140.00	107.50	0	360.00	607.50
68R	96.00	71.39	0	308.00	475.39
Average Per Group	$142.33	$ 91.14	$230.92	$504.23	$968.63
Per Active Hunter				$201.69 ,	$378.12
Percentage	15	9	24	52	100

Table 7-46 Estimated Transfer Payment Income During Hunting Season, By Hunting Group, 1969-70

Hunting Group Number	Family Allowances Federal	Family Allowances Provincial	Old Age Pension or Widow's Allowance	Welfare	Total
69A	$108.00	$ 41.95	$665.00	$902.00	$1716.95
69B	100.00	100.57	0	335.00	535.57
69C	150.00	88.89	0	293.00	531.89
69D	104.00	23.62	0	375.00	502.62
69E	0	0	0	150.00	150.00
69F	212.00	92.50	0	212.00	516.50
69G	318.00	191.12	0	515.00	1024.12
69H	182.00	124.17	0	0	306.17
69I	114.00	109.73	0	0	223.73
69J	108.00	65.00	0	268.00	441.00
69K	84.00	69.45	664.04	97.00	914.49
69L	0	19.72	0	455.00	474.72
69M	24.00	32.50	0	67.00	123.50
69N	146.00	56.67	775.45	388.00	1366.12
69O	84.00	152.51	0	821.00	1057.51
69P	36.00	0	0	65.00	101.00
69Q	36.00	13.06	0	437.00	486.06
69R	24.00	32.50	0	67.00	123.50
69S	182.00	92.23	1550.90	90.00	1915.13
69T	246.00	130.00	0	164.00	540.00
69U	60.00	44.73	552.63	231.00	888.36
Average Per Group	$110.38	$ 70.52	$ 200.38	$282.48	$663.76
Per Active Hunter				$159.12	$373.90
Percentage	17	11	30	43	100

Table 7-47 Estimated Net Cash Income For Hunting Season, By Hunting Group, 1968-69

Hunting Group Number	Total Costs (1)	Fur Income (2)	Total Income From Transfer Payments (3)	Net Cash Income /(2+3)-1/
68A	$ 827.87	$2276.93	$ 995.00	$2630.85
68B	549.39	1058.82	124.00	820.22
68C	585.69	491.00	246.06	268.11
68D	749.45	953.75	379.50	782.26
68E	1133.93	1730.25	1296.95	2115.08
68F	691.38	1433.50	372.67	1219.86
68G	1456.23	1814.50	2313.11	2989.26
68H	939.08	2295.50	932.67	2510.90
68I	874.72	2064.50	701.89	2055.11
68J	643.71	957.75	1010.15	1452.61
68K	964.75	1373.50	1493.54	2147.45
68L	2175.52	5002.00	2294.79	5588.24
68M	1532.94	3220.00	867.00	2822.57
68N	2002.06	3583.00	1927.40	3835.22
68O	645.75	1512.00	503.04	1474.36
68P	597.91	1504.00	474.72	1544.25
68Q	985.74	2543.75	607.50	2328.95
68R	344.19	375.75	475.39	588.67
Total	$17709.31	$34190.50	$17015.38	$37173.97
Average Per Group	$ 983.85	$ 1899.47	$ 945.30	$ 2065.22
Per Active Hunter/Season	$ 393.54	$ 759.79	$ 378.12	$ 826.09
Percentage		67	33	

Table 7-48 Estimated Net Cash Income For Hunting Season, By Hunting Group, 1969-70

Hunting Group Number	Total Costs (1)	Fur Income (2)	Total Income From Transfer Payments (3)	Net Cash Income /(2+3)-1/
69A	$1248.33	$1811.75	$1716.95	$2280.37
69B	543.20	1032.75	535.57	1025.12
69C	1140.71	3138.25	531.89	2629.43
69D	437.29	912.50	502.62	977.83
69E	352.64	966.00	150.00	763.36
69F	1872.56	2408.50	516.50	1052.44
69G	1047.30	1759.25	1024.12	1736.07
69H	474.46	1066.50	306.17	898.21
69I	556.39	1439.50	223.73	1106.84
69J	433.86	594.00	441.00	601.14
69K	823.35	1098.50	914.49	1189.64
69L	597.91	972.25	474.72	849.06
69M	212.79	433.25	123.50	343.96
69N	678.88	1397.25	1366.12	2084.49
690	930.51	834.00	1057.51	961.00
69P	271.09	589.50	101.00	419.41
69Q	599.24	747.75	486.06	634.57
69R	97.19	220.50	123.50	246.81
69S	2199.88	2851.25	1915.13	2566.50
69T	689.36	469.50	540.00	320.14
69U	477.07	606.75	888.36	1018.04
Total	$15684.01	$25349.50	$13938.94	$27030.42
Average				
Per Group	$ 746.86	$ 1207.12	$ 663.76	$ 1287.16
Per Active Hunter/ Season	$ 420.63	$ 679.98	$ 373.90	$ 725.07
Percentage		65	35	

$400, was considerably below incomes potentially earned from the sales of fur pelts. Transfer payment income roughly equalled hunting costs, but only welfare payments which totalled one-half or less of hunting costs, were paid at the times needed by hunters. It therefore required a combination of access to band administered welfare advances and incomes from the sales of fur pelt- to meet basic hunting costs.

The fragility created by these specific needs was demonstrated in the mid-1960's when the practices of issuing credit and large ration payments were stopped by the Hudson's Bay Company and the Department of Indian and Northern Affairs respectively. This indicated the dependence of a large number of Waswanipi hunters on specific cash incomes in order to finance even the limited costs of hunting activities. Thus the dependence of the Waswanipi hunters on cash incomes was a constraint on hunters not so much because of the size of their needs, but because of the highly specific scheduling of those needs.

The results of this dependence are therefore quite different than those foreseen by Leacock and by Murphy and Steward. There is not a dependence on cash incomes that is tied to dependence on purchased food and consumer goods which leads to a transformation of hunting for use into trapping for exchange. In the Waswanipi case, specific cash incomes were needed to continue hunting primarily for use, and trapping, i.e., production for exchange, was a means of making hunting for use possible. But, there was also a need for transfer payments. As the break down in the mid-1960's indicated, these dependencies would not lead to a transformation of hunting for use into trapping for exchange, but rather to an abandonment of both for wage labor, or welfare dependency.

Equally important, however, the events following the break down of the mid-1960's also indicated that the needs of the Waswanipi could be adequately met by re-organizing their access to cash so as to again provide at least the minimum of necessary support for hunting activity. This was done by having the band take control of the administration of welfare. Thus, confronted with a critical shortage of cash incomes the Waswanipi found the means to remedy the crisis by extending the range of local control over the timing of access to the needed incomes.

In short, the Waswanipi have so far been able to actively pursue a hunting economy based primarily on subsistence production and supported by production of fur pelts for market, transfer payments and some access to employment and credit. The use of new goods and services has been carefully adopted to Waswanipi needs and values, and such changes as have occurred have been effectively directed toward pursuit of the long-term goal of maintaining and enhancing the "traditional" hunting way of life.

Footnotes for Chapter 7

1. Each interviewer was asked to comment on a list of 99 men, the complete list of resident men I had at the time of these interviews. Because of the return of some men to the settlements under study after this phase of the work was completed, the final lists of men considered residents of the communities being studied totalled 107 at the end of the study.

2. The number codes used to identify commensal groups are composed of three parts. The initial two digits 68 or 69 refer to the winters of 1968-69 and 1969-70 respectively. The lower case letter that follows refers to the main hunting group of which this commensal unit was a part during the winter hunting period. Hunting groups are discussed later in this chapter. The roman numerals identify this commensal group from among others in the same hunting group.

3. Because some commensal groups were parts of different hunting groups during the course of the same winter, some commensal groups have more than one number code. In the discussions and tables concerned primarily with commensal groups these groups with more than one number have been listed only once, under the number for the hunting group in which they spent the longest time to avoid double counting. In the discussions and tables concerned primarily with hunting groups, including Figures 7-1 and 7-2, these commensal groups are listed with each hunting group in which they occurred, and without further cross-referencing. The following commensal group numbers refer to the same commensal group, the same is defined by the head of the group and his consort: 68eiv = 68dii; 68fii = 68ri; 68eii = 68mv = 68oi; 69aiv = 69bii; 69ciii = 69fii; 69oiv = 69pi; 69mi = 69qii; 69ri = 69fiv; and 69fiii = 69tii.

4. The equivalences are defined as commensal groups based on the same adult male and adult female pair. The actual equivalences are: 68ai - 69pi; 68ci - 69 qi; 68di - 69ti; 68dii - 69qii; 68ei - 69oi; 68eii - 69oii; 68eiii - 69oiii; 68fi - 69niii; 68gi - 69ai; 68gii - 69fiv; 68giii - 69bi; 68hi - 69aiii; 68hii - 69aiii; 68hiii - 69ei; 68i-i - 69di; 68i-ii - 69cii; 68ji - 69dii; 68ki - 69ui; 68kiii - 69uii; 68li - 69gi; 68lii - 69gi; 68ciii - 69ci; 68lv - 69giii; 68lvi - 69fi; 68mi - 69ji; 68mii - 69bii; 68miv - 69jiii; 68ni - 69si; 68nii - 69siii; 68oi - 69i-i; 68-i - 69li; 68qi - 69hi; 68qii - 69fii; 68rii - 69ki.

5. Typically fur pelt prices drop from early January through to spring. This pattern is reflected in the figures for 1969-70, but those for 1968-69 indicate an atypical pattern for local beaver pelt prices. The reason for this upward trend is not apparent, but the data I collected clearly reflect the trend.

CHAPTER 8 - FOOD PRODUCTION, SUBSISTENCE REQUIREMENTS, AND THE ALLOCATION OF FOOD PRODUCTS

A - Introduction

If asked why they hunt most Waswanipi men respond that they hunt for food, to feed themselves and others. They may continue their reply, and also add that they hunt for cash, derived from the sale of furs. The priority the Waswanipi give in their replies to the production of food to meet immediate human requirements is consistent with the fact that a minimum level of production is necessary for the survival of the individual and the community as a whole. There is a popular view that all hunting is concerned with is the provision of food adequate to meet subsistence needs. And, while the scientific and popular conceptions of hunting are shifting from the view of hunters as always pressed by work, to a view of hunters as the original affluent-leisure society, both views have been associated with the assumption that productive output is limited to subsistence needs, plus those other needs more or less directly related to subsistence.

This assumption is consistent with the minimal statement of hunting goals of the Waswanipi, but this is not all the Waswanipi say on the subject, and in part II of this study I have indicated that the Waswanipi have an elaborate system of beliefs concerning when animals should be killed which centers around the concept that the animals that should be killed are those that are given. The significance of this view will be discussed over the next several chapters. For the present purposes it is sufficient to note that the Waswanipi view implies that productive output is not simply limited to subsistence requirements, although it certainly is intended to meet those requirements as a minimum. It is a commonplace of economic studies of all societies that production is not simply a means of meeting physiological needs, that it also may serve a host of other social and cultural needs. The point would not be worth making were it not for the fact that hunter-gatherers have sometimes been considered an exception to this general condition.

Anthrophlogists have sometimes assumed, and have in some cases demonstrated, that providing for immediate subsistence needs is the main and apparently almost the only productive goal in some hunter-gatherer societies. Thus, Richard B. Lee has demonstrated that for the !Kung Bushmen of the Dobe area their daily caloric requirements during a four-week period averaged 1,975 calories per person per day and the foodstuffs they harvested yielded an average of 2,140 calories per person per day, or just eight percent above their requirements. Given the general abundance of the main resource, mongogo nuts, given the low input of time and labor to food production and the abundant leisure, and given that food harvested was consumed within the local group and within 48 hours of its collection, Lee argues that:

> "... the level of work effort in a given period is a direct reflection of the food requirements of the local group" (1969:75).

and,

> "... the purpose of Bushmen work is to get food, and the amount of work expended is therefore a measure of the amount of effort required to feed the group" (1969:83).

In the Bushmen case, with what Lee calls an "elementary form of economic life" (1969:74), the main goal of hunting and gathering can be demonstrated to be the production of food for immediate needs, subject to cultural definitions of the edibility and quality of available foods, and subject to rational choice with respect to reliability and energy costs of harvesting activities for alternative culturally desired resources.

This goal has been generalized by Lee and by Sahlins to characterize elementary hunter-gatherer societies, what Sahlins calls, the Zen strategy.[1] Whether or not this characterization of the goals of hunter-gatherers can be generalized to past conditions is beyond the scope of the present study, what is clear is that such a characterization cannot apply to a great many of the contemporary hunter-gatherer societies. Lee himself is very clear on this point, listing the assumptions involved in defining an "elementary form of economic life".

> "Such an economy sould have the following properties: minimal surplus accumulation; minimal production of capital goods; an absence of agriculture and domestic

> animals; continuous food-getting activities by all able-bodied personnel throughout the year; and self-sufficiency in food-stuffs and generalized reciprocity within local groups." (Lee, 1969:74).

Lee goes on to say that while no contemporary society exhibits all these properties, "the !Kung Bushmen of the Dobe area of Botswana are a close approximation" (1969:74). They are largely self-sufficient in terms of subsistence, there is no trade in foodstuffs, no wage labour, no cash, no conversions, no markets, no agriculture, and no domestic animals except the dog. And, "because they do not amass a surplus of foodstuffs, the relation between local food production and consumption is an immediate one" (Lee, 1969:74).

But these conditions, as Lee indicates, are not characteristic of contemporary hunter-gatherers groups. Most contemporary hunter-gatherer production groups do have one or more of the following: opportunities to enter into exchange or trade with other hunter-gatherer production groups, and/or with agricultural production groups; access to some market exchange for goods; means of storing food production for delayed consumption or for accumulation for other purposes; means of converting food production into prestige; and, as a result, at least some unequal, non-reciprocal, distribution of production.

Where such opportunities exist, and I would argue that one or more of the above opportunities exist in virtually every contemporary hunter-gatherer society, there may be goals for food production over and above simply producing for immediate nutritional needs. What the goals may be in any particular case will be related to the extent of the opportunities available for the use of food produced. But what the goals are in fact will not depend solely on the opportunities, it will depend on the cultural structuring of those possibilities, on the culturally defined belief and value systems. And these goals will have to be determined in each case, as will the actual behavior of the people. Where the goals for productive activities may be quite diverse, the actual goal or goals must be empirically determined.

What is striking in the present literature on hunter-gatherers is that this question is rarely addressed. So much of the work on hunter-gatherers has been focussed on reconstructing the elementary forms of hunting ways of life that the actual situation of contemporary hunter-gatherers has been relatively little studied or questioned.

Given the decision-making framework previously outlined, the question which I think must be resolved is: What is the goal or goals of hunting activity which the hunters' seek? While it is certain that the Waswanipi hunters seek to feed themselves and the social groups of which they are a part, and this is their first and foremost answer to the question "Why do you hunt?", it is not a complete or sufficient answer. Even in their briefest answers the Waswanipi also often refer to production for market exchange. And, as I have indicated in the second part of this study, they can also give a longer and more complete answer which begins with the claim that a hunter gets or produces what he is "given", "wants", "needs" or "asks for" and includes rules for deciding how much to produce. And, as I have shown there, the more complete answer is that one of the most important things he is seeking after is balance between what he hunts and what the animals and the other 'living beings' can yield over the long-term. It is the aim of this third part of the study to examine whether, to what degree and how that goal may be achieved.

One step in this analysis is to analyze some of the alternative plausible goals that could guide hunting activity and to discover the extent to which they are achieved, and the extent to which they could explain the actual hunting activities and production of the Waswanipi.

The purpose of the present chapter is to analyze how the activity of hunting is linked to the goal of providing for the physical survival and reproduction of the Waswanipi population. In this chapter I evaluate the extent and nature of the dietary contribution of hunting activities in relation to the subsistence needs of the population. But, consistent with my decision-making focus I will focus the analysis on the question of whether, and how far, the goal of providing for subsistence needs is sufficient to account for the actual quantities and kinds of foods which the Waswanipi produce.

To anticipate the conclusions of this chapter, I will demonstrate both that Waswanipi food production is abundant, relative to immediate nutritional needs, indeed usually super-abundant, and also that there is no simple relationship between Waswanipi food production and immediate nutritional needs; that production for delayed consumption occurs and that production for gift exchange, market exchange, and prestige-seeking is available and therefore a fuller analysis of production goals is needed.

B - Sources of Data

The data available and the analyses made in this and the succeeding chapters are determined by the choices I had to make given the possibilities and limitations that developed during data collection in the field, and it seems appropriate to outline these briefly.

It is difficult, if not impossible, throughout much of the sub-arctic area, to collect accurate observational data on a wide range of productive activities for all members, or even a majority of members of a band community. Because the members of a band divide into hunting groups, or other productive units, during the main part or all of the winter hunting season, and stay isolated for several months at a time, it is not possible to gather a comprehensive observational record on more than one hunting group in a year. The response of some anthropologists has been to do exactly that, live with one hunting group through most or a significant portion of the year (Rogers, 1963, 1972). The response of other researchers has been to stay with a small group of hunting groups, and to be able to compare them, but for different parts of the year (Tanner, 1976). My own response, with suggestions from the Waswanipi, was to seek the active participation of the hunters themselves in making a record of their productive activities.

To gather accurate data on Native harvests of animals, I asked Waswanipi hunters to keep records, daily if possible, of their catches and to write these in small 3½" x 6½" notebooks which I distributed. I initially asked just for records of animal kills, but several informants suggested that they were willing to keep more comprehensive records. They offered to keep daily activity records, daily weather records, and reports of purchases of foods, supplies and equipment. These records, each with a different degree of detail and completeness, form the main basis of the detailed analyses which follow, supplemented by interview data and my own observations.

The diary record project was initiated at the very beginning of my fieldwork. I arrived in the field in October, 1968, barely a few weeks before most of the hunters were to leave for their hunting territories, and I almost immediately began to ask people to keep the diaries for me. The willingness of the Waswanipi people to keep these records, and the willingness of some of them to keep additional records was a critical factor in the form the research finally took. I believe that it was understood by most of the people that by this means they could make a vital and active contribution to the research and that this understanding was critical to the participation of so many of them in the research. For the considerable effort that people were willing to put in, I paid the sum of $30.00 to each recorder, which was all my research budgets would permit.

Because of my own limited research funds I asked the head of each hunting group I heard would be formed that year to keep the diary for all of the members of that hunting group, men, women and pre-adults. The records could be kept in English or in Cree syllabics. In practice many of the diaries were kept by the wife or the son or daughter of the head of the hunting group.

To get the system going in the fall of 1968, I had to visit as many of the main Waswanipi settlements as I could before the majority of the hunters left for the hunting camps. I was able to visit three settlements, Matagami, Miquelon and Waswanipi River, and the small camps in between. At Christmas and at Easter holidays, when many hunters returned to the settlements for visits, I conducted general interviewing, and reviewed and assisted with the diary records. Wherever possible, each head of a hunting group was interviewed with his diary, and each entry was gone over. Where the record was in Cree syllabics it was translated with the help of a translator, in the presence of the head of the hunting group, and also in the presence of the person who recorded the diary when this was a person other than the head of the hunting group. Because I split my time during the holiday periods among the three different Waswanipi settlements, and because some hunters did not return throughout the winter, I did not get to see all of the diaries during the winter, and some were only seen the following summer. All were collected during the summer of 1969.

One of the reasons people were willing to keep such records was that the pattern fit with several well established practices. The daily reference to calendars was a common practice, even in isolated bush camps, in order that people keep track of and respect the sabbath throughout the year. The "diaries" I distributed in fact depended on those calendars because the diaries were just booklets of blank lined pages. People were asked to write the month and date of each day and what they caught that day, either on a separate page or a separate line, as they preferred. In addition to keeping calendars, some people were in the habit of keeping diaries for their own use, a practice which appears to have begun after missionization and the use of calendars became widespread. Finally, tallymen of traplines had been giving reports on their fur-bearing animal harvests to the Quebec Department of Tourism, Fish and Game and the Canada Department of Indian Affairs and Northern Development each summer, and some had been in the habit of keeping personal records of kills to facilitate these reports. These reports, which were submitted annually from about 1950 to 1966, included statements on the totals of each fur-bearing animal killed by all members of a hunting group using a particular hunting territory, and also a map of the locations of active and inactive beaver lodges on the hunting territory. Each of these different practices contributed to the willingness of people to keep the diary records and each also contributed to the form and content of the data put in the diaries. This relationship I did not fully anticipate at the beginning of the project.

In total I was able to meet and ask sixteen men from an expected eighteen hunting groups to keep records for me for the 1968-69 winter hunting season. All agreed. However, my requests were based on the anticipated activities and composition of the hunting groups to be formed, several weeks or days before the actual departure of the hunters for the bush. As it turned out, the actual activities of the hunters, and the actual composition of the hunting groups were not always what had been expected at the time I recruited recorders. However brief the delay between diary assigning and departure, there were always last minute changes of plans. In the event, three of the men whom I asked to keep records did not hunt and trap regularly that year, so their records were stopped by mutual agreement.

Of the remaining diaries, one diary was reported lost, and one recorder did not keep a diary. In total then, eleven books were returned from ten hunting groups. Eighteen hunting groups were actually formed in 1968-69.

The diaries returned had various kinds of data and various degrees of completeness of data. All diaries had the records of the animals harvested, seven diarie had data on daily activity schedules, three had data on weather conditions, and five had extensive data on purchases of foods and supplies.

Thus, for each kind of data I needed there were a different number and group of diary records that provided the appropriate data. Of the eighteen hunting groups, I would have data on some important subjects for as few as five groups, or slightly more than a one-quarter sample. However, this level of coverage needs to be viewed in the light of the very limited data normally available on the productive activities of sub-arctic hunting groups. To my knowledge, the only detailed recorded and publicly available activity records for sub-arctic hunting groups are for three groups at Mistassini, one which Edward Rogers lived with in 1953-54 (1963, 1973), one which Williamson collected at the end of a season (1964), and one which Adrian Tanner lived with in 1969-70 (1976). Only Rogers has given data on work intensities and duration. In contrast, the data from ten Waswanipi groups on harvests, activities and purchases, collected by means of the diaries, represent a significantly larger sample of data than has been available previously, although still a limited sample rather than complete coverage of the population.

In addition, it needs to be noted that not all the diaries were complete records for the entire hunting group, or for the entire hunting period. In some cases, the diary was used only to record data on the head of the hunting group and the members of his co-residential group, but not for members of the other co-residential groups that comprised the hunting group. These diaries were kept more or less in the pattern of the traditional personal diaries that had been kept in the past. Especially when extensive data was being kept on daily activities it became increasingly difficult for one individual to accurately report the activities of the hunters in all co-residential groups. This was pointed out to me at some of the interviews during the mid-winter holidays, and it was suggested that complementary booklets be issued to other members of the hunting group. This was done in several cases, so that what I have called a single diary may extend over several booklets. It was not possible to do this in all cases because not all diaries were seen during the winter visits to the settlements.

Where the diaries were not complete for all members of the hunting groups, it was possible to interview those whose harvests were not included to ascertain how many of the most important species had been caught. Indeed it was possible to do this for all hunters, including those in hunting groups not keeping diaries. By this means a complete record of the harvests of the main kinds of animals could be constructed for all eighteen hunting groups. However, the day by day harvests, and the daily activity patterns could not be reconstructed by this means.

In three cases, the diary record was also incomplete with respect to the harvests of the less important species. Two did not generally include harvests of hare, grouses and waterfowl, one did not generally include harvests of fish. These diaries appeared to be influenced by the pattern of only reporting fur-bearing animals and big game harvests to the government. Where possible estimates were made of the missing harvests by the informants.

Finally, not all diaries covered the entire winter hunting period. Two diaries were incomplete for specific periods. This appeared to be the result of the travel patterns of the recorder. Complete harvest or activity records would be kept for parts of the winter, but when the recorder left to stay in town, or to visit another camp, the records might be stopped, or only the major harvests might continue to be recorded. In these cases, as in those mentioned above, it was possible to estimate the full harvests for the missing period during interviews, but it was not generally possible to reconstruct daily harvests and activities. Finally, four diaries did not contain detailed records for the post-Easter hunting period.

Along with the interviews and transcriptions made when the diaries were collected, other information was also gathered to the extent possible. These included mapping the locations of moose kills and beaver lodges and kills, mapping the areas hunted and the location and periods of use of hunting camps, and data on the nature and values of purchases of supplies and sales of furs.

The resulting data set, as outlined above, is based on records from a series of non-random samples of hunting groups, often a different sample being available for each of the different analyses to be conducted. In order to make some assessment of the potential sampling problems inherent in this organization of data, I will first make each set of detailed analyses on the basis of the data available, and I will then compare some general feature or features of the sample to the distribution of that feature in the appropriate study population as a whole. This will provide a qualitative if not quantitative assessment of any substantial skewing that may be inherent in the use of the available detailed data, and some general statements about the distribution of the patterns reported for the sample among the population as a whole.

More general data on the hunting activities of the population as a whole was gathered by means of interviews. As indicated above, complete harvest records of big game and fur-bearing animals were collected in addition to economic data, including inventories of productive capital goods, employment records, and personal hunting histories. These data are used to supplement the data from diary records.

C - Production of Bush Foods in Relation to Nutritional Requirements: Hunting Group Sample

Among the eleven diaries collected, four were from hunting groups for which the records of harvests were virtually complete for all animals for almost the entire winter hunting period; and, in addition there were complete records of purchased foods and supplies for the same periods. For an additional hunting group, the records are equally complete with respect to the scope of the data recorded, but they do not cover the complete winter season. Records of food purchases commence with the Christmas-New Year's visit to the settlement and the data are complete for the post-New Year's period.[2]

These five diaries for groups 68A, 68B, 68C, 68J and 68P are the basis for the detailed analysis of food production in relation to dietary needs, which comprise the main body of this chapter.

In this section of the present chapter I will analyze in turn: the subsistence energy requirements of hunting group members and their dogs; the animals harvested by each of these groups; the relative importance of the different kinds of animals; the food energy produceable from the carcasses of these animals; the relationship of produceable food to subsistence requirements; the relationship of the animal foods produced to purchased foods as subsistence inputs; the need for and availability of nutrients other than energy; and the allocation of food production to alternative ends.

Following the analysis of the data from these hunting groups I will in the final section of this chapter compare these records with all 1968-69 and 1969-70 hunting groups on a limited number of production and demand variables.

i) Energy Requirements and Food Energy Available

a. Estimate of Human Requirements

In order to assess the energy requirements of the members of Waswanipi hunting groups the formula in the Dietary Standard for Canada (Canada, 1964) was adopted. To apply this formula it was necessary to establish the sex, age, and weight of individuals, and the energy requirements for the work the hunters performed. The latter required, in turn, that consideration be given to whether there were particular energy requirements arising from sub-arctic climatic conditions.

I searched the literature on northern nutrition to consider what adjustments, if any, to apply for Waswanipi hunters who live in a cold climate and on a protein rich diet. Research on the metabolic rates of men in cold climate has revealed the nature of the particular discrepancies that occur between caloric requirements of people living and working in temperate climates and those in colder climates.

First, there is no basic change in metabolism attributable to the variations in geographical climate per se, or more precisely, none has been demonstrated. Under laboratory conditions, chilling the human body does result in the increased metabolism, after the level is reached at which shivering beings. But in cold regions, the "effects of cold are almost completely attenuated by the intellectual creation of a milieu intermēdiaire and general evidences of acclimatization are not easy to find" (O.G. Edholm and H.E. Lewis, 1964:439). This is largely because men are seldom directly exposed to the meteorological climate in cold regions, at least during seasons of greatest severity. Edholm and Lewis, reviewing the data, have cited the differences between the climate at a meteorological station, the climate in the immediate vicinity of man, the exposure climate, and the micro-climate which is in contact with the skin under the clothing. They cite studies of polar expeditions (for example, J.P. Masterton, H.E. Lewis and Elsie M. Widdowson, 1957) that show that as little as six percent of the time is spent outdoors in winter, and even at other times of the year the outdoor time may be well under twenty percent. These percentages are for scientific teams under very severe arctic and antarctic climates, which do not have to support themselves off the land. Nevertheless, while the percentages may not be the same, it is reported in the literature that Inuit hunters go outdoors less in winter than in summer, and not at all in the most severe weather.

In sub-arctic regions so extensive a retreat to the micro-environment of the human shelter is not so necessary, nor is it compatible with the lifestyle of the Waswanipi, whose main aim during the winter is to be out hunting and who often spend eight to fourteen hours a day outside in the local climate. However, even though this is the case, some adjustments are made to local conditions.

In the daily activity records from the diaries kept at Waswanipi people cite days when it was too cold to move a camp or travel far, and when activities were localized around the camp. I did not count these occasions but they amount to no more than ten days during the seven-month period. One reason that outdoor activities are not more frequently restricted is that even when hunting the activity is undertaken so as to use the most moderate exposure climates available. For example, much travel is along the leeward shore of streams and rivers because the forest affords protection from the full force of the wind. Adrian Tanner has pointed out that the principle of facing the door of a house east or south, which is the most common orientation actually found in Mistassini and Waswanipi bush camps, when applied to lakeside sites, has the effect of situating the camps on the north and west shores of the lake. Given the predominant westerly and northerly flows the camps would then be in the lee of the forest near the water's edge rather than on the shore directly exposed to the prevailing winds.

There is thus a clear attempt made to limit exposure when environmental climatic conditions are worst, but this represents a small percentage of the total days, and to chose exposure climates that are better than the meteorological climate for camps and when hunting activities are undertaken.

In addition, clothing is carefully and thoughtfully used to regulate the micro-climate during outdoor periods. Many layers of clothes are worn, heavy underwear, light shirts, woolen shirts, sweaters or jackets and parkas in coldest weather, and the clothing is adjusted to climatic conditions and to the conditions of the work being done. These precautions do not completely eliminate exposure to uncomfortable micro-environmental conditions, but they reduce the occasions for such to a small fraction of the total time. The face is exposed continually but it is also protected with hoods with fur trim, to break the wind and afford a barrier of warmer air. Hands must be exposed to perform some work, but usually only for brief periods, and mitts are more effective than gloves in extremely cold conditions. Finally, during outside work and travel it is also common to make stops, to light a fire and to prepare tea breaks, fairly frequently.

In summary, the actual exposure to extreme cold, as such, is minimized and not frequent or general enough to be likely to alter metabolism as such. Kaare Rodahl, summarizing the data on nutritional requirements in polar regions, indicates that without an increased metabolism there is no increased intake of calories, or specific nutrients, or vitamins required in cold regions because of climatic exposure or acclimatization (1962:9-14). For the Waswanipi, therefore, cold climates do not appear to be the cause of special nutritional requirements, or to require special estimates of additional nutritional requirements due to exposure of the human body to conditions of cold.

Caloric needs are however higher in the sub-arctic and arctic regions than in temperate regions. This is because of the specific diet composition of many Native peoples in the north, and also because of increased energy expenditure in the performance of work.

Extensive studies on the basal metabolic rate of Inuit in their native environment have fairly consistently shown the rates to be fifteen to thirty-three percent higher than non-Natives. Rodahl has found that nine percent of this difference was due to apprehension, the BMR declining with repeated testing (1954:61). He also found that the BMR was higher in winter when the diet was high in protein intake. When the same Inuit subjects were given diets identical with non-Native peoples' diets their basal metabolic rates dropped sixteen percent and were comparable to that of non-Native control groups (1954:74). Rodahl therefore suggests that the fifteen percent higher BMR in Inuit is attributable to the high percentage of meat in the diet. Others have confirmed his test results.

Is this pattern the same in Indians? Very few studies of basal metabolism in northern Indians have been made, but the few that exist suggest the same pattern.

A series of basal metabolism rates among the Indian population at Old Crow, Northwest Territories, as compared to local non-Natives, was found to average thirteen percent higher (Laurence Irving et al., 1960:642). The Indians here were living a modified bush life and similar results were found on a second study among the same group (R.W. Elsner, et al., 1961). A study by Meehan of nine Natives, apparently Indians from Fort Yukon, who were brought to an air force base for physiological tests where they ate standard air force foods indicated no variation of their BMR from those of a non-Native control group (Meehan, 1955a). These studies then suggest a similar situation to that which exists among Inuit, namely the BMR is fifteen percent higher than Canadian or North American standards when people live on a bush diet, high in meat, and especially protein, which takes more energy for the body to digest than does carbohydrate.

A second factor influencing caloric requirements in polar regions is the additional energy needed to perform tasks in the sub-arctic. One effect is brought about by the clothing needed to maintain a comfortable microclimate. The clothing which limits the need for acclimatization has a hobbling effect on work activities In a laboratory study of work done in suits of clothing for tropical, temperate and arctic environments in rooms of different temperature, it was found that clothing had a more significant effect on caloric requirements than temperature (Edward Gray, Frank C. Consolazio, and Robert M. Kark, 1951). The hobbling effect, comparing cold and temperate climate clothing, was at least twice as great as the change due to temperature, estimated at five and two percent respectively (1951:274-5). Field studies have indicated a similar hobbling effect of clothing. A comparison of army men performing similar tasks in the sub-arctic and in the desert showed that the men working in the sub-arctic consumed 600 to 800 Calories[3] more per day than the desert group (cited results in P.F. Iampietro, D.E. Bass and E.R. Buskirk, 1958:149). The resting oxygen consumption of the two groups measured in comfortable ambient temperatures in the different locales was the same.

A second aspect of the energy needed to perform tasks in the sub-arctic is the additional energy involved in performing tasks that is caused by conditions other than temperature, particularly snow. These effects on caloric requirements are generally not separable from those of the clothing. The energy expenditure for walking in the sub-arctic has been found to be higher than elsewhere. Under some conditions this difference disappears when the total weight carried, including equipment and the necessary clothing was considered in the calculations (B.E. Welch, E.R. Buskirk, and P.F. Iampietro, 1958:143). There are however significant differences found between walking on unobstructed bare ground, and walking on hard and packed snow and freshly fallen soft snow and crusted snow (Rennie, 1958). Some data on the energy costs of travel are listed on Table 8-1. The increased energy costs of walking on snow, at least when it is soft, and or when it is crusted are clear. Whereas walking on a road costs 4.8 to 6.9 Cal/min. of energy, and walking on a packed snow trail 6.7 Cal/min., walking on soft snow and crusted snow costs 10.2 and 13.1 Cal/min. respectively. The effectiveness of snowshoes is also striking. The energy cost of snowshoeing on packed or crusted snow is in the range found for walking or marching on hard paved surfaces, 6.2 and 5.4 Cal./min. respectively. The energy cost of snowshoeing on soft snow is higher than on packed or crusted snow, but still less than without snowshoes. In the case of crusted snow, snowshoes drop the energy costs to well below half the costs of walking without snowshoes. This graphically illustrates the hobbling effect of crusted snow on locomotion, and the advantage given by snowshoes.

These two factors, more clothing, and greater environmental resistance to work, modify the nutritional requirements in the sub-arctic and can be taken account of in evaluating the energy requirements for various physical activities that occur outdoors in the sub-arctic region. The energy needed to complete a task in the sub-arctic environment can be evaluated on the basis of several studies of the energy requirements of various physical work activities in sub-arctic regions, mostly conducted with non-Natives. One caution is necessary when using these data however. It has been suggested that the traditional clothing of the Native peoples of the north offered less hobbling resistance than that utilized by the military personnel today (Welch, Buskirk, Iampietro, 1958:56). The Waswanipi under present conditions use primarily purchased commercially made clothing however, and the difference is much smaller, although the clothing regimes of soldiers and Indians are still not identical. In regard to footwear

Table 8-1 Energy Costs of Locomotion on Various Surface and Snow Conditions

Activity	Energy Cost (Cal/min.)	Source
Walking	6.9	Welch, Buskirk, Iampietro, 1958
March on road, 2.3 mph	4.8	Welch, et al., 1955
March on snow, 2.3 mph[1]	6.7	Welch, et al., 1955
Walking, soft snow, 20 kg.pack	10.2	Rennie, 1958
Walking, unbroken trail, crusted snow,	13.1	Rennie, 1958
Snowshoeing, 2.3 mph[1]	6.2	Welch, et al., 1955
Snowshoeing, soft snow, 20 kg.pack	8.6	Rennie, 1958
Snowshoeing, unbroken trail, crusted snow	5.4	Rennie, 1958
Sled pulling (87 lb) 2.3 mph[1]	9.3	Welch, et al., 1955
Sled pulling	9.6	Buskirk, et al., 1957

Footnotes:

1. These figures appear to be for marching in file, so that most subjects were travelling on a broken trail.

the Indians still appear to hold a decided advantage. It has been suggested that the heavy footgear of the non-Native subjects, soldiers, on the order of 5.6 pounds for a military boot, is the cause of the greatest relative increase in energy expenditure in sub-arctic work. The Indian moose-hide mocassin with felt liners and/or several layers of fabric liner, is far lighter, well insulated and less hobbling, but it does need frequent care and attention. In general then, the Indians would appear likely to suffer a similar hobbling effect of clothing plus environmental resistance to work, although possibly quantitatively lower than soliders who used the same environment. The findings on army personnel evaluating caloric expenditures in work may then be broadly comparable to maximum expenditures needed by Indian peoples doing similar tasks.

The army studies already cited, plus data in Welch, Mann, Insull, Friedemann, Buskirk, Kreider, Brebbia, Morona and Daniels (1955) the major review article by R. Passmore and J.V.G.A. Durnin (1955) and a recent article by Shephard and Godin (1976) provide a number of estimates of caloric expenditures for men performing hunting and work activities under sub-arctic conditions. With these values it is possible to estimate thecaloric requirements for Waswanipi hunters by estimating the time and energy cost of their specific daily activities.

Two Waswanipi informants kept particularly good diaries of their hunting activities. These records not only summarized what had been the major activity of each day, but broke the days down into morning, afternoon and evening periods, and on some days provided the approximate times at which each activity was begun and ended.

The key point that emerges from the activity schedules kept is that actual activity patterns conform, in general, to the work schedule reported as the cultural model by Waswanipi informants. These schedules are best considered as two distinct models of two typical daily work patterns of men, one associated with beaver and occasionally moose hunting, and usually involving six to eight hours away from the camp, mostly travelling; the other associated with days spent in and around the camp, on repair jobs, wood cutting and odd work, and for rest or "holidays".

Because of the limited daylight during the early winter period the amount of time spent in work away from camp is limited. Hunters do not always limit themselves to the daylight hours, and may during certain periods leave camp before sunrise and return one or two hours after sunset, but they generally try to work within daylight hours. The standard hunting schedule involves travelling away from the camp for up to two and one half or at maximum three hours, and then starting the return journey. The hunters will stop at three or more beaver lodges along the way to check and/or set traps at each. Usually a maximum of six lodges may be checked during a day, assuming that if two men trap together, each hunter sets one trap at each lodge. If a hunter traps by himself he may check six traps a day, at three lodges with two traps per lodge. Each checking of a trap may involve 10 minutes cutting the ice, not counting time for breaks, and some additional light work resetting the trap and preparing a beaver. On the return trip, if a hunter was successful, the beaver will be transported back to camp. Typically the animals are put on their backs and pulled along the snow trail behind the hunter much as if he were pulling a toboggan loaded with the beaver harvest. On some occasions, the toboggan will be used, but often it was pulled by a dog, assisted by the hunter on steep inclines. Upon returning to camp, a hunter may spend an hour or two in work around the camp, the most intensive work being the gathering and preparing of firewood. With breaks on the trail for tea and for food, an eight to ten hour trapping day would be filled.

From this pattern, the typical duration of each of the major work activities may be approximated and the rate of energy cost for work activities as reported in other studies may be used to estimate total energy costs. Such calculation assumes the comparability of the work activities, and it should be noted that the diary recorders did not time themselves as in a time and motion study, and therefore they did not make any estimates of rest periods, or actual rates of work, although one of the two frequently estimated the total mileage he had walked. It is therefore difficult to precisely determine the degree of similarit. or difference that may exist between the Waswanipi work patterns and the work patterns described in the physiological research. I have simply assumed that the work rates are comparable.

The time spent in each major work activity then may be converted into an energy cost on the basis of the existing studies on the rate of energy expended in comparable activities (Table 8-2). This provides an estimate of 2,797 Calories as the energy cost of work on a hunting day. In this and the following calculations I have assumed a standard 65 kg. man wherever necessary, and I have used conservative estimates of the rates of energy expenditure for activities whenever alternative figures were available for the same activity.

By comparison, a day spent in camp may be spent in a combination of carpentry and light construction work, light repairs, and somewhat more gathering and preparation of firewood. The total work time is typically somewhat less, both less continuous and less extended. I have calculated the energy cost of the typical activities for a camp day at 1,528 Calories (Table 8-3).

The activity schedules indicate that approximately half the days of the winter period in total were spent in the hunting day work schedule which suggests an average of the energy requirements of the two work schedules will serve as an overall daily estimate of energy expenditure in major work activities,[4] i.e., 2,163 calories. To this we add a standard caloric requirement for basal metabolism, 1,700 Calories, plus a fifteen percent increment to basal metabolism for a high protein diet adjustment, 255 Calories, plus adult maintenance increment of 448 Calories (Canada, 1964:10, Table 2). This gives an estimated maximum total energy requirement of 4,566 Calories per day for adult men on a typical intermittent trapping schedule.

The estimated caloric needs of a Waswanipi hunter are high by world standards, and this is an indication of the intense and extended nature of the work they perform. This value is significantly above the values cited for other hunter-gatherers, for example 2,250 calories per day for Bushmen males (Lee, 1969:89). Physical size accounts for some of the difference, but the caloric requirements estimated for the Waswanipi also indicate a much heavier activity schedule.

The estimate made here may be checked, at least to see if it is a plausible order of magnitude, by comparing it both with the estimates of food needs made by

Table 8-2 Standard Work Schedule and Caloric Requirements for a Hunting Day

Activity	Time (Minutes)	Energy Expenditure Rate (Cal./Min.)	Total Energy Cost (Calories)
Snowshoeing to Traps (2½ hrs)	150	5.85[1]	877.5
Cutting Ice to Check Traps (6 x 10 min.)	60	7.33[2]	439.8
Toboggan Pulling with Load (2½ hrs)	150	6.67[3,5]	1000.5
Gathering Wood:			
Felling Trees	5	13.0[4]	65.0
Hauling Trees	20	6.67[3]	133.4
Sawing Sections	15	9.0[4]	135.0
Splitting Logs	15	9.7[4]	145.4
Daily Total Work	415		2796.6

Footnotes:

Values calculated from data in the following sources:

1. Rennie, 1958, selected as an intermediate value, see Table 8-1.
2. Daniels and Madden, 1956.
3. Buskirk, Dee, Welch, Levy, Consolazio, 1957.
4. Passmore and Durnin, 1955.
5. A value from the low end of the range of values available was used to account for the moderate loads usually hauled on trapping trips.

Table 8-3 Standard Work Schedule and Caloric Requirements for a Camp Day

Activity	Time (Minutes)	Energy Expenditure Rate (Cal./Min.)	Total Energy Cost (Calories)
Carpentry - Snowshoes, Tent, etc.	120	3.0[2]	360.0
Repairs, Lightwork	60	3.5[2]	210.0
Gathering Wood:			
Felling Trees	10	13.0[2]	130.0
Hauling Trees	40	6.67[1]	266.8
Sawing Sections	30	9.0[2]	270.0
Splitting Wood	30	9.7[2]	291.0
Daily Total Work	290		1527.8

Footnotes:

Values calculated from data in the following sources:

1. Buskirk, Dee, Melch, Levy, Consolazio, 1957.
2. Passmore and Durnin, 1955.

the Waswanipi themselves, and with the results of other, partially comparable studies of caloric requirements in the sub-arctic and arctic regions.

In Chapter 6, I have indicated that the Waswanipi say that a beaver lasts a commensal group two days and a moose lasts one to one and a half months or 30 to 45 days. Given 26,820 Calories per beaver and 395,487 Calories per moose, see below, these figures amount respectively to 13,410 and 13,183 or 8,789 Calories per day per commensal group. The average commensal group contains 1.6 adult men, 1.3 adult women and 1.5 children, Chapter 7. If the adult women require less energy than the men by about one-third and the children on average require about two-thirds less energy than the adult hunters (calculated from Shephard and Godin, 1976:110, Table 1), then the average commensal group the equivalent of just less than three adult male hunters. If we assume the food from a beaver and/or a moose were apportioned among commensal group members according to the ratios of these caloric needs, then the adult male hunters would receive 4,515 Calories per day from beaver, and 4,428 to 2,959 Calories per day from moose. The beaver figure and the higher of the moose figures are strikingly close to the calculation made of hunters caloric requirements. I would hypothesize that the lower end of the scale of figures given for moose represents how long a moose would last if it was not eaten at all meals during the 45-day period. Less variation would therefore occur in the beaver estimates because it is eaten in a two-day period and may more often comprise the main food at all meals during that period. Although I know this difference in eating patterns occurs, I have no direct evidence that this factor affected the estimates of how long a moose would last a family. In any case, the upper range of the estimates would tend to support the order of magnitude of the estimates made above.

The estimate made above is also close to the upper limit for the daily energy cost of the most intensive hunting activities reported in a recent study of Inuit hunters, 4,440 calories (Shephard and Godin, 1976:110). But it is above the average for twelve types of hunting, 3,670 calories per day. It is also above the range of daily caloric requirements Shephard and Godin use in their calculations 3,670 to 4,110; but they appear to simply use an average of all types of hunting as a daily value, without considering the actual frequency of occurrence of the various activities.

The United States Army has studied energy consumption by soldiers in rigorous outdoor work programs in the sub-arctic regions. A study at Fort Churchill was made of men bivouacked in the bush for twenty-one days. Each day camp would be broken, packed on sleds, hauled for nine to twelve miles, and then camp set up again. Under the heavy work schedule, each man of a two-men team pulled 90 kg. on the sleds for the four to six hours per day needed to complete the distance. In three study periods, it was found that men consumed 3,902, 4,199 and 4,488 Calories per day - mean 4,196. It was also found that the ten mile treck consumed about 2,300 Calories. The conclusion was that "in a cold climate a caloric requirement of 4,500 Cal/man/day is adequate for soldiers who are working hard and living on a self-sufficient bivouac basis" (Buskirk, Dee, Welch, Levy and Consolazio, 1957:8).

Rennie has reported on another study conducted 26 miles north of Fairbanks, Alaska, where six men lived in snow shelters for four weeks. They each made a ten-mile ski or snowshoe trip a day, hauled supplies by sled to the camp from a local road three miles distant, gathered wood for the cooking stove, chopped ice and generally improved their shelters regularly. The mean caloric intake was 4,081 Cal/day for five men (one had voluntarily restricted his diet).

The last two studies cited indicated a very general caloric requirement for men on a heavy daily work schedule in the sub-arctic region of about 4,200 Calories. To this figure would have to be added a factor to take account of differences in basal metabolic rate attributable to a high protein diet. If the correction factor, 255 Calories, is added it gives a corrected total of 4,455 Calories. Thus 4,500 Calories might, by this method, be considered the maximum requirement for an adult man doing heavy work in the sub-arctic region while living on a high protein diet. These studies then tend to support the plausibility of the estimate of the daily caloric requirements of a Waswanipi hunter made above.

In order to use the caloric requirement for a trapper to estimate the total caloric requirements of hunting groups a number of assumptions must be made.

In particular it is assumed that the distribution of caloric requirements follows the principles outlined in the Dietary Standard for Canada in so far as variations in weight and age affect caloric requirements.

Weights of most of the members of the hunting group sample were recorded shortly after the 1968-69 winter hunting season but a few weights had to be estimated. The ages of the members for the majority of the duration of the hunting season were taken from official government band lists, with a few corrections based on informant reports.

Caloric requirements for work were calculated for each hunting group on the basis of the activity categories used in the Dietary Standard for Canada (Canada, 1964).[5] The 1964 edition of the Dietary Standard for Canada provides a four-fold classification of activity levels for use in calculating energy expenditures. An individual is assigned to one of the four categories, A to D, and this classification plus body weight, age and sex determine the daily caloric requirement. The estimated 2,163 average daily work Calories for the Waswanipi hunters falls almost exactly at the borderline between the two highest categories of activity C and D in the standard, 2160 Calories.

Two separate calculations were therefore made, a maximal calculation which is based on putting fully active adult male hunters in activity category D, and a minimum calculation which is based on putting fully active adult male hunters in activity category C. The category D rating assumes, in effect, that hunting activities require an energy expenditure equivalent to the most energy consuming industrial and recreational activities: hand felling trees, shoveling gravel or coal; training for weight lifting and marathon sports such as cross-country running or skiing, and long bicycle races. The category C rating assumes in effect that a fully active hunter does work that requires as much energy as: felling trees in lumbering, harvesting and haying manually, manual handling of a wheelbarrow in construction work and training for professional athletics or Olympic sports.

In the maximal calculation men who because of age, health or lack of hunting experience did not follow full hunting schedules, as indicated in the diary records, were rated at activity level C. Fully active adult women were rated in activity category D, and those less active by reason of youth, or health were rated in category C and one very elderly woman was listed in category A. Children are not rated in activity categories in this system.

In the minimal calculations fully active adult men were rated in category C, less active adult men were rated in category B, and all adult women in category B except one woman who hunted occasionally, in C, and one elderly woman in A. Category B is the equivalent of working in a garden, scrubbing walls and floors, moving heavy packages, carpentry, loading and unloading trucks, and sports such as hockey, football or skiing. Category A is the equivalent of most house chores. typing and filing, assembly linework, truck driving, and sports such as golf, bowling and fishing.

No corrections for high protein diets are made in these calculations because the range between the minimal and maximal calculations more or less covers the application of such a correction. This can be seen because category D corresponds to a daily work expenditure of 2,472 Calories (Canada, 1964:12) or 309 Calories more than our estimate for daily work requirements of the Waswanipi hunters. This difference is slightly above the correction to basal metabolism for a protein diet, 255 Calories, that I calculated for a hunter. No adjustment for pregnancy requirements was necessary because no women were in their last three months of pregnancy during the period covered by these data.

The daily caloric requirements for each member of a hunting group were calculated on the basis of the sex, age, weight and activity category of the individual according to the formula in the Dietary Standard for Canada, using the computer program of Dr. Florence Farmer, School of Food Science, Macdonald College, McGill University. The daily caloric requirements are listed on Tables 8-4 and 8-5. The daily caloric requirements were multiplied by the number of days each individual was a member of the group, and the totals for each hunting group added.

Table 8-4 Minimal Caloric Requirements of Members of Hunting Group Sample

No.	Sex	Age Years	Weight Pounds[1]	Activity Category	Days of Subsistence	Cal. per Day	Total Calories
Group 68A							
970[3]	M	22	156	C	206	4233	869,938
971	F	23	116	B	206	2893	595,958
972	F	2	22	-	206	998	205,588
580	M	30	144	C	206	3913	806,078
973	F	84	112[2]	A	145	1907	276,515
550	M	42	149	C	53	3913	207,389
		Average and Total Calories Group 68A				2976	2,961,466
Group 68B							
520	M	62	152	C	204	3852	785,808
521	F	61	118	B	204	2691	548,964
610	M	26	147	C	204	3974	810,696
550	M	42	149	C	49	3913	191,737
		Average and Total Calories Group 68B				3607	2,337,205
Group 68C							
530	M	59	153	C	177	3871	685,167
531	F	56	157	B	177	3333	589,941
532	F	37	122	C	177	3417	604,809
533	M	19	123	B	41	3023	123,943
620	M	24	138	B	80	3295	263,600
540	M	20	121	B	145	2986	423,970
590	M	29	181	C	112	4645	520,240
		Average and Total Calories Group 67C				3510	3,220,670

(CONTINUED)

Table 8-4 Minimal Caloric Requirements of Members of Hunting Group Sample (Continued)

No.	Sex	Age Years	Weight Pounds[1]	Activity Category	Days of Subsistence	Cal. per Day	Total Calories
Group 68J							
810	M	55	164	B	49	3539	173,411
811	F	40	122	B	49	2910	142,590
812	M	4	35	-	49	1509	73,941
813	M	2	25	-	49	1135	55,615
890	M	24	146[2]	B	49	3438	168,462
820	M	18	140[2]	B	49	3331	163,219
814	F	17	124	B	49	3041	149,009
870	M	34	136	C	151	3749	566,099
871	F	22	165	B	151	3768	568,968
872	M	1	22[2]	-	151	998	150,698
873	F	2	24[2]	-	151	1089	164,439
874	M	3	30	-	151	1362	205,662
300	M	29	167[2]	C	49	4373	214,277
301	F	29	138[2]	B	49	3233	158,417
302	M	4	43[2]	-	49	1854	90,846
303	M	3	31[2]	-	49	1407	68,943
304	M	1	18[2]	-	49	817	40,033
		Average and Total Calories Group 68J				2444	3,154,629
Group 68P							
930	M	50	140[2]	C	156	3705	577,980
931	F	38	162[2]	B	156	3600	561,600
990	M	19	127	C	156	3619	564,564
		Average and Total Calories Group 68P				3641	1,704,144

Footnotes:

1. Adjusted from fully clothed weight to body weight.
2. Estimated weights.
3. First two digits of number correspond to the informant numbers used elsewhere in this report. Third digit of a male adult is a zero, other third digits are used for other members of his commensal group.

Table 8-5 Maximal Caloric Requirements of Members of Hunting Group Sample

No.	Sex	Age Years	Weight Pounds[1]	Activity Category	Days of Subsistence	Cal. per Day	Total Calories
Group 68A							
970[3]	M	22	156	D	206	4883	1,055,898
971	F	23	116	D	206	3910	805,460
972	F	2	22	-	206	998	205,588
.580	M	30	144	D	206	4534	934,004
973	F	84	112[2]	A	145	1907	276,515
550	M	42	149	D	53	4608	244,224
		Average and Total Calories Group 68A				3473	3,471,689
Group 68B							
520	M	62	152	D	204	4499	917,796
521	F	61	118	D	204	3721	759,084
610	M	26	147	D	204	4604	939,216
550	M	42	149	D	49	4608	225,792
		Average and Total Calories Group 68B				4358	2,841,888
Group 68C							
530	M	59	153	D	177	4521	800,217
531	F	56	157	C	177	3947	698,619
532	F	37	122	D	177	3966	701,982
533	M	19	123	C	41	3534	144,894
620	M	24	138	C	80	3853	308,240
540	M	20	121	C	145	3491	506,195
590	M	29	181	D	112	5382	602,784
		Average and Total Calories Group 68C				4099	3,762,931

(CONTINUED)

Table 8-5 Maximal Caloric Requirements of Members of Hunting Group Sample (Continued)

No.	Sex	Age Years	Weight Pounds[1]	Activity Category	Days of Subsistence	Cal. per Day	Total Calories
Group 68J							
810	M	55	164	C	49	4173	204,477
811	F	40	122	C	49	3418	167,482
812	M	4	35	-	49	1509	73,941
813	M	2	25	-	49	1135	55,615
890	M	24	146[2]	C	49	4019	196,931
820	M	18	140[2]	C	49	3894	190,806
814	F	17	124	C	49	3555	174,195
870	M	34	136	D	151	4344	655,944
871	F	22	165	D	151	5093	769,043
872	M	1	22[2]	-	151	998	150,698
873	F	2	24[2]	-	151	1089	164,439
874	M	3	30	-	151	1362	205,662
300	M	29	167[2]	D	49	5067	248,283
301	F	29	138[2]	D	49	4392	215,208
302	M	4	43[2]	-	49	1854	90,846
303	M	3	31[2]	-	49	1407	68,943
304	M	1	18[2]	-	49	817	40,033
		Average and Total Calories Group 68J				2831	3,672,546
Group 68P							
930	M	50	140[2]	D	156	4314	672,984
931	F	38	162[2]	D	156	4906	765,336
990	M	19	127	D	156	4185	652,860
		Average and Total Calories Group 68P				4468	2,091,180

Footnotes:

1. Adjusted from fully clothed weight to body weight.
2. Estimated weights.
3. First two digits of number correspond to the informant numbers used elsewhere in this report. Third digit of a male adult is a zero, other third digits are used for other members of his commensal group.

b. Estimate of Canine Requirements

It is possible to estimate broad limits of the energy requirements of the dogs, which accompanied members of the hunting group to the bush on the basis of the data available and of a number of assumptions.

The Waswanipi distinguish two general kinds of dogs, those used as work dogs for hauling toboggans, and those that are hunting dogs, usually beaver dogs. The latter are used to sniff out beaver burrows and chase beaver out of lodges, and may also be used to locate moose and to run the moose down and corner them during the period when crusted snow limits moose to their yards. While some dogs can serve as both functional kinds, only larger dogs are useful for hauling. Thus the dogs may be classified into those dogs that are good for hauling and those dogs that are only good for hunting. The actual sizes of dogs range along a continuum, but the functional classification also reasonably bifurcates the size range into two groups. I know the number of hauling dogs and of hunting only dogs that were in the bush with each hunting group.

I did not weigh dogs in the field but I estimate the average weight for the smaller dogs at 20 pounds and that for the larger dogs 35 pounds. The larger dogs were used for hauling, but they were not the size of husky breeds, whereas the hunting dogs were terrier size, although they were a considerable mixture of breeds.

I have calculated the daily maintenance caloric requirements on the basis of these weights and the caloric intake recommendations for dogs made by the United States National Research Council. These are 1,550 Calories per day for the dogs the size of hauling dogs and 700 Calories per day for the smaller size dogs. To my knowledge there are no studies of the actual activity levels and energy expenditures of dogs in the arctic or sub-arctic. A number of observations on the typical foods and food portions fed to sled-hauling dogs in various arctic and sub-arctic communities have been recorded in the literature. These are listed on Table 8-6. I have converted these food portions into caloric equivalents using values found in the literature cited in Appendix 8-2. The estimated daily caloric value of the food fed to sled-hauling dogs ranges from 1,339 to

Table 8-6 Reported Daily Food Ration for Sled-hauling Dogs in Arctic and Sub-Arctic Regions

Community or Region, and Source	Daily Food Ration During Working Season: Food	Quantity, lbs.	Calories Per 100 gm.	Calories Per Day in Food Ration
Southamption Island, NWT.				
Freeman, 1969-70:168	Walrus	1.1	286[1]	1433
Banks Island, NWT.				
Usher, 1971, Vol. 2:84	Fox	2.5	118[2]	1399
Usher, 1971, Vol. 2:57	Seal	2.0	150[1]	1362
Eastern Arctic				
McLaren, 1958	Meat	1.0)	110[2])	1421
	Fat	0.25)	812[2])	
Lac La Martre, NWT.				
Helm and Lurie, 1961:62	Fish	2.5	126[3]	1430
Yukon Territory				
Tanner, 1966:28	Fish	3.3[4]	126[3]	1888

Footnotes:

1. Source: Heller and Scott, 1967.
2. Source: Farmer, Ho and Neilson, 1971:139.
3. See Appendix 8-2.
4. Assumes 65 percent of live weight is edible.

1,888 Calories per day. The value adopted in my calculations for hauling dogs, 1,550 Calories per day is somewhat above the average of the six values calculated from other reports.

A more detailed study of the feeding of dogs in the arctic was made by T.W.M. Cameron (1938). He gives estimates of the caloric requirements of arctic sled dogs for moderate and hard work demands, by weights of the animals. He reports that sled dogs average about 79 pounds in weight, bitches about 60 pounds, considerably above my estimates of the weights of the larger Waswanipi dogs. The smallest weight for which Cameron gives figures is for dogs of 44 pounds, and for this weight he estimates the minimum daily food requirement for maintenance as 1,300 Calories, 1,700 Calories for moderate work and 2,100 Calories for hard work. The moderate work level probably best reflects an average value for the intermittent work schedule of the Waswanipi dogs. Extrapolating for a dog of 35 pounds the minimum daily total calories required from food would be about 1,540 Calories. Given the estimates adopted I have calculated, using the numbers of large and small dogs with each hunting group and from the total days in the bush, estimates of the total caloric requirements of the dogs in each hunting group (Table 8-7).

c. The Animal Harvests and Food Produced

The harvests of all animals captured from the date the hunting group moved from the settlement to a bush camp in the fall of 1968, until the date it terminated its hunting season activities in the spring of 1969 were tabulated for the four hunting groups in the sample, and for the post-New Year's period for a fifth group (Table 8-8).

In the diaries under consideration the records of harvests were recorded in units consistent with the classifications of foods outlined in Chapter 4. Thus, fish were listed by the more inclusive category, namely 'fish' and without any listings by specific kinds. The large birds harvested were listed by less inclusive categories, namely 'grouses', 'geese', 'loon', and 'duck', with no specific kinds indicated. Finally, the large mammals were listed by

Table 8-7 Estimated Caloric Requirements of Dogs of Hunting Group Sample

Group	Dogs Large	Dogs Small	Total Estimated Caloric Requirements
68A	3	3	1,071,200[1]
68B	2	2	918,000
68C	2	3	940,400
68J	2	2	450,000
68P	2	3	811,200

Footnote:

1. Based on 1550 Cal./day for large dogs and 700 Cal./day for small dogs, see text.

Table 8-8 Animals Killed by Hunting Group Sample

Animal or Animal Group	Number of Individual Animals Caught				
	Group 68A	Group 68B	Group 68C	Group 68J	Group 68P[1]
Moose	9	5	2	2	3
Beaver	174	69	38	68	109
Fish	108	34	500[2]	490	1
Hare	33	2	32	50	115
Black Bear	1	0	0	0	0
Lynx	0	0	0	1	0
Muskrat	19	27	14	35	45
Mink	2	2	0	5	0
Squirrel	14	0	0	7	0
Marten	30	8	11	12	22
Otter	3	3	1	4	3
Weasel	10	4	1	25	6
Grouses	113	31	149	69	245
Geese	2	7	0	0	8
Loon	1	5	0	0	0
Duck	10	12	0	2	41

Footnotes:

1. Winter and Spring Record Only.
2. Estimated.

specific kinds, 'moose', 'beaver', 'hare', 'black bear', 'lynx', 'muskrat', 'mink', 'squirrel', 'marten', 'otter', and 'weasel'. This listing corresponds quite closely to the responses to the question 'What did you eat?' listed on Table 4-15. 'Sturgeon' is not listed separately in the diaries, as it is in responses to that question, but the main sturgeon fishery occurs in June, after the date when the diaries were completed. Although it must be assumed that some sturgeon were caught during the period covered by the diaries, it is unlikely they were specifically sought during this period. The only other difference in the responses was, of course, that the "big game" large mammals were listed as animals not as meat, that is 'moose' as opposed to 'moose meat'. Furthermore, informants all reported that they only listed the fish caught for human consumption, and not that specifically caught for dogs, see below.

The range of the numbers of each animal or animal group harvested is quite variable. Thus between 2 and 9 moose were hunted by each hunting group, between 38 and 174 beaver, between one and 500 fish, and between two and 115 hare.

In order to quantify the productive output of these hunting groups, and to compare the relative contribution of the different kinds of animals to the total output, I have converted each of the kinds of animals killed into a weight of food for humans procurable from that kind of animal.

Weights of animals killed by the Waswanipi were not measured in the field because the difficulties outlined at the beginning of this chapter made it impossible to record a substantial series of freshly killed weights for each kind of animal for the entire range of seasonal, geographical and age and sex variations. Indeed, given the number of moose, mink, marten, otter, weasel, lynx, loons, goose and bears killed by any one hunting group, it is difficult to see how a useful series of measurements could have been made even if the harvests of a single group had been measured over the entire period. Rather than using weights based on a limited number of field measurements it was considered more reliable to use weights available in published and unpublished biological studies.

The weights I have derived from the literature are reviewed and summarized in

Appendix 8-1 along with the details of the calculations used to arrive at the final values. The method of estimation that has been used involves two steps, an estimation of the average live weight of the animal, and an estimation of percentage of the live weight that is represented by the various portions of the body of given animal that the Waswanipi normally consume. One of the problems of arriving at live weights is that the weights of any given animal vary by age and sex of the animal, and by season, locality of the hunt, condition of the individual animal, harvesting technique, and a host of other factors. These are reflected in the variability of the data in the literature, and I have taken these factors into account, to the extent possible, when choosing among the figures in the literature. A full discussion appears in Appendix 8-1. In general where a choice existed which could not be decided on other grounds, the values chosen have been from the lower portion of the range of reported values. In some cases I think that the final weight values that were used err on the conservative side.

The particular butchering and dietary practices of the Waswanipi were taken into account when determining the percentages of the live weight attributable to the edible components of the carcass. The Waswanipi consider an especially high percentage of the carcass to be usable food for humans by comparison with non-Native sports hunters or commercial butchers. For example, beaver feet and tails, moose tongues, bear paws and fish heads are all considered edible, and indeed all are in fact highly valued foods. A very high percentage of the flesh and fat of animal carcasses is therefore eaten. In addition, many internal organs are eaten and again, are often especially valued. The heart, liver, eyeball muscles, tongue, blood and bone marrow of moose are regularly eaten, and most people ate the lungs, stomach, and intestine as well. Beaver organs, sometimes including lungs, brains and stomach, are eaten. Hare intestines sometimes are eaten. Grouse and ptarmigan wings, heads, livers and intestines are eaten by some. Duck intestines, lungs, liver, feet and heads are eaten, and goose intestines, feet, heads and wings are eaten, although lungs and livers are not eaten. This high level of consumption of internal organs was taken into general account when determining the weight of internal organs that are edible. The organ weight also generally include an allowance for blood and bone marrow weights which are desired and eaten as well. No specific consideration and adjustments were made for fish eggs, or for moose foetuses which are also considered edible and highly valued as foods. In summer some waterfowl eggs are also collected, but not in large numbers, so these too were not considered in the calculations.

The values adopted in Appendix 8-1 are summarized on Table 8-9. The percentage of the whole weight that is edible, is broken down for the more important kinds of animals into the percentage of live weight in the component portions of meat, fat and edible organs which can be eaten by men, and into a separate percentage for the inedible viscera which can be eaten by dogs.

Using the average whole weight in pounds, and the percentage of the whole weight which is edible I have calculated the food that can be produced from the numbers of animals harvested by each of the five hunting groups in the sample (Table 8-10) and I have totalled the food production of the five groups (Table 8-11).

The total pounds of food produceable from the animals harvested by each group varies less when groups are compared than did the harvests of individual kinds of animals. Group 68C produced the least food, 2,580 pounds, group 68A the most, 6,378 pounds. This latter group however had an exceptional harvest, about 90 percent higher than the second most productive group, 68P, which produced 3,350 pounds of food in the period after the New Year. If group 68A is excluded, then the range of variation of total bush food production among the other groups is relatively narrow, group 68P produced about 30 percent more food by weight than group 68C. The significance of these differences will become clear later.

Taking all five groups together, the food produced was dominated by food from moose and from beaver, which were about equally important and which together account for over three-quarters of the total bush food production by weight. Fishes, taken together, were the secondary food source, providing some 13 percent of the total food produced.

Table 8-9 Average Whole Weights and Percentage Distribution to Component Weights for Animals[1]

Animal or Animal Group	Average Whole Weight (Pounds)	Percent of Whole Weight				
		Edible[2]	Meat	Fat	Edible Organs	Viscera (Inedible)
Moose	634	54	35	10	9[4]	10
Beaver	27.7	57	37	20	(8)[3]	9
Fish	3.2	65				15
Hare	2.9	57				22
Black Bear	205	63				22
Lynx	17	40				22
Muskrat	2	56				22
Mink	1.5	56				22
Squirrel	.36	56				22
Marten	2	56				22
Otter	15	56				22
Weasel	.5	56				22
Grouses	2.0	60	44		16	2
Geese	8.0	55	44		16	2
Loon	4.0	60	44		16	2
Duck	2.5	41	38		3	26

Footnotes:

1. From Appendix 8-1.
2. Includes meat, fat and edible organs, but no bones.
3. This total which is included with the meat is estimated to itself include 2.4 percent of the whole weight for the liver, Appendix 8-2.
4. Includes 1.6 percent of the whole weight for the liver, Appendix 8-2.

Table 8-10 Bush Foods Available to Hunting Groups in Sample

Animals or Animal Groups	Average Food Portion (Lbs.)	Pounds of Bush Food Available				
		Group 68A	Group 68B	Group 68C	Group 68J	Group 68P
Moose	342	3078	1710	684	684	1026
Beaver	15.2	2644	1049	578	1034	1657
Fish	2.1	227	71	1050	1029	2
Hare	1.7	56	3	54	85	195
Black Bear	129	129	0	0	0	0
Lynx	6.8	0	0	0	7	0
Muskrat	1.1	21	30	15	39	49
Mink	0.8	2	2	0	4	0
Squirrel	0.2	3	0	0	1	0
Marten	1.1	33	9	12	13	24
Otter	8.4	25	25	8	34	25
Weasel	0.3	3	1	0	7	2
Grouses	1.2	136	37	179	83	294
Geese	4.4	9	31	0	0	35
Loons	2.4	2	12	0	0	0
Duck	1.0	10	12	0	2	41
Total		6378	2992	2580	3022	3350

Table 8-11 Summary of Bush Foods Available to Hunting Group Sample

Animal or Animal Group	Pounds of Bush Food Available	Percentage of Total Bush Food Available
Moose	7182	39
Beaver	6962	38
Fish	2379	13
Grouses	729	4
Hare	393	2
Muskrat	154	1
Black Bear	129	1
Otter	117	1
Marten	91	-
Geese	75	-
Ducks	65	-
Loons	14	-
Weasel	13	-
Mink	8	-
Lynx	7	-
Squirrel	4	-
Totals	18322	100

At the level of the types of specific kinds of animals, moose and beaver probably account for about ten times as much food produced, by weight, than does any other specific kind of animal. As groups of specific animals, fish are of secondary importance, and the small game, grouses plus hare are of tertiary significance. Muskrat, black bear, and otter provide about one percent each, other fur-bearers provide only traces, less than one-half of one percent.

While lynx was a minor component of the bush food production in these figures, it should be noted that the populations of this animal vary widely over what is believed by some biologists to be a ten-year cycle (Keith, 1963), and when lynx populations are higher they may account for a higher percentage of the bush food harvest. The lynx were at a relatively low point in 1969-70 according to the Waswanipi. The same consideration would apply to hare and the grouses. Each has characteristically highly variable population levels, possibly cyclical, and each could provide significantly more of the bush food harvest in different years (see Weinstein, 1976 and JBNQNHRC, 1976a for a consideration of these variations).

The contribution of fish too could vary from year to year, and it should be noted that the Waswanipi considered that fishing was less productive on the main southern lakes of the area in 1968-69 and 1969-70 than it would have been if there had not been a commercial fishery on these lakes for the previous years. This impact would however have been greater during the summer period when fishing is a more preferred activity than it is during winter, and when the activity is more heavily concentrated on those lakes that are fished commercially.

The relatively low contribution to production of potential food from geese and ducks and probably also the low contribution from loons, reflect the fact that some groups ceased their records prior to the commencement of the spring hunts. Geese were not reported by groups 68J and 68C which ceased hunting on about May 1. whereas the other groups all continued hunting up to May 23, May 25 and June 9.

Geese would have appeared in the Waswanipi region during the month of April, and the lack of harvests by group 68C probably also reflects the reduced hunting in that month, and an extensive stay in the settlement during that period as well. Ducks continue to be hunted all summer, and geese are hunted again especially in the fall, but largely before hunting groups go to the hunting territories. The relative importance of these animals as sources of food would therefore be different on an annual basis, as would importance of fish. A general annual estimate of harvests has been provided elsewhere.

d. Basic Nutrients Available from Bush Foods

In order to analyze the value of bush food production in relation to nutritional needs an analysis of the main nutritional components of bush food was undertaken. The number of pounds of edible portions available for consumption were converted into nutrients available on the basis of data from reports of nutritional analyses of northern animal foods. Appendix 8-2 outlines in detail the data compiled from the literature, the sources, and the values adopted for nutrient composition of foodstuffs. I placed primary emphasis in the calculations on the main nutrient components: calories, protein and fat. Some of the important vitamins and minerals will be considered below.

The basic nutrients, calories, protein and fat, available per unit of weight of animal foods are summarized on Table 8-12 as are the total of each of the basic nutrients procurable from one specimen of each of the various kinds of animals. Carbohydrates are not included on the table because there are only very limited quantities in the main meat and fat components of the animals. While some carbohydrates do occur in specific northern animal foods, or animal related foods, for example caribou stomach contents, appropriate nutrient data on the possible sources of carbohydrates in the Waswanipi region are not available. Vegetational sources, such as berries, which are harvested by the Waswanipi in sumer are, of course, an important local source of carbohydrates, but they do not appear in the detailed records of food harvests which are the basis of this analysis because these data only cover the fall, winter and spring periods.

Table 8-12 Nutritional Value of Animal Foods, and Total Nutrients Procurable from Specimen of Each of the Various Kinds of Animals

Animals and Components	Portion Weight (Kg.)	Calories Per 100 gm.[1]	Total Calories	Protein Per 100 gm.[1] (gm.)	Total Protein (gm.)	Fat Per 100 gm.[2] (gm.)	Total Fat (gm.)
Moose							
-Meat	100.7	124	124,921	24.5	24,671	2.0	2,014
-Fat	28.8	814	234,299	2.4	691	89.1	25,696
-Edible Organs	25.9	140	36,267	19.9	5,159	3.8	985
-All Edible	155.4	254[2]	395,487		30,521		28,695
Beaver							
-Meat	4.5	158	7,076	26.8	1,205	4.8	216
-Fat	2.4	814	19,734	2.4	58	89.1	2,144
-All Edible	6.9	389[2]	26,820		1,263		2,360
Fish, Edible	0.9	126	1,190	18.7	178	4.6	44
Hare, Edible	0.8	135	1,013	21	162	5	39
Black Bear, Edible	58.6	160	93,815	20.0	11,722	8.3	4,865
Lynx, Edible	3.1	118	3,643	22.6	698	4.1	127

(CONTINUED)

Table 8-12 Nutritional Value of Animal Foods, and Total Nutrients Procurable from Specimen of Each of the Various Kinds of Animals (Continued)

Animals and Components	Portion Weight (Kg.)	Calories Per 100 gm.[1]	Total Calories	Protein Per 100 gm.[1] (gm.)	Total Protein (gm.)	Fat Per 100 gm.[2] (gm.)	Total Fat (gm.)
Muskrat, Edible	0.5	107	544	22.4	112	1.3	6
Mink, Edible	0.4	107	408	22.4	81	1.3	5
Squirrel, Edible	0.1	107	98	22.4	20	1.3	1
Marten, Edible	0.5	107	544	22.4	112	1.3	6
Otter, Edible	3.8	107	4,081	22.4	854	1.3	50
Weasel, Edible	0.1	107	136	22.4	31	1.3	2
Grouses							
-Meat	0.4	121	483	26.7	109	1.9	8
-Edible Organs	0.1	157	228	20.8	28	7.0	10
-All Edible	0.5	131[2]	711		137		18
Geese							
-Meat	1.6	131	2,093	23.1	367	3.3	52
-Edible Organs	0.6	157	912	20.8	123	7.0	41
-All Edible	2.2	138[2]	3,005		490		93

(CONTINUED)

Table 8-12 Nutritional Value of Animal Foods, and Total Nutrients Procurable from Specimen of Each of the Various Kinds of Animals (Continued)

Animals and Components	Portion Weight (Kg.)	Calories Per 100 gm.[1]	Total Calories	Protein Per 100 gm.[1] (gm.)	Total Protein (gm.)	Fat Per 100 gm.[2] (gm.)	Total Fat (gm.)
Loon							
Meat	0.8	191	1,526	22.4	183	10.8	88
-Edible Organs	0.3	157	456	20.8	57	7.0	19
-All Edible	1.1	182[2]	1,982		240		107
Duck							
-Meat	0.4	124	535	24.3	99	3.5	14
-Edible Organs	0.05	157	53	20.8	9	7.0	3
-All Edible		130[2]	588		108		17

Footnotes:

1. From Appendix 8-2.
2. Weighted average.

On the basis of these values I have calculated the total of each of the basic nutrients that is procurable from the bodies of the animals which were harvested by members of each hunting group in the sample. These totals are listed in Tables 8-13 to 8-17 and are summarized on Tables 8-18 and 8-19. The relative contribution of the various species to the total protein available from bush foods (Table 8-19) closely parallels the relative contribution to the poundage of bush food (Table 8-11). In terms of relative contribution to the total calories available from bush foods however beaver is relatively more important, and other animals and animal groups less so, with the exception of moose which contributes a relatively stable percentage in all calculations. The lower importance of other animals as sources of calories is partly a reflection of the fact that separate calculations for the fat components were made only for beaver and moose. Because fat contains more than twice the caloric value of protein on a per unit weight basis using this more detailed calculation for only two species probably leads to an over-estimation of their relative contribution to the caloric potential of the bush food harvests. However, this difference also probably reflects a real difference in the fat content of the various animal carcasses. No summary was made for sources of fat in the available food because of the above considerations.

e. Caloric Production in Relation to Energy Requirements

Before proceeding to a comparison of the productive output of calories potentially available from the animals harvested, with the calories estimated to be required by the hunting groups, I must make two clarifications.

First, I have no extensive systematic data on actual food consumption. Such data would have been impossible to gather because of the geographical distribution of the populations under study, as I have indicated at the beginning of this chapter, nor would such data necessarily serve my particular purposes. My aim is not to assess the adequacy of the Waswanipi diet, but rather to assess the relationship between production and subsistence requirements and needs. My question is whether the production could have met the requirements and needs of the hunting groups, and this question can be answered without knowing the actual consumption. The fact that these foods were available, and the claims that

Table 8-13 Nutrients Available to Group 68A from Bush Foods

Animals and Components	No.	Whole Weight (Grams)	Component Weight (Grams)	Calories	Protein (Grams)	Fat (Grams)
Moose:	9	2,590,524				
-Meat			906,683	1,124,287	222,137	18,134
-Fat			259,052	2,108,683	6,217	230,815
-Ed. Org.			233,147	326,406	46,396	8,860
-All Edible			1,398,882	3,559,376	274,750	257,809
Beaver:	174	2,188,189				
-Meat			809,630	1,279,215	216,981	38,862
-Fat			437,638	3,562,373	10,503	389,935
-All Edible			1,247,268	4,841,588	227,484	428,797
Fish	108	156,902	101,986	128,502	19,071	4,691
Hare	33	43,448	24,765	33,433	5,201	1,238
Fur-bearers:						
Bear	1	93,070	58,634	93,814	11,727	4,867
Small Fur-bearers	78	70,842	39,672	42,449	8,887	516
Sub-Total - Fish, Hare, Fur-bearers		364,262	225,057	298,198	44,886	11,312

(CONTINUED)

Table 8-13 Nutrients Available to Group 68A from Bush Foods (Continued)

Animals and Components	No.	Whole Weight (Grams)	Components Weight (Grams)	Calories	Protein (Grams)	Fat (Grams)
Fowl:						
Grouses	113	102,604				
-Meat			45,146	54,627	12,054	858
-Ed. Org.			16,417	25,775	3,415	1,149
Geese	2	7,264				
-Meat			3,196	4,187	738	105
-Ed. Org.			799	1,254	166	56
Loon	1	1,816				
-Meat			799	1,526	179	86
-Ed. Org.			291	457	61	20
Ducks	10	11,350				
-Meat			4,313	5,348	1,048	151
-Ed. Org.			341	535	71	24
Sub-Total - Fowl		123,034	71,302	93,709	17,732	2,449
Total Bush Food		5,266,009	2,942,509	8,792,871	564,852	700,367

Table 8-14 Nutrients Available to Group 68B from Bush Foods

Animals and Components	No.	Whole Weight (Grams)	Component Weight (Grams)	Calories	Protein (Grams)	Fat (Grams)
Moose:	5	1,439,180				
-Meat			503,713	624,604	123,410	10,074
-Fat			143,918	1,171,493	3,454	128,231
-Ed. Org.			129,526	181,336	25,776	4,922
-All Edible			777,157	1,977,433	152,640	143,227
Beaver:	69	867,730				
-Meat			321,060	507,275	86,044	15,411
-Fat			173,546	1,412,664	4,165	154,629
-All Edible			494,606	1,919,939	90,209	170,040
Fish	34	49,395	32,107	40,455	6,004	1,477
Hare	2	2,633	1,501	2,026	315	75
Fur-bearers:						
Small Fur-bearers	44	54,480	30,509	32,645	6,834	397
Sub-Total - Fish, Hare, Fur-bearers		106,508	64,117	75,126	13,153	1,949

(CONTINUED)

Table 8-14 Nutrients Available to Group 68B from Bush Foods (Continued)

Animals and Components	No.	Whole Weight (Grams)	Component Weight (Grams)	Calories	Protein (Grams)	Fat (Grams)
Fowl:						
Grouses	31	28,148				
-Meat			12,385	14,986	3,307	235
-Ed. Org.			4,504	7,071	937	315
Geese	7	25,424				
-Meat			11,187	14,655	2,584	369
-Ed. Org.			2,797	4,391	582	196
Loon	5	9,080				
-Meat			3,995	7,630	895	431
-Ed. Org.			1,453	2,281	302	102
Duck	12	13,620				
-Meat			5,176	6,418	1,258	181
-Ed. Org.			409	642	85	29
Sub-Total - Waterfowl		76,272	41,906	58,074	9,950	1,859
Total Bush Foods		2,489,690	1,377,786	4,030,572	265,952	317,074

Table 8-15 Nutrients Available to Group 68C from Bush Foods

Animals and Components	No.	Whole Weight (Grams)	Component Weight (Grams)	Calories	Protein (Grams)	Fat (Grams)
Moose:	2	575,672				
-Meat			201,485	249,841	49,364	4,030
-Fat			57,567	468,495	1,382	51,292
-Ed. Org.			51,810	72,534	10,310	1,969
-All Edible			310,862	790,970	61,056	57,291
Beaver:	38	477,880				
-Meat			176,816	279,369	47,387	8,487
-Fat			95,576	777,989	2,294	85,158
-All Edible			272,392	1,057,358	49,681	93,645
Fish	500	726,400	472,160	594,922	88,294	21,719
Hare	32	42,131	24,015	32,420	5,043	1,201
Fur-Bearers:						
Small Fur-bearers	27	29,737	16,653	17,819	3,730	216
Sub-Total - Fish, Hare, Fur-bearers		798,268	512,828	645,161	97,067	23,136

(CONTINUED)

Table 8-15 Nutrients Available to Group 68C from Bush Foods (Continued)

Animals and Components	No.	Whole Weight (Grams)	Component Weight (Grams)	Calories	Protein (Grams)	Fat (Grams)
Fowl:						
Grouses	149	135,292				
-Meat			59,528	72,029	15,894	1,131
-Ed. Org.			21,647	33,986	4,503	1,515
Sub-Total - Fowl		135,292	81,175	106,015	20,347	2,646
Total Bush Food		1,987,112	1,177,257	2,599,504	228,201	176,718

Table 8-16 Nutrients Available to Group 68J from Bush Foods

Animals and Components	No.	Whole Weight (Grams)	Component Weight (Grams)	Calories	Protein (Grams)	Fat (Grams)
Moose:	2	575,672				
-Meat			201,485	249,841	49,364	4,030
-Fat			57,567	468,595	1,382	51,292
-Ed. Org.			51,810	72,534	10,310	1,969
-All Edible			310,862	790,970	61,056	57,291
Beaver:	68	855,154				
-Meat			316,407	499,923	84,797	15,188
-Fat			171,031	1,392,192	4,105	152,389
-All Edible			487,438	1,892,115	88,902	167,577
Fish	490	711,872	462,717	583,023	86,528	21,285
Hare	50	65,830	37,523	50,656	7,880	1,876
Fur-bearers:						
Small Fur-bearers	88	82,637	46,277	49,516	10,366	602
Lynx	1	7,718	3,087	3,643	698	127
Sub-Total - Fish, Hare, Fur-bearers		868,057	549,604	686,838	105,472	23,890

(CONTINUED)

Table 8-16 Nutrients Available to Group 68J from Bush Foods (Continued)

Animals and Components	No.	Whole Weight (Grams)	Component Weight (Grams)	Calories	Protein (Grams)	Fat (Grams)
Fowl:						
Grouses	69	62,652				
-Meat			27,567	33,356	7,360	524
-Ed. Org.			10,024	15,738	2,085	702
Ducks	2	2,270				
-Meat			863	1,070	210	30
-Ed. Org.			68	107	14	5
Sub-Total - Waterfowl		64,922	38,522	50,271	9,669	1,261
Total Bush Food		2,363,805	1,386,426	3,420,194	265,099	250,019

Table 8-17 Nutrients Available to Group 68P from Bush Foods

Animals and Components	No.	Whole Weight (Grams)	Component Weight (Grams)	Calories	Protein (Grams)	Fat (Grams)
Moose:	3	863,508				
-Meat			302,228	374,763	74,046	6,045
-Fat			86,351	702,897	2,072	76,939
-Ed. Org.			77,716	108,802	15,465	2,953
-All Edible			466,295	1,186,462	91,583	85,937
Beaver:	109	1,370,762				
-Meat			507,182	801,348	135,925	24,345
-Fat			274,152	2,231,597	6,580	244,269
-All Edible			781,334	3,032,945	142,505	268,614
Hare	115	151,409	86,303	116,509	18,124	4,315
Fur-bearers:						
Small Fur-bearers	76	82,628	46,272	49,511	10,365	602
Sub-Total - Hare, Fur-bearers		234,037	132,575	166,020	28,489	4,917

(CONTINUED)

Table 8-17 Nutrients Available to Group 68P from Bush Foods (Continued)

Animals and Components	No.	Whole Weight (Grams)	Component Weight (Grams)	Calories	Protein (Grams)	Fat (Grams)
Fowl:						
Grouses	245	222,460				
-Meat			97,882	118,437	26,134	1,860
-Ed. Org.			35,594	55,883	7,404	2,492
Geese	8	29,056				
-Meat			12,785	16,748	2,953	422
-Ed. Org.			3,196	5,018	665	224
Duck	41	46,535				
-Meat			17,683	21,927	4,297	619
-Ed. Org.			1,396	2,192	290	98
Sub-Total - Fowl		298,051	168,536	220,205	41,743	5,715
Total Bush Food		2,766,358	1,548,740	4,605,632	304,320	365,183

Table 8-18 Basic Nutrients Available from Bush Foods to Hunting Group Sample

Group	Calories Available from Bush Foods	Protein Available from Bush Foods (Grams)	Fat Available from Bush Foods (Grams)
68A	8,792,871	546,852	700,367
68B	4,030,572	265,952	317,074
68C	2,599,504	228,201	176,718
68J	3,420,194	265,099	250,019
68P	4,605,632	304,320	365,183
All	23,448,773	1,610,424	1,809,361

Table 8-19 Summary of Calories and Protein Available from Animals or Animal Groups to Hunting Group Sample

Animals or Animal Groups	Calories Available from Bush Foods	Percentage of Total Calories Available from Bush Foods	Protein Available from Bush Foods (Grams)	Percentage of Total Protein Available from Bush Foods
Moose	8,305,211	35	641,085	39
Beaver	12,743,945	54	598,781	37
Fish	1,346,902	6	199,897	12
Grouses	431,888	2	83,093	5
Hare	235,044	1	36,563	2
Small Fur-bearers	191,940	1	40,182	2
Black Bear	93,814	-	11,727	1
Geese	46,253	-	7,688	-
Ducks	38,239	-	7,273	-
Loons	11,894	-	1,437	-
Lynx	3,643	-	698	-
Totals	23,448,773	99	1,628,424	98

they would or would not have been sufficient to meet dietary requirements and needs if consumed in sufficient quantities, is not intended to demonstrate that they were so consumed, nor that in certain respects the diet was adequate or inadequate. This would require a much more extensive study, including records of actual consumption, medical and dental examinations and biochemical analyses.

The second point is that in part of what follows, I will simply assume that people ate foods to the levels they needed. This is an assumption I will make in order to assess production, and the possible distribution of that production to alternative allocations. My conclusions will concern productive output, and its allocations, including whether the food available could have met subsistence needs. In summary, I will present no data on food actually consumed by individual people or groups of people; I will speak about food that was potentially consumable; and, in limited instances, I will make explicit assumptions about actual consumption.

Before comparing caloric output to energy requirements two factors must be taken into account. First, the purchased foods that were brought to the bush camps and that were consumed during the period covered by the harvest data must be considered. These foods met part of the human caloric requirements. Second, in most groups some of the food available for human consumption was used to feed the dogs so that food available for human consumption must be reduced by this amount.

A list of the purchased foods taken by each hunting group in the sample into its bush camp during the winter hunting season was available from the data in the record books and from supplementary interviews. These purchases were tabulated as weights of edible portions (Table 8-20). In general the list of foods purchased for use in the bush camps is not diverse, and for all but one hunting group the list is limited, or very nearly limited, to the imported staple foods that have been part of the bush economy for several decades, namely flour, lard, sugar, evaporated milk, rolled oats, rice, macaroni, baking powder, salt and tea. All are easily preservable, transportable, and resistent to freezing and thawing. Group 68C, however, as will be noted, purchased a much more diverse

Table 8-20 Purchased Foods Available to Hunting Group Sample in Pounds of Edible Portion

Food Items[1]	Group 68A	Group 68B	Group 68C	Group 68C Adjusted[2]	Group 68J	Group 68P
Flour, lbs.	275	225	325	365	350	100
Lard, lbs.	70	40	50	54	130	30
Sugar, lbs.	175	120	100	116	240	50
Evaporated Milk, lbs.	180	30	102	118	360	30
Rolled Oats, lbs.	48	20	75	83	25	25
Rice, lbs.	11	2	12	16	26	5
Macaroni, lbs.	0	0	14	22	24	5
Butter, lbs	0	0	3	5	9	2
Soup, lbs.	3	0	3	9	0	
Baking Powder, lbs.	11	3	12	12	11	3
Cheese Spread, lbs.			10	14	3	
Hot Chocolate, lbs.			17	21		
Bread, lbs.			8	20		
Raisins, lbs.			2	4		
Crackers, lbs.			2	10		
Pancake Mix, lbs.			10	12		
Bacon, lbs.			2	10		
Cereal, Breakfast, lbs.			2	6		
Margarine, lbs.				2		
Eggs (Dozen)			6	18		
Bananas				8		
Cookies, lbs.			6	14		
Apples			6	8		
Hamburger Beef, lbs.			2	18		
Chicken Necks				16		
Canned Peas, lbs.			1	9		
Hog Dogs, lbs.			1	13		
Pork Chops, lbs.				16		
Instant Potatoes, lbs.			4	8		

(CONTINUED)

Table 8-20 Purchased Foods Available to Hunting Group Sample in Pounds of Edible Portion (Continued)

Food Items[1]	Group 68A	Group 68B	Group 68C	Group 68C Adjusted[2]	Group 68J	Group 68P
Bologna, lbs.			2	10		
Canned Pinapple, lbs.				8		
Chocolates, lbs.			2	6		
Potatoes, lbs.				16		
Milk, Powdered, lbs.				21		3
Honey			0	2		
Peanut Butter			0	4		
Jam, Strawberry			0	4		
Total, lbs.	762	437	792	1073	1167	250

Footnote:

1. Coffee, tea, and salt omitted.
2. See text for explanation.

range of fodstuffs, including cheese spread, hot chocolate, bread, pancake mix, eggs, cookies, apples, and instant potatoes and others purchased in smaller quantities. Differences in taste explain for the range of foods purchased by this group if not the total quantities, see later.

For all hunting groups these totals of food purchases only included foods taken to the bush, they do not include occasional purchases of store foods made during visits to the settlements for consumption during those visits. During short visits to the settlement during the winter most hunting groups provide for most of their food with bush foods they bring with them. But purchased foods taken to the bush are not usually transported back to town for these vacations. Rather supplies of purchased foods left in the settlement are used, or if the stay lasts a little while, small quantities of food may be bought to provide desired purchased foods during the visit. The larger quantities of purchased food which are taken to the bush are usually bought at the end of the visit, just prior to departure, and are transported unopened, for security.

Thus the foods listed here do not include some additional purchased foods normally consumed during visits to town. As long as the time spent in town is a small percentage of the total time, this leads to only a small under-estimate of available purchased foods. In fact, for most groups this percentage is modest, between six and sixteen percent: group 68A spent 6.7 percent of the winter hunting season time in visits to the settlements, group 68B spent 16.6, 68J spent 17.6 and 68P spent 6.0 percent of the days in the settlement. Because the main food source during these visits is bush foods, this leads to a relatively small error.

However, in the case of group 68C, 31.4 percent of the days during the winter hunting season were spent in visits to the settlement. Given the relatively heavier purchases of food made by this group for its stay in the bush I thought it desirable to partly correct for the under reporting of purchased foods. An increment for purchases made while in town has been added to the list of purchased foods for group 68C so that the purchased food for this group includes a roughly comparable percentage of the time as that of other groups. On the basis of my knowledge of the shopping habits of this group, having eaten with them for many weeks, and having made weekly food purchases with them on at least six occasions, I have estimated a standard weekly purchase list, and have added a four-week estimated ration based on the standard to the foods reported taken to the bush.[6] I have thereby reduced the percent of total person days spent in the settlement without record of occasional food purchases to 15.9 percent, within the range of other hunting groups. These changes in the store foods for group 68C are summarized on Table 8-21, and the new totals are listed on Table 8-20, as "68C Adjusted".

In total then the purchased foods listed for all hunting groups include all foods taken to the bush camps, but probably under-estimate of total purchases of each group during the winter.

The nutrient contents of the edible portions of purchased foods from Watt and Merrill (1963) were used to calculate the total nutrients available from purchased foods. Items of less than ten pounds were omitted from the calculations, as were salt, coffee and tea, because of their limited nutritional value (Tables 8-22 to 8-26). The totals are summarized on Table 8-27.

A brief comparison of the calories, protein and fat available from all bush food and purchased food sources indicates that bush foods were the source of 78 percent of the calories, 93 percent of the protein and 90 percent of the fat available to the hunting group sample during the winter hunting season. On the other hand, had carbohydrates been estimated, nearly 100 percent would have come from purchased food sources. It should, of course, be remembered that I am speaking here about food available and not about actual consumption (Table 8-28).

In fact, in order to estimate reduction of total human caloric requirements as a consequence of the consumption of purchased foods, I will assume, for purposes of the analyses which follow, that all the purchased food taken into the bush was consumed. In general the hunting group members reported that this was the case. In some cases however, some purchased food was probably left over and was brought back to the settlement at the end of the hunting period, particularly

Table 8-21 Estimated Store Food Purchases While in Settlement, Plus Store Foods Taken to Bush by Group 68C

Food Items	Weekly Standard (Lbs)	Four Week Ration (Lbs)	Reported Purchases (Lbs)	Total Purchases (Lbs)
Flour	10	40	325	365
Lard	1	4	50	54
Sugar	4	16	100	116
Salt	-	-	5	5
Evaporated Milk	4	16	102	118
Rolled Oats	2	8	75	83
Rice	1	4	12	16
Macaroni	2	8	14	22
Butter	.5	2	3	5
Coffee	.5	2	16	18
Tea	.5	2	13.5	15.5
Soup, Chicken	2	8	1	9
Baking Powder	.5	2	10	12
Hot Chocolate	1	4	17	21
Instant Potatoes	1	4	4	8
Cheese Spread	1	4	10	14
Bread, White	3	12	8	20
Raisins	.5	2	2	4
Crackers, Saltine	2	8	2	10
Pancake Mix	.5	2	10	12
Bacon	2	8	2	10
Cereals, Corn Flakes, Breakfast	1	4	2	6
Eggs - Dozen	3	12	6	18
Cookies	2	8	6	14
Hamburger Beef	4	16	2	18

(CONTINUED)

Table 8-21 Estimated Store Food Purchases While in Settlement, Plus Store Foods Taken to Bush by Group 68C (Continued)

Food Items	Weekly Standard (Lbs)	Four Week Ration (Lbs)	Reported Purchases (Lbs)	Total Purchases (Lbs)
Chicken Necks	4	16	0	16
Hot Dogs	3	12	1	13
Bologna	2	8	2	10
Milk, Powdered	0	0	21	21
Pork Chops	4	16	0	16
Canned Peas	2	8	1	9
Chocolates	1	4	2	6
Canned Pinapple	2	8	0	8
Honey	.5	2	0	2
Peanut Butter	1	4	0	4
Jam, Strawberry	1	4	0	4
Potatoes	4	16	0	16
Bananas	2	8	0	8
Apples	2	8	0	8

Table 8-22 Nutrients Available to Group 68A from Purchased Foods

Food Item	Weight (Lbs)	Calories	Protein (Grams)	Fat (Grams)
Baking Powder	11	6039	5	0
Lard	70	286370	0	31752
Evaporated Milk	180	262080	6606	7110
Rolled Oats	48	84912	3091	1613
Rice	11	18117	334	20
Sugar	175	305550	0	0
Flour	275	454025	13090	1237
Total		1417093	23127	41732

Table 8-23 Nutrients Available to Group 68B from Purchased Foods

Food Items	Weight (Lbs)	Calories	Protein (Grams)	Fat (Grams)
Lard	40	163640	0	18144
Evaporated Milk	30	43680	1101	1185
Rolled Oats	20	35380	1288	672
Sugar	120	209520	0	0
Flour	225	371475	10710	1012
Total		823695	13099	21013

Table 8-24 Nutrients Available to Group 68C from Purchased Foods

Food Item	Weight (Lbs)	Calories	Protein (Grams)	Fat (Grams)
Baking Powder	12	6588	6	0
Hamburger	18	21888	1462	1732
Bread, White	20	24500	790	290
Cheese Spread	14	18284	1016	1359
Chicken Necks	16	5264	539	328
Cookies	14	30478	323	1282
Crackers, Saltine	10	19640	408	544
Eggs (Dozen)	18	11844	938	835
Lard	54	220914	0	24494
Macaroni	22	36828	1247	119
Evaporated Milk	118	171808	4331	4661
Milk, Powdered	21	39060	1401	790
Rolled Oats	83	146827	5345	2789
Pancake Mix	12	19380	468	98
Bacon	10	28620	322	3021
Pork, Chops	16	17040	978	1424
Potatoes	16	4464	123	6
Rice	16	26352	486	29
Sausage, Bologna	10	13790	549	1247
Hot Dogs	13	18226	737	1628

(CONTINUED)

Table 8-24 Nutrients Available to Group 68C from Purchased Foods (Continued)

Food Item	Weight (Lbs)	Calories	Protein (Grams)	Fat (Grams)
Sugar	116	202536	0	0
Flour	365	602615	17374	1643
Total		1686946	38844	48319

Table 8-25 Nutrients Available to Group 68J from Purchased Foods

Food Item	Weight (Lbs)	Calories	Protein (Grams)	Fat (Grams)
Baking Powder	11	6039	5	0
Lard	130	531830	0	58968
Macaroni	24	40176	1361	130
Evaporated Milk	360	524160	13212	14220
Rolled Oats	25	44225	1610	840
Rice	26	42822	790	47
Sugar	240	419040	0	0
Flour	350	577850	16660	1575
Total		2186142	33639	75779

Table 8-26 Nutrients Available to Group 68P from Purchased Foods

Food Items	Weight (Lbs)	Calories	Protein (Grams)	Fat (Grams)
Lard	30	122730	0	13608
Evaporated Milk	30	43680	1101	1185
Rolled Oats	25	44225	1610	840
Sugar	50	87300	0	0
Flour	100	165100	4760	450
Total		463035	7471	16083

Table 8-27 Basic Nutrients Available from Purchased Foods to Hunting Group Sample

Group	Calories Available from Purchased Foods	Protein Available from Purchased Foods (Grams)	Fat Available from Purchased Foods (Grams)
68A	1,417,093	23,127	41,732
68B	823,695	13,099	21,013
68C	1,686,946	38,844	48,319
68J	2,186,142	33,639	75,779
68P	463,035	7,471	16,083
All	6,576,911	116,180	202,926

Table 8-28 Comparison of the Contribution of Bush Foods and Purchased Foods to All Food Calories, Protein and Fat Available to Hunting Group Sample During Winter Hunting Season

Nutrient	Percentage of Total Available from Bush Foods	Percentage of Total Available from Purchased Foods
Calories	78	22
Protein	93	7
Fat	90	10

items such as salt, baking powder, flour and lard, that are purchased infrequently, and in quantities that last a long time. A small quantity of items not included on the purchase lists were probably used from caches stored in the bush, but all informants claimed that this was not a significant amount. The assumption that all purchased foods were eaten by humans is also clearly incorrect, because rolled oats at least are often used as a dog food. I did not however inquire what percentage of the rolled oats may have been used in this manner. No correction is made for this fact because rolled oats always account for less than ten percent of total calories available from purchased food, and separate adjustment for the energy requirements of the dogs will be made below. Because lists of food purchases do not include the foods purchased during approximately six to fifteen percent of the total period, when people were on visits to the towns, I believe the assumption that all purchased foods were consumed is a reasonable estimator of the total consumption of purchased foods.

When the caloric values of the purchased foods are added to the caloric values of the bush foods produced, and the total food calories available is compared to the human maximal caloric requirements for all hunting groups in the sample, it will be seen that the total calories available exceed the maximal human caloric requirement, often by a substantial amount (Table 8-29). The potential excess of calories over human requirements is half or more of the total caloric content of the bush foods produced, in all cases but group 68C, where the excess is smaller. But this over-estimates the excess because the caloric needs of dogs have not been considered.

Dogs are regularly fed on animal viscera and on fish. In the fall, according to the Waswanipi, when establishing camp, fish nets are set and much of fish caught, nearly all in some groups, are eviscerated and hung on racks to dry. These are fed to the dogs during the hunting season. This supply is usually large enough to last until after the Christmas-New Year's holiday and during January or early February it is exhausted. After this people must either set nets again or give the dogs other products of the hunt. Throughout the year dogs are fed viscera of the animals killed and other leftovers. A common practice is to have a slop pail into which these morsels are put, along with

Table 8-29 Total Food Calories Available and Required and Potential Excess of Calories from Food Produced Over Caloric Requirements of Humans in Hunting Group Sample

Group	Purchased Food Total Calories Available	Bush Food Total Calories Available	Total Food Calories Available	Maximal Human Caloric Requirements	Potential Excess Calories
		Assuming Maximal Caloric Requirements			
68A	1,417,093	8,792,871	10,209,964	3,471,689	6,738,275
68B	823,695	4,030,572	4,854,267	2,841,888	2,012,379
68C	1,686,946	2,599,504	4,286,450	3,762,931	523,519
68J	2,186,142	3,420,194	5,606,336	3,672,546	1,933,790
68P	463,035	4,605,632	5,068,667	2,091,180	2,977,487
All	6,576,911	23,448,773	30,025,684	15,840,234	14,185,450
		Assuming Minimal Caloric Requirements			
	Purchased Food Total Calories Available	Bush Food Total Calories Available	Total Food Calories Available	Minimal Human Caloric Requirements	Potential Excess Calories
68A	1,417,093	8,792,871	10,209,964	2,961,466	7,248,498
68B	823,695	4,030,572	4,854,267	2,337,205	2,517,062
68C	1,686,946	2,599,504	4,286,450	3,220,670	1,065,780
68J	2,186,142	3,420,194	5,606,336	3,154,629	2,451,707
68P	463,035	4,605,632	5,068,667	1,704,144	3,364,523
All	6,576,911	23,448,773	30,025,684	13,378,114	16,647,570

excess broths, etc. Carcasses of small fur-bearers often end up here. This is heated on the fire every few days, often supplemented with rolled oats, and given to the dogs. This practice continues through the year.

Several families, 68B among them, reported that after Christmas the dogs "ate what we did". They gave the dogs liver, blood, meat and fat from the moose and beaver and some tails and belly skin of beaver. Other families report that the dogs eat just fish and things the people will not eat. Group 68C reported that dogs ate mostly fish, plus viscera and leftovers. The dogs then appear to be consumers who can be supplied essentially independent of the production for human consumption, fed from fish, viscera, small fur-bearing mammal carcasses and rolled oats. On the other hand, when ample food is available, the dogs can become co-consumers with man of the edible products of the hunt, fed off of the surplus of humanly consumable food, and not requiring separate subsistence supporting activities. The dogs are also independent hunters catching some of their own food, although to a quite limited degree. In short the allocation of calories which are potentially available for human consumption to the dogs appears to be variable and adjustable to the extent of the excess foods above other requirements.

In orderto estimate how much of food suitable for human consumption was fed to the dogs I have estimated the viscera and fish available for the dogs and reduced total canine energy requirements by this amount.

The food available specifically for dogs includes both those viscera of the animals hunted which are inedible by human beings, and also the fish caught specifically for dogs. The caloric value of the inedible viscera are tabulated on Table 8-30. No direct estimate was available of fish for consumption by dogs. It will be recalled that suckers are not highly valued nor are they frequently eaten by human beings. Most suckers caught are in fact fed to the dogs. In a recent study of Waswanipi fish harvests, suckers were found to comprise 32 percent of the total number of fish caught in winter (JBNQNHRC, 1976a). Since only fish caught for human food were listed in the diary food records, I would estimate that at least half as much fish as was reported were suckers, which were not recorded in the diaries but which were kept and fed to the dogs. I have therefore used one half the caloric value of fish caught for human consumption as a minimum estimate of fish specifically given to dogs for consumption (Table 8-30). This is a minimum estimate because varying amounts of other fish in addition to suckers were presumably processed as dog food also, but I cannot estimate these amounts.

The total estimated caloric needs of the dogs, minus the total estimated caloric value of the viscera plus fish available for dogs leaves a balance of caloric requirements of dogs that presumably were met from the food produced that was edible by humans (Table 8-31). It should be emphasized that because other fish may have been caught and processed immediately as food for dogs, this estimate of human foods that were required by the dogs should be treated as a maximum estimate. This balance of canine requirements would have been met in part, although not entirely, by rolled oats and carcasses of the small fur-bearers.

If the caloric requirements of the dogs over and above those providable from foods not for human consumption are deducted from the potential excess of calories available from the food produced, this gives an estimate of the actual excess of calories from the animals harvested over and above the estimated immediate needs of the humans and dogs present in the hunting groups (Table 8-32).

The extent of this estimated excess is, in some cases, quite significant. The estimated excess, assuming maximal caloric requirements ranges from a small surplus of six percent of total production, for group 68C, to a surplus that amounts to 71 percent of production for group 68A (Table 8-33). In the latter case the humans in the hunting group and their dogs appear to have required less than one-third of the total calories estimated to be available in the food produced from the animals the group members killed. Considering the other groups, 68B is estimated to have had a surplus of at least one-third of the total calories, the other two, 68J and 68P, a surplus of over one-half of the total calories produced. Three of the five groups produced more than twice as many food calories as the estimated caloric requirements. If the surplus is considered to be over and above minimal caloric requirements, then a fourth group produced nearly

Table 8-30 Caloric Value of Inedible Viscera and Fish Estimated to be Available to Hunting Group Sample to Feed Dogs

Species and Component	Calories Available				
	Group 68A	Group 68B	Group 68C	Group 68J	Group 68P
Moose, Viscera	259,052	143,918	57,567	57,567	86,351
Beaver, Viscera	196,937	78,096	43,009	76,964	123,369
Fish, Viscera	23,535	7,409	108,960	106,781	0
Hare, Viscera	9,559	579	9,269	14,483	33,310
Beaver, Viscera	20,475	0	0	0	0
Small Fur-bearers, Viscera	15,585	11,986	6,542	18,180	18,178
Lynx, Viscera	0	0	0	1,698	0
Grouses, Viscera	2,052	563	2,706	1,253	4,449
Geese, Viscera	145	508	0	0	581
Loon, Viscera	36	182	0	0	0
Ducks, Viscera	2,951	3,541	0	590	12,099
Total Viscera	530,327	246,782	288,053	277,516	278,337
Fish[1]	64,251	20,228	297,461	291,511	0
Total	594,578	267,010	585,514	569,027	278,337

Footnote:

1. Estimated as one-half of fish food for human consumption, see text.

Table 8-31 Estimated Caloric Requirements of Dogs and Caloric Values of Viscera and Fish Processed for Dogs, Hunting Group Sample

Group	Estimated Caloric Requirements of Dogs	Estimated Caloric Value of Viscera and Fish Available for Dogs	Balance of Caloric Needs of Dogs
68A	1,071,200	594,578	476,622
68B	918,000	267,010	650,990
68C	940,400	585,514	354,886
68J	450,000	569,027	0
68P	817,200	278,337	538,863

Table 8-32 Estimated Excess of Calories from Food Produced Over Caloric Requirements of Humans and Dogs in Hunting Group Sample

Assuming Maximal Caloric Requirements			
Group	Potential Excess Calories	Balance of Caloric Needs of Dogs	Estimated Excess Calories
68A	6,738,275	476,622	6,261,653
68B	2,012,379	650,990	1,361,389
68C	523,519	354,886	168,633
68J	1,933,790	0	1,933,790
68P	2,977,487	538,863	2,438,624
Total	14,185,450	2,021,361	12,164,089

Assuming Minimal Caloric Requirements			
Group	Potential Excess Calories	Balance of Caloric Needs of Dogs	Estimated Excess Calories
68A	7,248,498	476,622	6,771,876
68B	2,517,062	650,990	1,866,072
68C	1,065,780	354,886	710,894
68J	2,451,707	0	2,451,707
68P	3,364,523	538,863	2,825,660
Total	16,647,570	2,021,361	14,626,209

Table 8-33 Percentage of Total Bush Food Calories Produced that are Estimated to be Excess to the Caloric Requirements of Humans and Dogs in the Hunting Group Sample

Group	Percentage of Bush Food Calories that are Estimated to be Excess to Maximal Caloric Requirements
68A	71
68B	34
68C	6
68J	57
68P	53
All	52

Group	Percentage of Bush Food Calories that are Estimated to be Excess to Minimal Caloric Requirements
68A	77
68B	46
68C	27
68J	72
68P	61
All	62

twice as much as it required, and the fifth produced a 25 percent surplus. There is then an overall surplus of fifty to sixty percent of the caloric productive output of available bush food over and above the immediate caloric requirements of the groups.

It is also the case that all groups met the caloric requirements of their members and their dogs. However, one group, 68C, produced only six percent more available calories than it required, and in effect just met those requirements. Furthermore, as noted above, members of this hunting group purchased particularly large quantities of store-bought foods, and without these the group would have had a deficit of production in relation to requirements. The data for group 68C therefore suggest that the minimum level of productive output is related to meeting the immediate caloric requirements of humans and dogs, and that this is the limiting case. But it appears, in this sample, to be an uncommon case.

This limiting case raises the question of whether some surplus would not be sought to provide a margin of security for meeting the needs of the immediate future. Such a surplus would provide a margin of security against unexpected declines in future production capability. I would argue that in the present case the majority of the surpluses recorded would appear to go beyond such an explanation. While a surplus of 6 percent is probably best considered as no surplus at all, a surplus in the order of 25 to 33 percent would aid security should injury or inclement weather or other disruption of productive activity occur. But, the incremental increase from having a thirty percent margin above immediate needs to 100 percent and more over-production would appear to have marginal impact on security. This can be seen by considering the weekly relationship of food harvests to caloric requirements cumulatively. I have calculated the weekly cumulative maximal human caloric requirements for the members in hunting groups 68A and 68B and the weekly cumulative calories available from bush foods and from bush foods plus purchased foods. The calculations have been made only for groups 68A and 68B, because the adjustments made to purchased foods for group 68C prevent a comparable calculation, because the data available for group 68J do not always permit identification of the week in which each animal was killed, and because the fall season harvests and food purchases are not known for group 68P. For groups 68A and 68B I have assumed that purchased foods were used entirely within the period prior to the next purchase of food supplies, and that the purchased foods were consumed at an even rate within each of these periods. In the case of group 68A the major purchase of food was made in the fall and only supplementary purchases were made thereafter in December and March. Thus, although sixty percent of the purchased food was taken into the bush in the fall, I have added one twenty-ninth of the total purchased food to weekly cumulative total calories each week. Group 68B made two major purchases, one in the fall and one in January, and a supplementary purchase in March. In this case the fall purchase has been divided equally among the first eight weeks, and the January and March purchases have been pooled and distributed evenly over the remaining weeks of the year. While it might be argued that in fact not all the food need have been used this quickly, notes in the diaries and interview comments indicate that purchased foods tend to be consumed somewhat more quickly than at an even rate and some purchased foods often run out sometime before the next planned visit to town for purchases. The weekly distribution here may therefore be conservative with respect to the earliest weeks in the sequence.

When the weekly calories available from bush foods and all foods are compared with human caloric requirements (Table 8-34), the weekly cumulative caloric production from animals harvested by group 68B during the first twelve weeks of the hunting year was below the maximal human caloric requirements. Nevertheless, the total calories available from bush foods plus purchased foods were always somewhat greater than caloric requirements.

I have not considered the energy requirements of the dogs in this calculation, because it is during the fall and early winter that the caloric requirements of the dogs are met primarily from fish usually harvested just before and after freeze-up and stored for use as dog food.

In the thirteenth week five moose were caught by members of group 68B which

Table 8-34 Weekly Cumulative Calories Available and Maximal Calories Required for Hunting Group 68B

Week	Calories Available from All Bush Foods (Cumulative)	Total Calories Available from All Foods (Cumulative)	Maximal Calories Required for Human Subsistence (Cumulative)
1	57,783	109,494	89,768
2	204,026	307,448	179,536
3	209,551	364,684	269,304
4	210,399	417,243	359,072
5	323,975	582,530	448,840
6	409,110	719,376	538,608
7	413,254	775,231	628,376
8	496,725	910,413	718,144
9	552,372	985,584	807,912
10	580,196	1,032,932	897,680
11	616,927	1,089,187	987,448
12	747,820	1,239,604	1,077,216
13	2,753,077	3,264,385	1,166,984
14	2,753,077	3,283,909	1,265,968
15	2,864,925	3,415,281	1,387,992
16	3,087,524	3,657,404	1,510,016
17	3,145,307	3,734,711	1,632,040
18	3,451,387	4,060,315	1,754,064
19	3,451,387	4,079,839	1,876,088
20	3,534,858	4,182,834	1,998,112
21	3,534,858	4,202,358	2,110,920
22	3,562,682	4,249,706	2,200,688
23	3,646,153	4,352,701	2,290,456
24	3,701,800	4,427,872	2,380,224
25	3,733,705	4,479,301	2,469,992
26	3,781,567	4,546,687	2,559,760
27	3,825,268	4,609,912	2,649,528
28	3,919,298	4,723,466	2,739,296
29	4,036,315	4,860,007	2,829,064

provided a considerable surplus of calories available from bush foods over maximal human caloric requirements for the rest of the year. By the fifteenth week the cumulative caloric production from animals killed was more than the maximal human caloric requirements for the whole 29-week winter hunting season.[7] During the remaining fourteen weeks the members of group 68B produced an additional 1,171,390 Calories from bush foods or about thirty percent of the total for the period. Seasonal variations in the availability of game and the methods of harvesting make simple comparative interpretations difficult, but it is clear that bush food production was continued at an active rate well after any foreseeable security needs were met.

Finally it should be recalled that this calculation makes the fall period look somewhat more precarious than it was, because about one-half of the annual purchased foods were taken with the group when it left for the bush camp. It therefore had a supply in camp of 413,000 Calories at the beginning of the record, and this was supplemented by the addition of approximately 400,000 Calories in the ninth week.

In group 68A there was a similar pattern, with five moose caught in the fourteenth week, which put caloric production of bush foods just in excess of maximal human caloric requirements for the full 29-week hunting season (Table 8-35). This group, however, went to produce fully as many bush food calories during the latter half of the season as had during the former half. This group, which had an exceptional harvest, also took purchased foods which contained nearly 1,000,000 Calories with them in the fall.

Groups 68J and 68P would probably have patterns not very different from that for groups 68A and 68B. Group 68C however was clearly in a different situation. Assuming maximal caloric requirements its estimated surplus production was only six percent, assuming minimal caloric requirements, 27 percent. A reasonably close fit between production and requirements existed for this group, although I will return to consider this relationship below.

Among the hunting group sample, then, the excess of production of bush food

Table 8-35 Weekly Cumulative Calories Available and Maximal Calories Required for Hunting Group 68A

Week	Calories Available from All Bush Foods (Cumulative)	Total Calories Available from All Foods (Cumulative)	Maximal Calories Required for Human Subsistence (Cumulative)
1	162,870	211,735	100,275
2	274,430	372,160	200,550
3	446,288	592,883	300,825
4	702,093	897,553	401,100
5	848,057	1,092,382	501,375
6	1,102,310	1,395,500	601,650
7	1,226,114	1,568,169	701,925
8	1,226,114	1,617,034	802,200
9	1,320,865	1,760,650	912,010
10	1,438,773	1,927,423	1,025,634
11	1,601,818	2,139,333	1,139,258
12	1,798,535	2,384,915	1,252,882
13	1,827,364	2,462,609	1,366,506
14	3,946,029	4,630,139	1,480,130
15	4,187,722	4,920,697	1,593,754
16	5,528,063	6,309,903	1,707,378
17	5,646,175	6,476,880	1,821,002
18	6,277,428	7,156,998	1,934,626
19	6,339,780	7,268,215	2,048,250
20	6,456,065	7,433,365	2,161,874
21	6,483,889	7,512,734	2,275,498
22	6,846,569	7,561,599	2,407,554
23	6,542,216	7,666,111	2,553,434
24	6,692,854	7,865,614	2,699,314
25	6,861,791	8,083,416	2,845,194
26	7,200,347	8,470,837	2,991,074
27	7,519,972	8,839,327	3,136,954
28	7,867,139	9,235,359	3,282,834
29	8,152,906	9,569,991	3,428,714

over human and canine energy requirements, cannot be explained by any security such excess might provide, because the excess is found among precisely those groups with the most secure production, and at times when subsistence would seem to be most secure from problems should unanticipated breakdowns in production occur.

ii) Other Nutritional Needs and Bush Food Production

Before considering the allocations made with bush food which is in excess of immediate needs, I want to consider one other possibility, namely that the focus should not be solely on caloric production and requirements, but also on the relation of production to the need for other nutrients known to be necessary for human health. It has been said that ecological analysis has been too focussed on caloric considerations, to the exclusion of other nutritional needs.

The Government of Canada, Department of Health and Welfare, recognizes standards of human daily nutritional intakes for energy, protein, ten vitamins, and six minerals in the Dietary Standard for Canada (Canada, 1975: Table 13). The World Health Organization recognizes standards of human daily nutritional intakes for energy, protein, eight vitamins, and two minerals (Passmore, Nicol and Rao, 1974). The human diet is clearly not simply a means of meeting energy needs, it also must supply the body with a wide range of other micro-nutrients for good health and proper functioning.

An assessment of the adequacy of food productive output should consider the adequacy of the production of other nutrients in addition to energy, including proteins, vitamins and minerals. However, these comparisons are limited by the range of data available on the nutrient composition of bush foods. From the data presented in Appendix 8-2 it will be seen that extensive data are available for the protein composition of foods from sub-arctic animals, and for five vitamins (A, thiamin, riboflavin, niacin, and C) and three minerals (calcium, phosphorus and iron). These are the nutrients which will be considered here. I will briefly give an assessment of protein first and then consider the other nutrients.

a. Assessment of Bush Foods in Relation to Recommended Intakes of Protein

Protein is the major component of body tissue, second to water. Proteins are essential to growth, providing the amino acids basic for the synthesis of new tissue needed for the continuous replacement and repair of tissue. In addition proteins supply raw materials needed for the formation of many other materials in the body. There are over twenty amino acids that are components of proteins, only some of which the body is capable of synthesizing. Those the body cannot synthesize are called essential amino acids. Proteins can be derived from animal or vegetable foods, but animal proteins contain more of the essential amino acids than vegetable proteins, most of which lack one or more of the essential amino acids. In general the presence of some animal proteins helps to provide the essential amino acids in amounts that often facilitate the use of biologically incomplete vegetable proteins (Passmore, Nicol and Rao, 1974). The source of the proteins in the diet must therefore be considered when estimating required levels of intake.

The Canadian standard assumes two-thirds of protein come from animal sources and one-third from vegetable sources (Canada, 1975:19). When establishing the recommended protein intake level, the safe level adopted is the amount necessary to meet physiological needs and maintain the health of virtually all individuals in a population. The recommended level is therefore higher than estimates of protein requirements of the average individual. The recommended levels assume that energy requirements are being met from fat and carbohydrate intakes and the recommended level of protein is the quantity necessary over and above any protein used to meet energy requirements. There is no increase in protein requirements, as such, as a result of intense physical activity (Passmore, Nicol and Rao, 1974).

Diets that are deficient in protein lead to poor growth, decreased resistance to infection and ultimately death. Protein deficiency is uaually associated with deficiencies in other nutrients, particularly energy (Canada, 1974:41).

In a situation such as that described for Waswanipi food production, where meat is a major proportion of the available food, and where available energy is well above caloric requirements, it is unlikely that the protein available would be less than the recommended intake levels. The Dietary Standard for Canada recommended daily intake of protein is listed on Table 8-36, and from these the total recommended protein intakes for members of each hunting group have been calculated (Table 8-37). A comparison of the recommended protein intakes with protein available from bush foods produced indicates a production from five to ten times total recommended intakes (Table 8-38). Similar calculations and examinations can be made for other nutrients.

b. Estimates of Selected Vitamin and Mineral Intake Recommendations

Vitamin A has important roles in vision, maintaining epithelial tissues, bone growth and reproduction. Deficiencies can lead to blindness. Vitamin A is found only in foods derived from animals, in blood, eggs and milk, and in significant quantities in organs, especially liver and kidneys, including fish livers. Meat and carcass fat contain little of nutritional value (Passmore, Nicol and Rao, 1974:20). Vitamin A can be manufactured in the body from carotene pigments of plant origin, but these are only absorbed partially by the intestine, and it takes about six units of carotene in the diet to equal one unit of the vitamin from an animal source (Passmore, Nicol and Rao, 1974:27). Excess Vitamin A is stored in the liver so the body can easily accommodate short term inadequate intakes. In order to maintain liver reserves the Dietary Standard for Canada recommends an intake approximately double the minimum requirement (Canada, 1975:42). Some evidence of a possible deficiency of Vitamin A was found in the nutritional study of James Bay Indians at Rupert House and Attawapiskat in the late 1940's (Vivian, McMillan, Moore, et al., 1948:517) and in Indian and Metis children in the Pine House region of Saskatchewan in 1950's (Best and Gerrard, 1959; and, Best, Gerrard, Irwin, et al., 1961). The recommended daily intake of Vitamin A is listed on Table 8-39 along with the recommendations for the other nutrients which are discussed below.

Thiamin is vital for carbohydrate metabolism, and thiamin deficiencies can cause beriberi. Thiamin is found in all natural food and especially in wheat germ, plant seeds and animal organ meats. Lean meat, fish, poultry, and cereals are

Table 8-36 Recommended Daily Intake of Protein[1]

Age and Sex		Protein (gm.)
0-6 mo.		12
7-11 mo.		13
1-3 yrs		22
4-6 yrs		27
7-9 yrs	M	33
	F	33
10-12 yrs	M	41
	F	40
13-15 yrs	M	52
	F	43
16-18 yrs	M	54
	F	43
19-35 yrs	M	56
	F	41
36-50 yrs	M	56
	F	41
51 + yrs	M	56
	F	41

Footnote:

1. Source: Dietary Standard for Canada (Canada, 1975:Table 13).

Table 8-37 Recommended Protein Intake for Members of Hunting Group Sample

No.	Recommended Total Protein Intake (gm.)
Group 68A	
970	11,536
971	8,446
972	4,532
580	11,536
973	5,945
550	2,968
Group Total	44,963
Group 68B	
520	11,424
521	8,364
610	11,424
550	2,744
Group Total	33,956
Group 68C	
530	9,912
531	7,257
532	7,257
533	2,296
620	4,480
540	8,120
590	6,272
Group Total	45,594

(CONTINUED)

Table 8-37 Recommended Protein Intake for Members of Hunting Group Sample (Continued)

No.	Recommended Total Protein Intake (gm.)
Group 68J	
810	2,744
811	2,009
812	1,323
813	1,078
890	2,744
820	2,646
814	2,107
870	8,456
871	6,191
872	3,322
873	3,322
874	3,322
300	2,744
301	2,009
302	1,323
303	1,078
304	1,078
Group Total	47,496
Group 68P	
930	8,736
931	6,396
990	8,736
Group Total	23,868

Table 8-38 Recommended Protein Intake and Protein Available from Bush Foods and Purchased Foods

Group	Total of Recommended Protein Intakes (gm.)	Protein Available from Bush Foods (gm.)	Protein Available from Purchased Foods (gm.)	Total Protein Available (gm.)
68A	44,963	564,852	23,127	587,979
68B	33,956	265,952	13,099	279,051
68C	45,594	228,201	38,844	267,045
68J	47,496	265,099	33,639	298,738
68P	23,868	304,320	7,471	311,791
All	195,877	1,628,424	116,180	1,744,604

Table 8-39 Recommended Daily Intake of Selected Vitamins and Minerals[1]

Age and Sex		Iron (mg.)	Calcium and Phosphorus (mg. each)	Vit. A[2] (RE)	Thiamin[3] (mg./1000 Cal.)	Niacin[4] (mg/1000 Cal.)	Riboflavin[5] (mg/1000 Cal.)	Vitamin C[6] (mg.)
0-6 mo.		7	500[7]	400	0.5	6.6	0.6	20
7-11 mo.		7	500[7]	400	0.5	6.6	0.6	20
1-3 yrs		8	500	400	0.5	6.6	0.6	20
4-6 yrs		9	500	500	0.5	6.6	0.6	20
7-9 yrs	M	10	700	700	0.5	6.6	0.6	30
	F	10	700	700	0.5	6.6	0.6	30
10-12 yrs	M	11	900	800	0.5	6.6	0.6	30
	F	11	1000	800	0.5	6.6	0.6	30
13-15 yrs	M	13	1200	1000	0.5	6.6	0.6	30
	F	14	800	800	0.5	6.6	0.6	30
16-18 yrs	M	14	1000	1000	0.5	6.6	0.6	30
	F	14	700	800	0.5	6.6	0.6	30
19-35 yrs	M	10	800	1000	0.5	6.6	0.6	30
	F	14	700	800	0.5	6.6	0.6	30
36-50 yrs	M	10	800	1000	0.5	6.6	0.6	30
	F	14	700	800	0.5	6.6	0.6	30
51 + yrs	M	10	800	1000	0.5	6.6	0.6	30
	F	9	700	800	0.5	6.6	0.6	30

(CONTINUED)

Table 8-39 Recommended Daily Intake of Selected Vitamins and Minerals[1] (Continued)

Footnotes:

1. Source: Dietary Standard for Canada (Canada, 1975:Table 13).
2. Minimum for adults is 500 to 600 RE (Canada, 1975:42).
3. Minimum is 0.3 mg/1000 Cal. (Canada, 1975:24).
4. Minimum is 4.4 mg/1000 Cal. but not less than 13/day.
5. "Marginal intake" is 0.32 mg/1000/1000 Cal. but not less than 1.2 mg/day (Canada, 1975:28).
6. Minimum is 10 mg/day (Canada, 1975:36).
7. The values here are for calcium For phosphorus the values are 250 and 400 mg. respectively. Because of the small number of children under one year of age in the sample, the calcium values are used for phosphorus.

especially important sources in North America, and liver is a good source (Canada, 1974:51 and 53). The human body does not store thiamin. Because thiamin is easily destroyed by heat the amounts of thiamin in raw foods may not reasonably approximate the quantities available in the cooked, edible portions. It is therefore especially difficult to compare thiamin available in raw food production with the actual human needs for this vitamin, and to draw conclusions about the adequacy of the supposed actual intake. Thiamin needs are related to the level of carbohydrates used, because of the role of thiamin in carbohydrate utilization (Passmore, Nicol and Rao, 1974:33-39). The Dietary Standard for Canada recommended intake is based on Canadian diets which have about 49 percent of calories from carbohydrates, and 41 percent from fat and 11 percent from protein. The Waswanipi diet might have a lower percentage of calories from carbohydrates, so the recommended levels may provide an additional degree of security when applied to the Waswanipi.

Niacin is vital for numerous metabolic processes, and niacin deficiency can cause pellagra. The human body can produce niacin, but not very efficiently and the main sources are meats, and especially livers (Canada, 1974:53). Because niacin has a role in the liberation of chemical energy from carbohydrate, fat and protein, the recommended levels are related to energy intakes, as are those of thiamin and riboflavin.

Riboflavin is important in the oxidative mechanisms in the cells of all body tissues. It is found in most foods, the richest sources of riboflavin being organ meats, but meat, fish and dairy products also contain significant amounts (Canada, 1974:52). No fatal or severe disease in human has been associated with riboflavin deficiency. Riboflavin is less susceptible to break down by heat than is thiamin but can be destroyed by exposure to light. Riboflavin requirements increase not only with increases in energy intakes, but also with increases in protein intake. The levels recommended in the Dietary Standard for Canada assume the input of only 11 percent of calories comes from protein, as indicated above (Canada, 1975:27). The recommended levels might therefore be somewhat low for the presumed Waswanipi diet. Some possible signs of riboflavin deficiency were found during the nutritional study at Rupert House, but the evidence was inconclusive (Vivian, McMillan, Moore, et al., 1948:516-517).

Vitamin C is important factor in cell function, and is important in the regulation of certain metabolic processes. Vitamin C deficiency causes scurvy. The liver can store some Vitamin C, but only enough for a period of about two months, and a rich diet is needed to build up the store (Passmore, Nicol and Rao, 1974:33). The major dietary sources are fruits, vegetables and liver, although it is found in meats and fish in general. Vitamin C is unstable and over-cooking or long periods of contact with the air will reduce the Vitamin C levels of food (Canada, 1974:65). The recommended intakes are roughly three times the minimal requirement, in part because foods vary considerably in ascorbic acid content when fresh, and these levels are further altered by storage, preparation and cooking procedures (Passmore, Nicol and Rao, 1974:35). Clinical signs suggestive of vitamin C deficiency were reported in the nutritional survey of Rupert House (Vivian, McMillan, Moore, et al., 1948:517).

The other major vitamins, including D, E, B6, B12, and folate are not considered in this study because no data are available on the levels of these vitamins in the bush foods. Similarly, only limited values are available on the magnesium, sodium, potassium, iodine, and zinc content of sub-arctic food animals and these are not considered here. Some levels are available, however, for calcium, phosphorus and iron.

Iron is an essential component of hemoglobin and other oxygen-carrying pigments. Iron is stored in liver, kidney, spleen, and other organs. It is an important element in nutrition and iron deficiency causes anemia. The disease causes few deaths but contributes to weakness, ill health, and reduced performance. Iron is widely found in many foods, but the form found in animal foods is more efficiently absorbed by the body than the iron in vegetable foods (Canada, 1975:101). Meat increases the absorption of some forms of iron (Canada, 1975:60). The recommended levels assume that 10 to 25 percent of calories come from foods animal origin (Canada, 1975:60) so they may over estimate Waswanipi needs.

Calcium and phosphorus are major constituents of bones and teeth, and have other important functions as well. Specific symptoms of calcium deficiency in humans are not known and man has the capacity to adapt to varying levels of intakes (Canada, 1975:52). When less calcium is available the rate of absorption is higher (Canada, 1975:53). The rate of absorption of calcium into the body from food also appears to vary widely and with the quantity available. Calcium occurs in all natural human foods, and in significant amounts in dairy products and some fruits, but it also occurs in significant amounts in fish.

Almost all natural foods contain more phosphorus than calcium and phosphorus occurs in many meats and fish which are especially rich sources (Canada, 1974:89; Passmore, Nicol and Rao, 1974:49). Because it occurs so widely in common foods, and because requirements are less than those for calcium, phosphorus is rarely in short supply in a diet.

The total recommended intakes of these vitamins and minerals for the members of each hunting group were calculated on the basis of the age, sex, required caloric intakes, and duration of the stay of each person, as reported earlier in this chapter, and the recommended daily intakes in the Dietary Standard for Canada (Table 8-39). The total recommended intakes for each nutrient for each hunting group are listed in Appendix 8-3, and they will be considered below when assessing food production. Two values were calculated for niacin, riboflavin and thiamin, one assuming the minimal caloric requirements previously calculated, the other assuming the maximal caloric requirements, two values were also calculated for vitamin C, a required and a recommended level because of the large difference between the two.

It should be noted that the recommended daily intakes established in the dietary standard are not required intakes. In all cases, except the energy requirements previously reviewed, the recommended intakes are in excess of known minimal requirements. The recommended intakes are proposed as adequate to maintain health of the majority of people, but intakes below these levels may be compatible with good health. For some of the nutrients there are sufficient data to estimate a minimum requirement, which is the intake which will maintain health, but below which either clinical signs of deficiency or evidence of excessive loss of the nutrient from the body occur. Minimum levels may be adequate to maintain health for a long period of times (Canada, 1964;3-4). Where minimum requirements were provided in the dietary standard they are noted on Table 8-39. A recent Nutrition Canada nation-wide dietary survey has established levels below which intakes are classified as inadequate, defining this as the minimum adequate intake level. Where the dietary standard has not established minimums, I will use and refer to the Nutrition Canada minimums, specifically iron and calcium. The levels below which iron intakes are classified as inadequate are the recommended levels for each age and sex class, less 25 to 40 percent depending on the category (Canada, 1974:22). For calcium the levels below which intakes are classed as inadequate are 20 to 50 percent below recommended adequate levels, but Nutrition Canada notes that there is controversy over the minimum levels of calcium which should be included in the diet (Canada, 1974:89).

c. Estimates of the Quantities of Vitamins and Minerals Available from Bush Foods and Purchased Foods

The vitamins and minerals potentially available from the bush foods produced were calculated on the basis of the nutrient composition values selected in Appendix 8-2. The calculations and treatment were similar to those used to estimate calories, protein and fat produced. Some modifications were made however.

First, no calculations were made for the fat component for either moose or beaver. Examination of the figures indicated that the nutrient composition of fat was relatively low in all the vitamins and minerals considered here, by comparison to the nutrient composition of meat. The only partial exception were the thiamin levels reported in fats, but because no direct measurements were available on the fats of sub-arctic animals, no calculation was made of the nutrient composition from this source.

Second, because the liver was the richest source of many of the vitamins and minerals considered here, and because it was, in general, the only internal organ for which there were some measurements for sub-arctic animals, it was decided to calculate only the nutrient contribution of livers, and not of edible organs in general. This may result in some under-estimation of available nutrients. As it was, the nutrient composition values adopted for moose liver had to be drawn from measurements on moose, caribou and beef livers, and beef values had to be assumed for the nutrient composition of beaver liver. No other liver estimates were adopted, so no edible organ calculations were made for waterfowl.

The values used for the nutrient composition of the bush foods are listed in Appendix 8-2. The vitamins and minerals available from a single specimen of each kind of animal are listed on Table 8-40. The totals available to each hunting group from bush foods are listed in Appendix 8-4.

The vitamins and nutrients available from purchased foods were calculated on the basis of the nutrient composition in Watt and Merrill (1963), and are listed in Appendix 8-5.

d. Vitamin and Mineral Production in Relation to Recommended and Minimum Intakes

For the majority of the vitamins and minerals considered here the quantities available from the bush foods produced are far in excess of the recommended nutritional intakes. Thus, the total of Vitamin A available from bush foods is over fourteen times the total recommended intakes (Table 8-41). The niacin available from bush foods is 217 percent of the total recommended intakes assuming maximal caloric requirements (Table 8-42). The riboflavin available from bush foods is 209 percent of the total recommended intakes assuming maximal caloric requirements (Table 8-43). The Vitamin C available from bush foods is 219 percent of the total recommended intakes of Vitamin C (Table 8-44). The iron available from bush foods is more than seven times the total recommended intakes of iron (Table 8-45). The total phosphorus available from bush foods is over four times the total of recommended intakes (Table 8-46).

Only two cases need special comment, thiamin and calcium. The total thiamin available from bush foods is 93 percent of the total recommended intake, assuming maximal caloric requirements. When the total thiamin available is considered,

Table 8-40 Total of Selected Vitamins and Minerals Procurable from a Single Specimen of Each of the Kinds of Animals

Animals and Components	Portion Weight (kg)	Total Calcium (mg.)	Total Phosphorus (mg.)	Total Iron (mg.)	Vitamin A (RE)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Vitamin C (mg.)
Moose									
- Meat	100.7	12,089	215,498	4,735	93,784	91	181	3,224	4,029
- Liver	4.6	184	12,972	723	1,327,676	11	150	627	1,427
- Total	105.3	12,173	228,470	5,458	1,421,460	102	331	3,851	5,456
Beaver									
- Meat	4.5	698	10,665	321	10,469	2	7	88	93
- Liver	0.3	24	1,056	20	132,499	1	10	41	94
- Total	4.8	722	11,721	341	142,968	3	17	129	187
Fish, Edible	0.9	504	2,169	4	1,944	3	3	23	45
Hare, Edible	0.8	160	2,816	10	-	1	0	102	-
Black Bear, Edible	58.6	-	94,932	4,219	45,708	94	398	1,875	-
Lynx, Edible	3.1	434	8,184	121	-	4	29	149	93
Muskrat, Edible	0.5	125	1,100	43	4,235	1	3	31	25
Mink, Edible	0.4	100	880	34	3,388	0	3	25	20
Squirrel, Edible	0.1	25	220	9	847	0	1	6	5
Marten, Edible	0.5	125	1,100	43	4,235	1	3	31	25
Otter, Edible	3.8	950	8,360	327	32,186	4	25	236	190

CONTINUED

Table 8-40 Total of Selected Vitamins and Minerals Procurable from a Single Specimen of Each of the Kinds of Animals (Continued)

Animals and Components	Portion Weight (kg)	Total Calcium (mg.)	Total Phosphorus (mg.)	Total Iron (mg.)	Vitamin A (RE)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Vitamin C (mg.)
Weasel, Edible	0.1	25	220	9	847	0	1	6	5
Grouse									
- Meat	0.4	160	1,060	60	80	0	0	31	8
Geese									
- Meat	1.6	288	4,992	90	-	4	7	149	80
Loon									
- Meat	0.8	144	2,496	45	-	2	4	74	40
Duck									
- Meat	0.4	40	704	6	-	0	0	27	-

Table 8-41 Recommended Vitamin Intake and Vitamin A Available from Bush Foods and Purchased Foods

Group	Total of Recommended Vitamin A Intake (RE)	Vitamin A Available from Bush Foods (RE)	Vitamin A Available from Purchased Foods (RE)	Total Vitamin A Available (RE)
68A	828,200	20,572,239	88,108	20,660,347
68B	620,200	10,399,903	14,685	10,414,588
68C	838,200	5,647,909	135,001	5,782,910
68J	874,400	7,160,131	176,216	7,336,347
68P	436,800	9,355,072	14,685	9,369,757
All	3,597,800	53,135,254	428,695	53,563,949

Table 8-42 Recommended Niacin Intake and Niacin Available from Bush Foods and Purchased Foods

Group	Total of Recommended Niacin Intake (mg.) Miminal	Maximal	Niacin Available from Bush Foods (mg.)	Niacin Available from Purchased Foods (mg.)	Total Niacin Available (mg.)
68A	19,546	22,913	71,515	4,925	76,440
68B	15,425	18,756	33,972	3,694	37,660
68C	21,256	24,835	33,646	8,779	42,425
68J	20,821	24,239	38,563	7,068	45,631
68P	11,247	13,802	49,585	1,590	51,175
All	88,295	104,545	227,281	26,056	253,337

Table 8-43 Recommended Riboflavin Intake and Riboflavin Available from Bush Foods and Purchased Foods

Group	Total of Recommended Riboflavin Intake (mg.)		Riboflavin Available from Bush Foods (mg.)	Riboflavin Available from Purchased Foods (mg.)	Total Riboflavin Available (mg.)
	Minimal	Maximal			
68A	1,777	2,083	6,904	665	7,569
68B	1,402	1,705	3,182	330	3,512
68C	1,932	2,258	2,879	935	3,814
68J	1,893	2,203	3,523	1,088	4,611
68P	1,022	1,255	3,392	188	3,510
All	8,026	9,504	19,880	3,136	23,016

Table 8-44 Recommended Vitamin C Intake and Vitamin C Available from Bush Foods and Purchased Foods

Group	Total of Recommended Vitamin C Intake (mg.)		Vitamin C Available from Bush Foods (mg.)	Vitamin C Available from Purchased Foods (mg.)	Total Vitamin C Available (mg.)
	Required	Recommended			
68A	10,220	28,600	89,774	900	90,674
68B	6,610	19,830	44,301	150	44,451
68C	9,090	27,270	43,637	1,758	45,395
68J	13,430	33,310	49,698	1,800	51,498
68P	4,680	14,040	41,625	150	41,775
All	44,030	123,050	269,035	4,758	273,793

Table 8-45 Recommended Iron Intake and Iron Available from Bush Foods and Purchased Foods

Group	Total of Recommended Iron Intake (mg.)	Iron Available from Bush Foods (mg.)	Iron Available from Purchased Foods (mg.)	Total Iron Available (mg.)
68A	10,487	123,828	4,932	128,760
68B	6,406	56,374	3,453	59,827
68C	9,621	36,423	8,741	45,164
68J	13,369	44,670	6,090	50,760
68P	5,304	74,290	1,870	76,160
All	45,187	335,585	25,086	360,671

Table 8-46 Recommended Phosphorus Intake and Phosphorus Available from Bush Foods and Purchased Foods

Group	Total of Recommended Phosphorus Intake (mg.)	Phosphorus Available from Bush Foods (mg.)	Phosphorus Available from Purchased Foods (mg.)	Total Phosphorus Available (mg.)
68A	720,700	4,743,116	840,528	5,583,644
68B	508,400	2,185,489	153,635	2,339,124
68C	691,800	2,270,970	1,155,287	3,426,257
68J	845,000	2,636,890	1,020,052	3,656,942
68P	358,800	2,717,608	113,445	2,831,053
All	3,124,700	14,554,073	3,282,947	17,837,020

that from bush foods and that from purchased foods combined, then the available thiamin is 142 percent of the total recommended intakes (Table 8-47). On a hunting group by hunting group basis the total available thiamin was just sufficient in two cases, groups 68B and 68P. It should be noted however that the recommended level of thiamin includes a safety margin of some 40 percent above minimal requirements. Production in all hunting groups would therefore appear to be well above required levels, although a caveat must be attached noting that thiamin in fresh foods is higher than thiamin levels in cooked foods.

Only in the case of calcium is there no consistent abundance of the nutrient available over total recommended intakes (Table 8-48). The calcium available from bush foods is only 44 percent of the total recommended intakes, and the total calcium available from both bush foods and purchased foods is just nine percent above the total recommended intakes. In this case, there are two hunting groups which did not have calcium available in quantities sufficient to meet total recommended intakes, groups 68B and 68P (Table 8-48).

By the Nutrition Canada survey standards, the total calcium available to these two hunting groups would be classified as "marginal", but not "inadequate". That is, they would have sufficient calcium to meet minimum intake requirements, but not sufficient to provide a desirable level of safety (Canada, 1974:18). It is difficult to interpret the calcium levels however given the disagreements that exist over the minimum levels for calcium intakes, and the ability of the body to adapt to a range of intake levels.

It should be noted, with respect to the question of bush production, that while groups 68B and 68P have lower calcium levels available from bush foods than do other groups, the main source of the shortage of calcium is not the bush foods, but the purchased foods. Group 68B had only 57,000 mg. of calcium available from its purchased foods, group 68P only 7,300, compared to an average of over 650,000 mg. for each of the other groups. The major sources of calcium from purchased foods in the other groups were milk and baking powder (Farkas, 1974). Two of the other groups had children which partially explains the increased use of milk. The reasons for the low baking powder are less clear.

Table 8-47 Recommended Thiamin Intake and Thiamin Available from Bush Foods and Purchased Foods

Group	Total of Recommended Intake of Thiamin (mg.)		Thiamin Available from Bush Foods (mg.)	Thiamin Available from Purchased Foods (mg.)	Total Thiamin Available (mg.)
	Minimal	Maximal			
68A	1,481	1,736	1,947	767	2,714
68B	1,169	1,421	903	515	1,418
68C	1,610	1,881	1,762	1,302	3,064
68J	1,577	1,837	1,853	1,045	2,898
68P	852	1,046	867	279	1,146
All	6,689	7,921	7,332	3,908	11,240

Table 8-48 Recommended Calcium Intake and Calcium Available from Bush Foods and Purchased Foods

Group	Total of Recommended Calcium Intake (mg.)	Calcium Available from Bush Foods (mg.)	Calcium Available from Purchased Foods (mg.)	Total of Calcium Available (mg.)
68A	720,700	327,297	559,936	887,233
68B	508,400	145,531	56,865	202,396
68C	691,800	349,173	638,709	987,882
68J	845,000	363,390	778,294	1,141,684
68P	358,800	187,580	7,300	194,880
All	3,124,700	1,372,971	2,041,104	3,414,075

Baking powder is used in making bannock, a pan bread most commonly cooked in a frying pan on top of the stove, but cooked in several other ways as well. Most of the flour purchased goes into bannock production. The recipe I have for bannock is: two cups of flour, one-half cup of lard, two teaspoons baking powder, salt and water. Bannock is usually eaten daily, and frequently. It is eaten as a snack, with meals, and is often the main part of the mid-day meal carried by hunters when away from the camps. Bannock is therefore an important source of calcium because of the baking powder in it (Farkas, 1974). Group B reported an especially low ratio of purchases of baking powder to purchases of flour, and may have used additional baking powder from caches.

From the point of view of the present analysis, the point I would stress is that any possible shortage of calcium available from foods, relative to recommended intakes, and possibly to requirements, is more a shortage of purchased foods than it is a shortage of bush food production. Among the vitamins and minerals being considered here, calcium is unique in that it is the only one for which purchased foods provided more of the quantity available than did bush foods (Table 8-49).

In summary, therefore, it seems unlikely that the low quantities of calcium available to two of the five groups are critical factors determining the overall levels of bush food production.

Let me return now to the general proposition under consideration, namely, whether the abundance of calories from bush foods, relative to caloric requirements could be explained as a result of the need to produce and consume more food to meet other nutritional requirements. If I now compare the relationship that exists with respect to each different nutrient, between the quantity of that nutrient potentially available from bush foods or from all foods, and the total requirements or recommendations for intakes of that nutrient, it is clear that energy (calories) were relatively less abundant than most other nutrients (Table 8-50). Only thiamin and calcium were potentially available in less abundance relative to recommended intakes. Calorie abundance is therefore unlikely to be explained by the requirements for other nutrients.

Table 8-49 Comparison of the Contribution of Bush Foods and Purchased Foods to Total Quantities of Selected Vitamins and Minerals Available to Hunting Group Sample During Total Winter Hunting Season

Vitamin or Mineral	Percentage of Total Available from Bush Foods	Percentage of Total Available from Purchased Foods
Vitamin A	99	1
Thiamin	65	35
Niacin	90	10
Riboflavin	86	14
Vitamin C	98	2
Iron	93	7
Calcium	40	60
Phosphorus	82	18

Table 8-50 Percentage of Maximal Total Recommended Intake of Nutrients Provided by Bush Foods and All Foods

Nutrient	Percentage of Maximal Total Recommended Intake of Nutrient Provided by:	
	Bush Foods	All Foods
Calories	148	190
Protein	831	891
Vitamin A	1,477	1,489
Thiamin	93	142
Niacin	217	242
Riboflavin	209	242
Vitamin C	219	223
Iron	743	798
Calcium	44	109
Phosphorus	466	571

Since bush food production exceeds human and canine caloric requirements, and since the foods produced are not needed to meet other immediate human nutritional requirements, then it is plausible to assume that only a portion of the food produced is consumed immediately, and that the excess can be put to alternative ends.

Before turning to consider the alternative uses to which food produced is put, I want to briefly consider one implication of this analysis. If people only eat a portion of the total food which they produce, that is equal to their caloric requirements, then the question arises as to whether the other nutrients will be available in sufficient quantities. If nutrients were equally distributed amongst all foods there would be no problem, because it is calories that are in the least abundant supply. But nutrients are not all equally available from different sources.

While some vitamins and minerals are widely distributed among the foodstuffs available, others are not so widely distributed and they are available only in particular kinds of foods. Among the foods having relatively high concentrations of certain nutrients are liver, fish, hare, grouse and geese (Appendix 8-2). Fish has relatively high calcium, thiamin and vitamin C levels per unit of weight of meat, grouses have relatively high calcium and iron levels, hare have high niacin levels, geese have high thiamin, niacin and Vitamin C levels, and liver has very high vitamin A, vitamin C and riboflavin levels, and relatively high thiamin and niacin levels.

The interesting feature of these foods is that they are all positively valued as foods, but as the caloric analysis has indicated they all contribute relatively little to the total of calories. None of the foods just listed contributes more than six percent of total calories (Table 8-19) available.

However, because they are highly valued it is plausible to assume that these animals were harvested to be eaten, and that along with the moose and beaver which are clearly the mainstay of the diet, these other highly valued foods would also be eaten. For the relative ranking of these foods see Tables 4-17 and 4-18.

Now, assuming hypothetically that the diet consists of all the fish, hare, grouse and waterfowl harvested, and as much moose and beaver, including their internal organs and livers, as are then necessary to meet caloric requirements, I have calculated the quantities of vitamins and minerals that would be hypothetically consumed, I have then compared this with recommended and required intakes. The results of this calculation are that on the whole the quantities of nutrients remain greater than the total maximal requirements. The only nutrients that would not be available at higher than recommended levels for all hunting groups are calcium, thiamin and Vitamin C. The calcium situation would be roughly the same as described above. Three groups would also be short of recommended intakes of thiamin, two of which would be below the minimal levels and this would be the only clear shortage of nutrients that would develop under this hypothesis. The vitamin C would be in short supply relative to recommended intakes in two groups but both would be well over double the total required minimal intakes for Vitamin C.

These data indicate that if the total quantity of the foods considered to have been eaten are limited to the levels required to meet caloric needs, and if this quantity is composed of the specific kinds of animals known to be highly valued, and chosen to maintain diversity of diet, then the quantities of vitamins and minerals that would be available for human consumption under such conditions are generally adequate to meet total recommended intakes, and in all but one case are adequate to meet required intakes.

This then leads to the conclusion that, given the food resources available to Waswanipi hunting groups, most requirements for vitamins and minerals can be met despite the fact that large quantities of the food produced will be allocated to ends other than meeting immediate nutritional needs.

D - Allocation of Bush Foods to Alternative Uses: Hunting Group Sample

To what uses is the excess of bush food production over and above immediate caloric requirements allocated? It is I think now clear that the quantities of bush foods produced are sufficient to serve several ends, and that choices must be made to allocate this productive output amongst several alternative uses. Two alternative uses are mentioned by the Waswanipi, preserving the bush food for use by co-residential group members later in the summer, and giving bush food away to other Waswanipi, in other hunting groups or in town.

The members of each of the five hunting groups studied intensively were asked to report the number of animal carcasses that they preserved for future use and which were retained either in the settlements or the bush camps at the end of the winter hunting season. The reports from group 68J were incomplete and difficult to reconstruct because the size of this hunting group changed significantly at Christmas due to illness. The reports from the other groups are listed on Table 8-51. The caloric equivalent of the carcasses stored ranges from approximately 300,000 Calories to over 1,000,000 Calories.

The caloric value of the stored food can be compared to the estimated excess of calories over immediate needs. For group 68A, with a relatively very large harvest of bush food, the percentage stored is nine percent of the estimated excess (Table 8-52). However, for other groups, all cases fall between approximately one-third and two-thirds of the excess caloric value of food produced going into storage. In general beaver meat was the main item put into storage caches.[8]

The caches that were reported can provide an important fraction of the caloric requirements of a hunting group during the summer period, although they cannot generally provide the majority of such requirements. If the minimum average daily caloric requirement for each group is used as an estimate of summer requirements, then a rough estimate of summer caloric requirements for each group can be calculated for the number of members of the group and the remainder of the days in a year (Table 8-53). Caches vary from roughly 10 to 60 percent of summer requirements.

When maximal caloric requirements are assumed, however, hunting group 68C has a deficit, that is, it put more food into storage than has been estimated was excess to the maximal caloric requirements of the group members and their dogs. While this could be taken as an argument against using maximal caloric assumptions. it is also a reminder of the other use to which bush food is put by producers,

Table 8-51 Reported Carcasses Returned to Settlement, or Retained at End of Recorded Period in Caches for Hunting Group Sample

Group	Beaver Carcasses	Moose Carcasses	Caloric Equivalent
68A	20	0	536,400
68B	20	1	931,887
68C	12	0	321,840
68J	N.A.[1]	N.A.	
68P	40	0	1,072,800

Footnote:

1. N.A. = not available.

Table 8-52 Distribution of Estimated Excess Calories from Food Produced to Storage for Summer Use and to Gifts

Assuming Maximal Caloric Requirements				
Group	Estimated Excess Calories	Caloric Value of Stored Foods	Percentage of Excess Stored	Caloric Value of Foods Presumably Given Away (Received)
68A	6,261,653	536,400	9	5,725,253
68B	1,361,389	931,887	68	429,502
68C	168,633	321,840	100	(153,207)
68J	1,933,790	N.A.	-[2]	N.A.
68P	2,438,624	1,072,800	44	1,365,824
All	12,164,089	2,862,927	26[3]	7,367,372

Assuming Minimal Caloric Requirements				
Group	Estimated Excess Calories	Caloric Value of Stored Foods	Percentage of Excess Stored	Caloric Value of Foods Presumably Given Away (Received)
68A	6,771,876	536,400	8	6,235,476
68B	1,866,072	931,887	50	934,185
68C	710,894	321,840	45	389,054
68J	2,451,707	N.A.	-[2]	N.A.
68P	2,825,660	1,072,800	38	1,752,860
All	14,626,209	2,862,927	24[3]	9,311,575

Footnotes:

1. N.A. = not available
2. Not applicable.
3. Based on four groups.

Table 8-53 Caloric Value of Stored Foods as a Percentage of Total Summer Minimal Caloric Requirements of Hunting Group Sample

Group	No. of Members[1]	Minimal Average Daily per Capita Caloric Requirement[1]	Days of Summer Subsistence[2]	Total Summer Caloric Caloric Requirements	Caloric Values of Stored Food as a Percentage of Summer Requirements
68A	6	2,976	159	2,839,104	19
68B	4	3,607	161	2,322,908	40
68C	7	3,510	188	4,619,160	7
68J	17	2,444	N.A.[3]	N.A.[3]	N.A.[3]
68P	3	3,641	167	1,072,800	59

Footnotes:

1. From Table 8-14.
2. Calculated as 365 minus days in winter trapping period.
3. N.A. = not available or applicable.

namely food gifts among people in different bush camps and between people bush camps and those in the settlement.

Groups 68A, 68B and 68C all lived in sufficiently close proximity that visits were made between these camps on several occasions, and recorded in the diaries, along with visits to other nearby camps as well. These visits were often occasions for the gift of meat between members of hunting groups.

In discussions, however, members of the hunting groups indicated that the great majority of the food they exchanged was moose meat, and they claimed to give half of each moose they caught as a gift to some other people.[9] The diaries include records of the date of the kills of moose, and the dates of visits to and from members of other hunting groups, and visits to town. On a few occasions hauling carcasses between camps is mentioned as an activity. The diary records do not however include records of the actual quantity of the bush foods given between members of different hunting groups. Using the principle that half of a moose is given away, and the actual record of visits following the dates of moose kills, it is possible to construct a hypothesis about how much and to whom moose meat was exchanged for each of these groups. This is undertaken as an exercise to see what the possible relationship of gift exchange to food production may be.

From the diaries it is clear that hunting group 68B killed five moose between January 25 and 31, 1969 (Table 8-54). Between January 28 and February 2, 1969 there were three visits between members of hunting groups 68B and 68R, the last of which was part of a trip to the settlement by members of group 68B. The head of hunting group 68B was the father of one of the hunters in group 68R. The hunters of group 68R had caught no moose up to this period, and only caught moose in mid-March, some weeks later. The timing and possible relationships of visits to food transfers were not clear to me during the period of the fieldwork, and I did not elicit a detailed report on the possibility of gifts. I would now hypothesize that one moose carcass was given to members of group 68R during the visits. The members of group 68B also took at least two moose hides back to the settlement and left them there for members of group 68C. When members of

Table 8-54 Dates of Moose Kills, Bear Kills and Visits by Members of Hunting Groups 68A, 68B and 68C Between January and April, 1969

Group	Dates of Moose and Bear Kills and Numbers Killed	Visits to or from Members of Other Hunting Groups	Visits to Settlement
68B	1/25 - 2 moose		
	1/26 - 1 moose		
	1/31 - 2 moose	1/28 visit to 68R	
		2/2 visit from 68R	
		2/3 visit to 68R	2/4
		2/27 visit to 68R	2/27
		3/17 visit to 68C	
		3/22 visit to 68C	3/25
68C			2/23
	2/25 ff. working on moosehides		
		3/16 visit to 68B	
		visit from 68A	
		3/17 visit from 68B	
			3/18
	3/27 - 2 moose		3/29
68A	2/3 - 4 moose		
	2/6 - 1 moose		
	2/19 - 3 moose		
	3/7 - 1 moose		
		3/17 visit from 68B	
	4/20 - 1 bear		
		4/22 visit from 68B	
			4/23

the latter group visited the settlement on February 23, 1969 they picked up the moose hides and brought them back to their bush camp, where they began processing them and then making showshoes. The hunters of group 68C had caught no moose up this date. Some meat may have been transferred with the hides, but I do not have data on this possibility. Several visits by members of group 68B to the camp of group 68C took place in mid-March, and meat was reported hauled to the camp during these visits. The heads of these two hunting groups are brothers. The quantity of meat given is unknown, but I would estimate one carcass may have been given. Overall then, I hypothesize that group 68B gave away two of its five moose carcasses to other hunting groups, one to group 68C, one to group 68R.

The members of group 68C killed two moose on March 27, 1969 and visited the settlement two days later. It is unlikely that any of the carcasses were given to other groups because the carcasses were reported consumed in town. The data on group 68A are less clear. The hunters of group 68A killed nine moose between February 2, 1969 and March 7, 1969. The record of their visits however may be incomplete. The available records indicate a visit to group 68C on March 16, 1969 and a visit from group 68B on March 17, 1969. The head of group 68A was the son-in-law of the head of group 68B. I would hypothesize that at least one moose carcass was given by members of group 68A to group 68B, I am less confident about exchanges to group 68C. It is possible that a carcass was given to 68C and that more than a single carcass was given to group 68B, assuming meat was hauled between the camps on both visits, that in March and again in April. For present purposes I will assume minimal exchanges. The distribution of some of the other carcasses caught by group 68A was presumably made in the settlement during the visit of April 23, 1969 and later visits. One interesting exchange was initiated by the killing of a black bear by a member of group 68A on April 20, 1969. On April 22, 1969 the members of group 68B visited the camp of group 68A to participate in a bear feast.

In total, considering the hypothesized exchanges just among these hunting groups, group 68B would have given away two carcasses, but would have received one, for a net exchange of minus one. Group 68C would not have given away any but would have received one, for a net exchange of plus one. Group 68A would have given away one or more, possibly without receiving any.

While this schematic description of the exchanges that may have been occurring is hypothetical, it is clear that if hunters do give away approximately one-half of each of the moose they kill, as they say theyshould, and as they say they generally do, and if the actual groups to which the gifts are made are adequately reflected in the timing of visiting patterns, then the exchanges hypothesized here have an interesting consequence. The result of such a system of exchange is that there is a net flow of bush foods from hunting groups which catch more moose, and which catch moose earlier in the hunting season, to groups that kill fewer moose and/or that kill them later in the season. Such exchanges would affect the actual surpluses available to members of each hunting group for storage, and for giving away themselves.

It is this exchange of foods between hunting groups which probably explains the fact that, assuming maximal caloric requirements, members of hunting group 68C put more food into storage than the excess food they had produced over and above their own immediate needs. In the balance of exchanges which I have hypothesized the net effect of the exchanges between these hunting groups would have been to reduce the surplus Calories of groups 68A and 68B by 395,487 Calories and to increase the surplus calories of group 68C by this same amount.

While these exchanges redistribute productive output among hunting groups, the exchange network also includes families living in the settlements. Moose or beaver carcasses may be given to families in settlements, and then stored by them for use. When large quantities of meat are brought to the settlement it is often an occasion for a feast, and substantial amounts may be consumed. The exchange networks are wide, and some food always found its way to me during my residence.

During the holiday visits to town by members of the hunting groups a major flow of animal carcasses arrives. During the holiday periods in the settlements everyone is eating bush foods. Many of these exchanges also take place on a small scale.

People regularly go to welcome new arrivals from the bush and these initial visits involve an exchange of foods. The people in the settlement bring something to the people who have arrived that they think they will need, tobacco, lard, flour, generally purchased items and in small one or two pound sizes. In return people coming from the bush offer pieces of animal carcasses, a hind leg of a beaver, a quarter of a small beaver, etc. During the next few days a newly arrived family will generally have one or more substantial preparations of bush food which will be circulated through the community. These distributions can circulate a substantial amount of food. During one holiday period, while eating regularly with a family that had not been in the bush, our main plate at every meal for eleven days was bush meats. The family consisted of five adults plus myself. Sometimes only half the people ate the bush food, but the flow into the household was regular and pieces of meat arrived from other families at every meal. A large amount of food distributed at the holiday periods is thus distributed in relatively small quantities over a period of several days or more, and the total amount given is flexible and would be adjustable to the level of productivity attained by the group in its hunt. The exchanges at holiday periods in the settlements thereby adjust to the level of affluence. However such giving is expected, and it is an unusual group that cannot do so.

I cannot systematically reconstruct the total of exchanges which were given and received by each hunting group in the sample, but I can estimate the net flow. I propose to use the caloric value that was left as a balance, after the excess of calories over immediate needs had been reduced by the caloric value of the bush foods put into storage caches, as an estimate of the net flow of bush foods given in exchanges by each hunting group. That is, bush food that was not needed for human food or dog food, and that was not put into caches, was presumably given away and is a measure of the net balance of such exchanges (Table 8-52).

By this criterion group 68A gave away 65 percent of the bush food it produced, group 68B eleven percent, group 68D thirty percent, and group 68C received six percent of the food it disposed of. For group 68J I can only calculate that storage plus gifts totalled 57 percent of production (Table 8-55).

The allocation of bush food harvests can then be described if three assumptions are made: first, that bush foods were consumed by each hunting group up to a quantity needed to meet the maximal human caloric requirements that would have to be met after all purchased foods were eaten; second, that bush foods fit for human consumption were used to feed dogs up to the level of their caloric requirements not met by inedible viscera and suckers; third, that all bush food calories not used to feed humans and dogs and not put in storage caches were given away. Applying these principles, then adding all hunting groups together, about 40 percent of the bush food calories produced by all the groups were assumed to be eaten by members of the hunting group, range 23 to 80 percent (Table 8-55). Nine percent were fed to dogs (range 0 to 16 percent). Fourteen percent were put in caches for use in summer (range 6 to 23 percent). Such caches generally provide less than one-half the caloric requirements for the summer season. The net balance of the exchanges of meat as gifts was an outflow of 37 percent of bush foods produced by these hunting groups (range from an inflow of 6 percent to an outflow of 65 percent) (Table 8-55).

Thus, given the assumptions made, the hunting groups on average used forty-nine percent of the caloric values of the food harvested for immediate needs (40 percent for human consumption, and nine percent for canine needs), the other fifty-one percent was split. Approximately one-seventh of the total produced was put away for summer use of the hunting group members, and over one-third of total caloric production is given away in exchanges, the net flow presumably going to Waswanipi living in the settlements and not hunting intensively.

Let me now recapitulate the main points of the analysis of the hunting group sample. One conclusion of the caloric analysis of bush food production by the hunting group sample is that all groups were able to produce sufficient bush food to meet caloric requirements, taking into account the purchased foods they had available for consumption. The caloric requirements are a minimum level of production and the least productive hunting group just achieved that level in this sample.

The second conclusion of the caloric analysis is that production of bush foods

Table 8-55 Assumed Distribution of Bush Food Production on a Caloric Basis

Group	Total Bush Food Calories	Assumed Consumed by Group Members[1]	Assumed Fed to Dogs[2]	In Storage Cache	Assumed Given Away (Received)[3]
68A					
Calories	8,792,871	2,054,596	476,622	536,400	5,725,253
Percentage	100	23	5	6	65
68B					
Calories	4,030,572	2,018,193	650,990	931,887	429,502
Percentage	100	50	16	23	11
68C					
Calories	2,599,504	2,075,985	354,886	321,840	(153,207)
Percentage	100	80	14	12	(6)
68J					
Calories	3,420,194	1,486,404	0	1,933,790[6]	
Percentage	100	43	0	57	
68P					
Calories	4,605,632	1,628,145	538,863	1,072,800	1,365,824
Percentage	100	35	12	23	30
All					
Calories	23,448,773	9,263,323	2,021,361	2,862,927[4]	7,367,372[4]
Percentage	100	40	9	14[5]	37[5]

Footnotes:

1. Maximal total caloric requirements minus calories available from purchased foods.
2. Caloric requirements of dogs minus calories available from inedible viscera and from suckers.
3. Residual calories.
4. For four groups: 68A, 68B, 68C, 68P.
5. Based on totals for four groups cited in footnote 4.
6. Cannot break this down into storage and gift components.

by hunting is not generally limited by caloric needs of men and dogs, because production not only exceeds those requirements, production continues after all foreseeable requirements of the group for that hunting season have been met.

A third conclusion is that this excess is split between storage for later use and gift exchanges of food to other Waswanipi. A significant part, over one-third, of the production is given away. Can the conclusions reached from this limited sample be generalized for other hunting groups?

E - Food Production, Nutritional Requirements and the Allocation of Food Production in all Hunting Groups

Considerable variations in the quantities of bush food produced and in the allocations of bush food production to alternative uses exist between the five hunting groups on which there is comprehensive data, and which comprise the sample. So far I have been assuming the aggregated data for these five hunting groups provide an adequate picture. However, the five groups were selected on the basis of the quality of the data available on their activities and there is no a priori grounds for assuming random selection. Given the variations between the groups with respect to the productive outputs and the allocations of production between alternatives it is important to adopt a procedure by which the sample hunting groups may be compared to the total population of hunting groups with respect to nutritional demands, the production of bush foods, and the uses of bush foods.

i) Subsistence Requirements

On the demand side, a standard unit for the measurement of the nutritional demand was adopted, namely "adult-days of subsistence demand". This unit was designed to be sensitive to the size of the hunting group, the age and sex structure of the members, and to the duration each member was with the hunting group, because these data are available for the entire population of hunting groups. This unit is not, however, directly related to the body size of individual members, nor to the activity levels of individual members, because these data were not available for most hunting groups. The adult-day standard was designed to be converted into caloric units, because the previous analysis indicated that energy needs were the nutritional needs for which a required level could be most clearly specified.

To calculate the adult-days of subsistence demand for a hunting group, each member was classified as either on full adult energy requirement, or some fraction of an adult energy requirement, either one- or two-thirds. Based on the average Canadian weights and activity patterns for each age and sex category, the Dietary Standard for Canada gives the recommended daily caloric requirements for each category (Table 8-56). The actual caloric requirements do not correspond to the Waswanipi context, but I have assumed that the ratios between the caloric requirements for different categories would be applicable to the Waswanipi case. I have calculated the recommended daily caloric requirement for each age group, averaging the sexes, as a percentage of the requirement for adults 20-25 years of age, the maximum requirement (Table 8-57), and then grouped the age classes into three categories: those considered as one-third of a fully active adult requirement; those considered as two-thirds of a fully active adult requirement; and those considered as a fully active adults. The children from birth to 6 years of age were in the first category, youths from seven to seventeen years of age were in the second, as well as adults over 65 years of age, and all those from eighteen to 65 years of age in the third.

By classifying each member of a hunting group into an adult equivalent class and multiplying by the number of months they were in the hunting group, and multiplying again by thirty to convert to days, the number of adult-days of subsistence demand created by each individual was calculated. The total adult-days of subsistence demand for each hunting group is the sum for the individual members.

In order to provide a more refined measure of demand, which will be useful later, I have also derived an estimate of average caloric requirement for an adult-day of subsistence demand. Using the adult demand by age groups established above, and the days each person was resident in the group the adult-days of subsistence demand have been calculated for each person in the hunting group sample. The total minimal and maximal caloric requirements previously established for these

Table 8-56 Recommended Daily Caloric Requirements by Age and Sex[1]

Age	Sex	Weight (Kg.)	Energy (Cal.)
0-1 yr	M/F	3-9	360-900
1-2 yrs	M/F	11	900-1200
2-3 yrs	M/F	14	1400
4-6 yrs	M/F	18	1700
7-9 yrs	M/F	26	2100
10-12 yrs	M/F	35	2500
13-15 yrs	M	49	3100
	F	49	2600
16-17 yrs	M	62	3700
	F	55	2400
18-19 yrs	M	65	3800
	F	56	2450
20-25 yrs	M/F	71	3610
25-35 yrs	M/F	71	3540
35-45 yrs	M/F	72	2750
45-55 yrs	M/F	72	2650
55-65 yrs	M/F	71	2540
65 + yrs	M/F	70	1870

Footnote:

1. Dietary Standard for Canada, (Canada 1964).

Table 8-57 Age Factors for Estimating Adult-Days of Subsistence

Age in Years	Caloric Requirements as a Percent of Requirements at Age 20-25[1]	Correction Age Factor Utilized in Computing Adult Days of Subsistence
0-1	17	33%
1-2	28	33%
2-3	37	33%
4-6	45	33%
7-9	51	67%
10-12	67	67%
13-15[3]	83	67%
16-17[3]	84	67%
18-19[3]	87	100%
20-25	100	100%
25-35	97	100%
35-45	95	100%
45-55	91	100%
55-65	87	100%
65[2]+	65	67%

Footnotes:

1. Computed on basis of estimates in Dietary Standard for Canada (Canada, 1964).
2. Assumes a reduction of one category in activity.
3. Male and female values averaged.

groups have then been divided by the number of adult-days subsistence demand. Considering all thirty-six people in the five hunting groups, this gave an average minimal daily requirement of 3,567 Calories and a maximal daily requirement of 4,223 (Table 8-58), with a mean of 3,895. I will consider 3,900 Calories to be the number of calories required per adult-day of subsistence demand. The next step was to estimate how much of these caloric demands would have to be met by bush foods and by moose and beaver respectively, that is what is the minimum caloric contribution of purchased foods, and of smaller animals, to daily caloric requirements.

Comparing the percentage of total food calories available that come from purchased foods, among those groups for which data are complete for the entire winter hunting period, purchased foods contributed 13.9 and 17.0 percent respectively of the total available calories for groups 68A and 68B, and 39.3 and 39.0 percent for groups 68C and 68J (Table 8-59). For groups 68A and 68B respectively the purchased foods provided 1,693 and 1,246 Calories per adult-day of subsistence demand (Table 8-60). Members of both of these hunting groups produced bush foods well in excess of the immediate human and canine caloric requirements, therefore, I will assume that the purchased food taken by Group 68B is the minimum purchased food relative to the subsistence demand that any hunting group would use during the course of a winter. The minimum purchased foods assumed to be available to any hunting group would therefore provide a total of at least 1,250 (1,246) Calories per adult-day of subsistence demand to members of the group. Thus of the 3,900 Calories maximally required per adult-day of subsistence demand I would expect up to maximum of 2,650 Calories would have to be met from the production of bush foods.

The same two hunting groups 68A and 68B derived less than four percent of their total available calories from bush foods other than moose and beaver (Table 8-59), for a total of 469 and 201 Calories per adult-day of subsistence demand from the smaller animals (including one bear in the case of group 68A). Both groups had available more Calories from moose and beaver combined than were necessary to meet the immediate human and canine caloric requirements. I will therefore assume that small animals, fish and large birds will always be harvested in quantities that will provide at least 200 Calories per adult-day of subsistence

Table 8-58 Minimal and Maximal Calories Required per Adult-Day of Subsistence Demand

Group	Adult-Days Subsistence Demand	Calories Required per Adult Day of Subsistence Demand	
		Minimal	Maximal
68A	837	3,538	4,148
68B	661	3,536	4,299
68C	909	3,543	4,140
68J	876	3,601	4,192
68P	468	3,641	4,468
All	3,751	3,567	4,223

Table 8-59 Percentage of Calories Available From Bush Food Sources and Purchased Food to Hunting Group Sample

Group	Percentage of Calories Available From:									
	Moose	Beaver	Moose and Beaver	Hare	Furbearers	Small Game	Fish	Fowl	Bush Food	Purchased Food
68A	34.9	47.4	82.3	0.3	1.3	1.7	1.3	0.9	86.1	13.9
68B	40.7	39.5	80.3	0.0	0.7	0.7	0.8	1.2	83.0	17.0
68C	18.4	24.7	43.1	0.8	0.4	1.2	13.9	2.5	60.7	39.3
68J	14.1	33.7	47.9	0.9	0.9	1.8	10.4	0.9	61.0	39.0
All	28.5	38.9	-	0.4	0.9	-	5.4	0.8	75.5	24.5

Table 8-60 Calories Available per Adult-Day from Bush Food Sources and Purchased Food to Hunting Group Sample

Group	Calories Available per Adult-Day from:										
	Moose	Beaver	Moose and Beaver	Hare	Fur-bearers	Small Game	Fish	Fowl	Bush Food	Purchased Food	All Food
68A	4,253	5,784	10,037	40	163	203	154	112	10,506	1,693	12,199
68B	2,992	2,905	5,897	3	49	52	61	88	6,098	1,246	7,344
68C	870	1,163	2,033	36	20	56	654	117	2,860	1,856	4,716
68J	904	2,162	3,066	58	61	119	666	57	3,908	2,498	6,406
Mean	2,255	3,003	5,258	34	73	107	384	93	5,843	1,823	7,666

demand during the course of a winter. This gives an estimate of the food that would maximally be required from the harvests of moose and beaver per adult-day of subsistence demand, namely 2,450 calories.

ii) Food Production, Abundance and Allocation

On the production side, data on the complete bush food production of many hunting groups is incomplete, especially for fish, small mammals, small birds, and waterfowl, all of which may be caught in fairly large numbers. People say that they do not remember exactly how many of these kinds of animals they killed, and often they show reluctance to answer questions about how many of each of these kinds of animals were killed. I found that people could and would generally estimate these harvests, if it was clear that they were being asked for an approximate and not a precisely correct answer. Nevertheless, my early data is incomplete and I did not always systematically ask for harvests of all the smaller game. The data on moose and beaver harvests however are complete for all hunting groups in 1968-69 and 1969-70.

Moose and beaver together accounted for at least 71 percent of the total calories available from bush food production in the hunting group sample, and combining the results of all four groups these two animals together accounted for 90 percent of calories (Table 8-61). It will be remembered that on a pound of meat basis, moose and beaver together accounted for 77 percent of the total bush food production (Table 8-11). The production of moose and beaver is therefore probably a reasonably good indication of the overall quantity of bush production.

The variable I will use to assess the bush food production of hunting groups is the calories available from moose and beaver per adult-day of subsistence demand. On this basis it is possible to compare the production of the hunting groups in the hunting group sample to the production of each hunting group formed in 1968-69 and 1969-70, and to take the representativeness of the sample into account and draw conclusions about the population of hunting groups as a whole. It will be possible to compare the production of all hunting groups to the maximum expected requirements from moose and beaver per adult-day of subsistence

Table 8-61 Percentage of Calories from Bush Foods Available from Moose, Beaver and Other Animals

Group	Percentage of Calories from Bush Foods Available from:			
	Moose	Beaver	Moose and Beaver	Other Animals
68A	40	55	95	4
68B	49	48	97	3
68C	30	41	71	29
68J	23	55	78	22
All	39	51	90	10

demand established above, and assess the adequacy of production levels for meeting subsistence needs among all the hunting groups.

The calories available per adult-day of subsistence demand from harvests of moose and beaver are reported for all hunting groups formed in 1968-69 and 1969-70 on Tables 8-62 and 8-63, and the distribution of all hunting groups and of the hunting group sample is presented graphically on Figure 8-1.

With respect to the representativeness of the sample, only one hunting group in each year produced less calories per adult-day of subsistence demand from harvests of moose and beaver than did group 68C, and only one of those significantly less. All other hunting groups produced at higher levels. At the other end of the scale group 68A had the highest production of calories per adult-day of subsistence demand from harvests of moose and beaver achieved during the two-year period, although two groups in 1969-70 had relatively high productive outputs as well. However, one of these, 68M, was a hunting group that was not formed for the whole hunting season, being composed of two hunters which were only together for two months during which time they made a large number of kills. After two months they split up to join other groups. The other case of relatively high productive output, group 69C, was continuous over most of the winter hunting season. The hunting group sample therefore covers well the range of productive outputs relative to subsistence demand.

However, middle range of values is under-represented in the sample. The average of the sample groups is 5,458 calories from moose and beaver per adult-day of subsistence demand, whereas the average of all 1968-69 hunting groups is 4,352 and the average of all 1969-70 hunting groups is 4,166. If the range of values is split into four groups, a weighting can be considered. I would break the range at 2,500, 4,500 and 7,000 Calories per adult-day available from harvests of moose and beaver. The first break is roughly the number of calories required from moose and beaver harvests per adult-day of subsistence demand, assuming that intakes of other animals and purchased foods are kept to the lowest level recorded in the sample hunting groups, presumably the level below which no one goes. The second level is intended to approximate the total caloric requirements

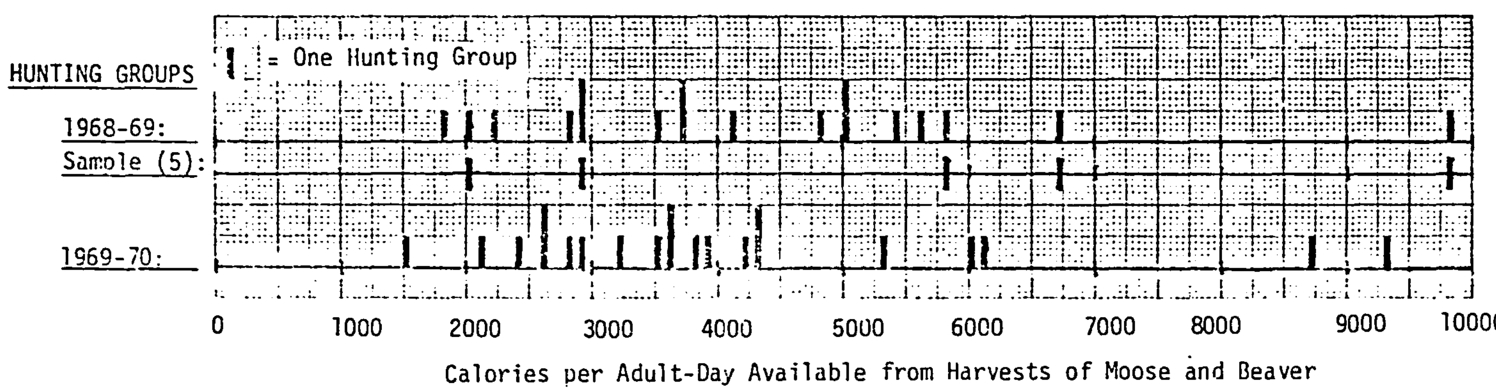
Table 8-62 Calories per Adult-Day of Subsistence Demand Available from Moose and Beaver Harvests, 1968-69

Group	Number of Moose	Calories from Moose	Number of Beaver	Calories from Beaver	Total Calories	Adult-Days	Calories per Adult-Day
68A	9	3,559,383	174	4,666,680	8,226,063	837	9,828
68B	5	1,977,435	69	1,850,580	3,828,015	661	5,791
68C	2	790,974	38	1,019,160	1,810,134	909	1,991
68D	3	1,186,461	76	2,038,320	3,224,781	1,127	2,861
68E	8	3,163,896	119	3,191,580	6,355,476	1,538	4,132
68F	4	1,581,948	120	3,218,400	4,800,348	859	5,588
68G	3	1,186,461	145	3,888,900	5,075,361	2,726	1,862
68H	3	1,186,461	185	4,961,700	6,148,161	1,639	3,751
68I	4	1,581,948	170	4,559,400	6,141,348	1,258	4,882
68J	2	790,974	68	1,823,760	2,614,734	876	2,985
68K	4	1,581,948	109	2,923,380	4,505,328	1,539	2,927
68L	13	5,141,331	365	9,789,300	14,930,631	4,204	3,552
68M	9	3,559,383	206	5,524,920	9,084,303	1,816	5,002
68N	21	8,305,227	274	7,348,680	15,653,907	2,864	5,446
68O	3	1,186,461	112	3,003,840	4,190,301	1,118	3,748
68P	3	1,186,461	113	3,030,660	4,217,121	630	6,694
68Q	7	2,768,409	210	5,632,200	8,400,609	1,676	5,012
68R	1	395,487	41	1,099,620	1,495,107	658	2,272

Table 8-63 Calories per Adult-Day of Subsistence Demand Available from Moose and Beaver Harvests, 1969-70

Group	Number of Moose	Calories from Moose	Number of Beaver	Calories from Beaver	Total Calories	Adult Days	Calories per Adult-Day
69A	3	1,186,461	174	4,666.680	5,853,141	2,407	2,432
69B	0	0	103	2,762,460	2,762,460	1,049	2,633
68C	9	3,559,383	298	7,992,360	11,551,743	1,327	8,705
69D	2	790,974	70	1,877,400	2,668,374	749	3,563
69E	3	1,186,461	100	2,682,000	3,868,461	630	6,140
69F	5	1,977,435	202	5,417,640	7,395,075	2,309	3,203
69G	5	1,977,435	159	4,264,380	6,241,815	2,149	2,905
69H	1	395,487	109	2,923,380	3,318,867	769	4,316
69I	3	1,186,461	129	3,459,780	4,646,241	1,077	4,314
69J	0	0	57	1,528,740	1,528,740	718	2,129
69K	2	790,974	102	2,735,640	3,526,614	919	3,837
69L	2	790,974	70	1,877,400	2,668,374	630	4,236
69M	2	790,974	47	1,260,540	2,051,514	220	9,325
69N	3	1,186,461	143	3,835,260	5,021,721	1,360	3,692
690	3	1,186,461	103	2,762,460	3,948,921	1,468	2,690
69P	2	790,974	52	1,394,640	2,185,614	409	5,344
69Q	5	1,977,435	110	2,950,200	4,927,635	1,259	3,914
69R	0	0	22	590,040	590,040	160	3,688
69S	26	10,282,662	300	8,046,000	18,328,662	3,028	6,053
69T	2	790,974	34	911,880	1,702,854	1,137	1,498
69U	2	790,974	56	1,501,920	2,292,894	799	2,870

Figure 8-1 Distribution of Hunting Groups by Calories per Adult-Day Available from Moose and Beaver Harvests, 1968-69 and 1969-70



for an adult-day of subsistence demand 4,000 Calories from moose and beaver, but I have modified the break upwards to fit a gap in the distribution of the population of hunting groups (Figure 8-1). Finally, the highest break is set in a large gap in the actual distributions, albeit somewhat arbitrarily.

Over the two-year period, approximately 50 percent of the hunting groups fell between 2,500 and 4,500 Calories, 25 percent between 4,500 and 7,000, 15 percent under 2,500 and less than 10 percent over 7,000 (Table 8-64). The situation of hunting group 68J might therefore be considered representative of some 50 percent of the hunting groups, that represented by 68B as representative of 25 percent, that of 68C of 15 percent and that of 68A of less than ten percent.

Now it is possible to re-examine the conclusions of the analysis of the hunting group sample and consider their possible application to the population of hunting groups as a whole.

One conclusion was that all groups in the sample were able to produce sufficient bush foods to meet caloric requirement, taking into account the purchased foods they had available for consumption. There are six groups that produced less than 2,500 Calories from moose and beaver per adult-day of subsistence demand. The 2,500 Calories limit however is the maximum number of Calories required from moose and beaver assuming that food purchases and other bush foods were kept to a presumed minimum. But not all groups use a minimum of these products.

Group 68C, for example, produced only 1,991 Calories from moose and beaver per adult-day of subsistence demand (Table 8-62), but it used 1,856 Calories per adult-day from purchased foods, and 654 Calories per adult-day from fish (Table 8-60) to provide a total of over 4,700 Calories per adult-day. This is 700 Calories per adult-day more than the total requirements.

By this standard, assuming a similar use of purcnased foods and fish, any hunting group which harvested over about 1,300 Calories per adult-day from moose and beaver could have met the total caloric requirements. This includes all six groups in the category below 2,500 Calories per adult-day. All groups

Table 8-64 Distribution of Hunting Groups by Categories of Calories per Adult-Day Available from Moose and Beaver Harvests

Categories of Calories per Adult-Day Available from Harvests of Moose and Beaver	Percentage of Hunting Groups in: Sample (N = 5)	1968-69 (N = 18)	1969-70 (N = 21)	1968-69 plus 1969-70 (N = 39)
0 to 2500	20	17	14	15
2501 to 4500	20	39	62	51
4501 to 7000	40	39	14	26
7001 plus	20	6	10	8

therefore presumably did produce sufficient bush foods to meet the caloric requirements over and above those met by purchased foods.

The second conclusion was that the production of bush foods by hunting is generally not limited to caloric needs. Among the groups in the sample, only group 68C used over two-thirds of the bush food calories produced to meet immediate caloric needs, it used 94 percent of production. In effect, group 68C only produced what it needed, although a net surplus from exchanges helped to provide for a modest food cache. I would propose that this situation might be characteristic of the six hunting groups producing less than 2,500 Calories from moose and beaver per adult-day of subsistence demand, or 15 percent of all hunting groups. The other 85 percent of the hunting groups produced more than the 2,500 Calories maximally required from moose and beaver to meet an adult-day of subsistence demand, and clearly produced an excess over immediate human requirements.

The third conclusion was that the excess of bush food production was used for both delayed consumption and gift exchanges to other Waswanipi, and that such exchanges amount to over one-third of food production.

There is a relationship between the level of moose and beaver production per unit of demand attained, and the percentage of production that is allocated to gifts. Group 68C, in the lowest production category, had a negative exchange balance, that is, it presumably received more than it gave away. Groups 68B and 68P in the third production category gave away between 11 and 30 percent of production. I have no data on the exchange balance for group 68J. Group 68A, in the highest productive category, gave away in net exchanges 65 percent of its total bush food production.

I would then assume on the basis of the distribution of the hunting groups in the productive categories: that approximately 15 percent of the Waswanipi hunting groups were in a situation where they used 90 percent or more of

Calories produced in bush foods to feed themselves and their dogs and had a negative net exchange, as did group 68C; that seventy-five percent of the hunting groups (between 2,500 and 7,000 Calories) used between one-half and two-thirds of the calories produced in bush foods to feed themselves and their dogs and gave away 10 to 30 percent of foods produced, as did groups 68P and 68B; and finally, that ten percent of hunting groups used less than one-third of the calories produced in bush foods to feed themselves and their dogs and gave away through exchanges up to two-thirds of bush food production, as did group 68A.

I would summarize this by claiming that the modal and indeed the most common level of production achieved by members of Waswanipi hunting groups is sufficient, that between one-third and one-half of the bush food produced is not needed to meet immediate human and canine requirements; and, this quantity is allocated both to make exchange gifts to others, and to store foods for summer consumption. On a weighted average basis production for immediate need accounts for 60 percent of the food produced, and approximately 20 percent is for later consumption and 20 percent for gifts.

Finally, I would note that the level of bush food production attained, while more than the immediate requirements of all people living in the bush camps, was not sufficient to meet the annual requirements of the entire Waswanipi population. In this chapter, in Chapter 2 and in Chapter 10 I have provided the data needed to estimate the nutrient values of the annual estimated bush food harvests of the Waswanipi population, and to compare this level of available nutrients to the approximate range of recommended intakes of those nutrients. As indicated in Chapter 2, the total annual bush food harvest is adequate to provide about 45 to 50 percent of the energy requirements of the resident population, and between 50 and 100 percent of the recommended intakes of other nutrients.

Thus the levels of bush food production cannot be explained either by the immediate requirements of the hunting group population nor by the annual requirements of the entire population resident in the settlements under consideration. How this level may be explained will be addressed in later chapters, but first I will address myself to the issue of the costs, particularly labor-time costs, of producing the quantities of bush foods indicated.

Footnotes for Chapter 8

1. The Zen strategy is the limitation of human material wants to levels that can be easily achieved (Sahlins, 1972:2). Sahlins however does not explicitly equate these levels with food requirements as does Lee.

2. The records for the hunting groups are not all exactly for the same period. Groups 68A, 68B are complete for the entire period of winter hunting during the 1968-69 season, roughly from the end of October to the end of May. Groups 68C and 68J do not quite cover the entire winter hunting season. These two harvest records terminate at May 1 and April 1 respectively, when both groups were in the settlements, and both groups reported that until shortly after May 1 they hunted very occasionally, and thereafter they ceased to hunt, set fish nets or trap for a period, and considered their winter hunting to be at an end.

3. I will use the word Calories, with a capital 'C', to refer to kilocalories, the unit of energy required to raise the temperature of one liter of pure water to one degree Centigrade. This convention is followed throughout this study, in the text, tables, appendixes.

4. I assume in this calculation that days which were "holidays", visiting, or which were spent in town included sufficient travel or other activities that they were comparable to camp days with respect to the energy requirements over and above basal and general maintenance needs of the individual.

5. The Dietary Standard for Canada was revised in 1975 (Canada, 1975), but this new standard provided less data for the calculation of extremely heavy activity patterns, having been adapted more completely to light activity patterns typical for southern Canada. Therefore, the original calculations I made based on the 1964 Edition have been retained for caloric requirements. The calculations presented later for recommended intakes of other nutrients have been calculated on the basis of the standards established in the 1975 revision.

6. It should be noted that I do not think my own presence in this group significantly altered the range of foods purchased, from the observation I have of the foods available upon my arrival. Furthermore, I was only present with this group in the settlement and not in their bush camp. The quantity of food purchased weekly in the settlement was however presumably affected by my presence, and the quantities have been reduced proportionnally to account for this.

7. Due to minor variations in the caloric values used, the totals on Tables 8-34 and 8-35 differ slightly from those previously calculated. The figures previously derived in the text are considered more accurate than those in these tables.

8. This is despite the fact that Waswanipi say that moose meat can be better preserved in warm weather conditions by smoke drying than can moose, as reported previously.

9. Moose meat is the only food for which there is an explicit rule about how much should be given away, namely half of each animal harvested. It is also the single most highly valued food (Table 4-18). It is the priority use of moose meat in exchanges that probably accounts for the fact that beaver are main food put away by hunting groups for their own summer subsistence needs.

CHAPTER 9 - HUNTING PRACTICE IN RELATION TO HUNTING RECIPES: RELIABILITY, EFFICIENCY, KNOWLEDGE, AND THE ALLOCATION OF TIME

A - The Reliability and Efficiency of Sub-Arctic Hunting

The fact that Waswanipi hunters produce bush foods in excess of their immediate nutritional requirements might be taken as an indication that Waswanipi hunting practices are reliable and efficient. And, it might be taken as an indication that the Waswanipi do, in fact, hunt in conformity with the culturally encoded recipes which are clearly concerned with the efficiency of hunting practice. Furthermore, the level of production achieved by the Waswanipi might also be taken as an indication of the widely reported under-utilization of labor time resources characteristic of some hunter-gatherer and subsistence producer populations. The aims of this chapter are therefore three-fold: to evaluate the extent to which Waswanipi hunting performance conforms to Waswanipi hunting recipes; to evaluate the extent to which hunting practices are reliable and efficient; and, to evaluate the labor inputs required to achieve the productive outputs previously described.

Choice must be made concerning which specific kinds of animals to hunt, and when and how to hunt each kind of animal. The models for the alternative times, places and methods of hunting specific kinds of animals clearly involve a formulation of the conditions and means by which the uncertainty of a harvest may be reduced, and by which the labor inputs per harvest may also be reduced.

I indicated in Chapter 6 how with respect to moose the Waswanipi identify particular periods in which moose hunting is claimed to be especially reliable and how during each of these hunting periods specific days were preferred days for hunting because particularly efficient hunts could be expected on those days. With respect to beaver I indicated that alternative methods were identified as relatively reliable and/or efficient at each season, and how generally the preferred method was the one that was least damaging to the future reproductive potential of a colony; and how the alternatives available could decrease the uncertainty of a harvest, but at a cost of lower efficiency, i.e., more labor input per harvest output and a cost of greater impact on the hunted population.

Similarly, the annual cycle identified for each portion of the year the main resources, alternative resources of secondary importance and tertiary resources which were available for variety. The annual cycle model implies a set of choices among those resources available at any period based in part on the comparative reliability and/or efficiency of the available methods.

In general then the choice of resources and the methodological choices the Waswanipi make concerning when, where and how to kill animals appear to be focussed in part on reducing the uncertainty and increasing efficiency of hunting.

These goals, to have a relatively reliable and efficient hunt, have been reported in other studies of hunters and gatherers and probably apply to hunters in general. Thus, Robert Paine has posited a principle of least effort in regard to hunting choices, which he relates to decisions about when hunters choose to cease using a particular resource population and start using either an alternative population of the same resource or of an alternative resource (1971: 159-160). Michael Joachim has claimed that the reduction of effort to a predefined range is an important objective of hunters and gatherers (1976:18-19). Richard Lee has characterized the Bushmen strategy of depending primarily on gathering as the choice of low-risk, high-return subsistence activity, over high-risk, low-return hunting. With respect to the Bushmen, Lee claims the "strong emphasis on vegetable food sources"can be explained by reference to the reliability and efficiency of alternative subsistence activities.

> "The reasons for this emphasis are not hard to find. Vegetable foods are abundant, sedentary and predictable. They grow in the same place year after year, and the gatherer is guaranteed a day's return for a day's expenditure of energy. Game animals, by contrast, are scarce, mobile, unpredictable, and difficult to catch. A hunter has no guarantee of success and may in fact go for days or weeks without killing a large mammal..." (Lee, 1968:40; c.f., Woodburn, 1968:53).

Lee generalizes these results to hunters and gatherers in general, including the assumption that efficiency and reliability are correlated:

> "It seems reasonable that a similar kind of subsistence strategy would be characteristic of hunters and gatherers

> in general. Wherever two or more kinds of natural foods are available, one would predict that the population exploiting them would emphasize the more reliable resource. We would also expect, however, that the people would not neglect the alternative means of subsistence. The general view offered here is that gathering activities, for plants and shellfish, should be the most productive of food for hunting and gathering man, followed by fishing, where this source is available. The hunting of mammals is the least reliable source of food and should be generally less important than either gathering or fishing" (Lee, 1968:41).

Consistent with this view Lee sees the Central Inuit, who are almost without vegetable food in their diet, as the "most precarious human adaptation on earth", although to the degree that fishing is important this statement may be qualified (Lee, 1968:40). By analogy, those sub-arctic hunters who depend primarily on mammal hunting as opposed to fishing, must run a close second to the Inuit.

But do hunters depend on big game only when vegetable foods and fish resources are unavailable? Is all big mammal hunting unreliable? And, to the extent it is unreliable is it also inefficient? These questions will be addressed in the present chapter. The data already presented on Waswanipi harvests indicate a need to re-examine these questions. The Waswanipi winter harvests are predominately from big game, moose and beaver, and only secondarily from fish as I have indicated in the previous chapter. This is not only inconsistent with the general formulation just proposed, it appears to also be inconsistent with the inherent instability and unpredictability of the terrestrial animal populations of the sub-arctic environment. The deduction that has been drawn from the instability of sub-arctic populations about sub-arctic hunting is that it too must be highly unpredictable and variable and that effective planning and reduction of uncertainties must be difficult or impossible (Knight, 1965). The Waswanipi views do not agree.

In this chapter, I will examine the hunting of each major resource, I will compare alternative means of hunting that resource, and I will compare also the hunting of alternative resources, giving quantitative measures of the rates of success of hunts and of the efficiency of hunting activities wherever possible.

The levels of efficiency and reliability that the Waswanipi are able to attain are clearly a function of the extensive knowledge they have of regularities in the behavior of the animals they hunt in relation to features of the environment. In order to demonstrate the knowledge of the Waswanipi, I have also reviewed the basic biological data on the behavioral patterns of the different kinds of animals that are the main food resources. I have summarized the data on the relationship between animal behavior patterns and those environmental variables which the Waswanipi use in their decision-making. And in order to put these individual species by species accounts of animal behavior in a general context, I have also made a review of the general features of sub-arctic ecosystems and of the general types of adaptations to this environment which are expected, on theoretical grounds, to be characteristic of sub-arctic animal populations.

These basic surveys of the ecology of the sub-arctic, and of the climate, land, vegetation, and animal populations of the Waswanipi region, appear as a series of appendixes to the text of the present chapter.[1] A detailed comparison of Waswanipi knowledge and the findings of biological researchers is not undertaken. For present purposes, the extensive agreement between the Waswanipi knowledge of animal behavior in relation to environmental features, and scientific knowledge of the same relationships simply needs to be noted. A few specific points of comparison are noted in the text, and the reader may himself compare the data in Chapters 5 and 6 with those in Appendixes 9-1 to 9-7. The point to be noted here is that there is a very extensive correspondence, and the Waswanipi knowledge must be a key to the levels of reliability and efficiency Waswanipi hunters achieve.

The main text of this chapter provides quantitative and comparative measures of Waswanipi hunting activity with the primary aim of determining whether uncertainty and efficiency are factors which influence resource use decisions and, particularly, whether they can be used to account for the allocations of time to different hunting activities and for the relative quantities produced of different animal foods. At the end of the chapter, I summarize the detailed results and compare them one to another, and to other data on subsistence production in other societies, and return to the general questions of the alternative goals of Waswanipi hunters.

B - Moose Hunting

Waswanipi models for hunting moose base the main decisions respecting the periods and days for moose hunting on three kinds of knowledge about moose behavior.

First, they describe the distribution of moose over space and in time emphasizing that moose concentrate into relatively larger groups at locations that are distinctive with respect to topography and vegetation; that there is a sequence to these distributional changes which occur at particular seasonal periods; and that the timing of these changes are closely related to weather and particularly snow cover conditions.

Second, they describe the mobility patterns of moose and of men indicating how under some conditions moose are highly mobile but will approach the hunter during the rut, how under other conditions the mobility of the moose is restricted sufficiently that snowshoed hunters are more mobile than moose and, finally, how under yet other conditions moose are effectively immobile.

The third kind of knowledge the Waswanipi describe is a generalized account of daily weather conditions and how these conditions affect: the comportment and sensitivity of moose to sensual cues; responses of moose to disturbance; and the effectiveness of concealment and stalking by the hunters.

Each of these three kinds of knowledge is generally confirmed by the scientific studies reviewed in Appendix 9-4.

My purpose here is to describe some key features of moose hunting behavior, the activity as it was actually conducted,and to indicate the extent to which behavior conforms to this knowledge and to the decision-making structures in which the Waswanipi indicate they use such knowledge. For the description of actual Waswanipi moose hunts I have depended on the diary records previously described, and on mapping and other data collected in interviews at the end of the winter hunting seasons.

I will examine each of the three features of Waswanipi hunting activities described in Waswanipi belief as significant for hunting: the relative mobility of moose and men, the distribution of moose, and the effects of daily weather conditions and storm systems. Then I will turn to the more general issues and assess the reliability and efficiency of Waswanipi moose hunting.

i) Moose Hunting Activities and Snow Cover Conditions

The data I have on the geographical and temporal distribution of moose hunts come from the daily records of harvests kept in the diaries and from supplementary mapping and hunting accounts collected in interviews. The dates of twenty-six moose kills made in 1968-69 by the twenty-five hunters listed in the eleven diaries are known. This represents approximately one-quarter of the total total winter season kills reported by all Waswanipi hunters. In addition, the location of eighteen moose kills in 1968-69 and fifty moose kills in 1969-70 have been mapped by hunters on four-mile to one-inch topographic maps (1:250,000). The mapped kills for 1969-70 represent almost two-thirds of the total winter season kills reported by all Waswanipi hunters.

Because I am interested in hunting activity as well as in the spatial and temporal distribution of moose harvests, I have initially adopted as the basic unit of analysis the successful moose hunting day, rather than a moose kill. The hunting day is unit of activity, and I will refer to the successful moose hunting day simply as a "moose hunt" in the pages that follow. I will review this usage later on. Thus, the twenty-six moose kills recorded in the diaries were made during sixteen moose hunts, the eighteen moose mapped in 1968-69 were killed during fourteen hunts, and the fifty moose kills mapped in 1969-70 were killed in thirty hunts. The diary hunts for 1968-69 averaged 1.63 moose killed per successful hunt, and the moose kills mapped for 1969-70 averaged 1.67 moose killed per successful hunt.

During the fall hunting season the Waswanipi say that they hunt moose mainly along the shores of streams, lakes and rivers. During the winter hunting season the Waswanipi define two periods as preferred for moose hunting: January and early February, after snow depths are sufficiently high to restrict moose mobility, which is said to occur with snow depths of 30 to 36 inches; and, March and April after more or less continuous crusting of the snow begins.

The reports of 16 successful moose hunts that are recorded in the diaries give the dates of these hunts. The general snow cover conditions on the days of the hunts can be determined using the daily climatological reports made to the Quebec Service de Météorologie from the weather station at the radar site at Chapais, Quebec. This station was chosen because, on the basis of the records of its general location, it was the station closest to the areas of recorded hunts. Unfortunately, data were not collected during the winter of 1968-69 at the weather station at Matagami on the western side of the Waswanipi traplines.

The dates of thirteen of the sixteen successful hunts can be grouped together into two periods. During the two weeks from January 24 to February 7, 1969, a total of six successful hunts occurred, and during the four weeks from March 1 to March 28, 1969, a total of seven successful hunts occurred. The remaining three successful hunts occurred one before, one between, and one after the two main periods. One hunt, the first successful hunt, was made on December 13, 1968, the next successful moose hunt was on January 25, 1969, and the last occurred on April 13, 1969 (Table 9-1). Thus, one moose hunt occurred during the twelve weeks prior to the first period of intensive hunting, one during the three weeks between the intensive hunting periods, and one during the seven weeks after the second intensive hunting period. In short, moose hunts were heavily concentrated into two hunting periods.

The two main periods in which moose hunts occurred correspond to the times the Waswanipi say they prefer to hunt moose and also to the times which they say

Table 9-1 Dates of Successful Moose Hunts and Weather Conditions During Those Days, Winter Hunting Season, 1968-69[1]

Date of Successful Moose Hunt	No. of Successful Hunts	Snowfall (Inches)	Snow Depth on the Ground (Inches)	Wind Speed 12 Noon (m.p.h.)	Wind Direction 12 noon	Maximum Wind Speed (19 m.p.h. or Over)	Temperature (°F) Max.	Temperature (°F) Min.	Temperature Maximum (°F) Day Previous	Nebulosity (1/10's)
Dec. 13	1	8.0	29	11	NE	-	20	14	24	10
Jan. 25	1	0.6	31	13	SSW	29	36	8	40	5
Jan. 26	1	0.6	31	11	W	-	9	-16	36	10
Jan. 28	1	T[2]	31	6	ESE	21	15	-15	- 2	10
Jan. 31	1	0.3	34	9	W	29	27	1	25	10
Feb. 2	1	T[2]	34	7	E	-	19	- 8	10	0
Feb. 6	1	1.0	38	8	WSW	-	3	-10	- 8	7
Feb. 19	1	-	40	5	E	-	29	6	31	6
March 1	1	-	35	8	E/SE	-	37	10	33	0
March 7	2	0.4	34	9	W	-	9	- 6	6	8
March 10	1	3.7	34	12	NW	22	15	4	30	10
March 15	1	0.3	35	5	W	25	30	8	35	10
March 18	1	T[2]	35	9	E/SE	-	32	8	25	10
March 27	1	0.4	40	15	W/NW	24	18	3	35	9
April 13	1	T-R[2,3]	39	6	W	21	47	29	32	10

Footnotes:

1. Data for Chapais weather station (5612) from the "Rapport Climatologique - Quebec" tally sheets, provided by the Quebec Service de Météorologie.
2. T = Trace.
3. R = Rain.

are generally characterized by high snow conditions and crusted snow conditions respectively.

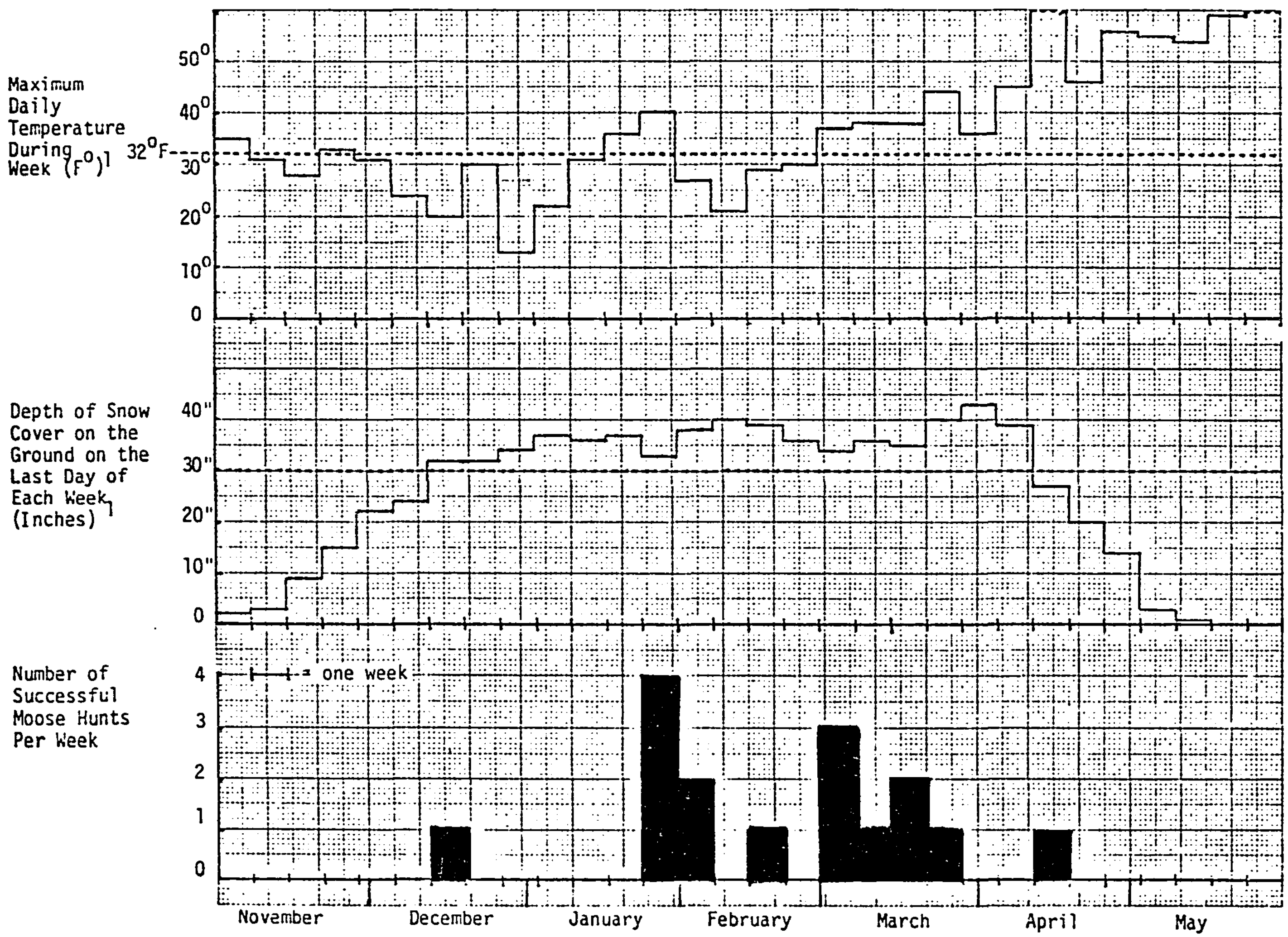
The snow depth on the ground at the Chapais weather station for each date on which a successful hunt occurred indicates that the snow cover was at least 30 inches deep on the morning of the dates of all hunts except the first (Table 9-1). However, the snow cover during the first successful hunt was marginally at the thirty-inch treshold as well. On the morning of December 13, 1968 the recorded depth was 29 inches, and eight inches of snow fell during that day so that the snow depth reading the next morning was 33 inches. From December 13, 1968 snow depth stayed over thirty inches deep until April 16, 1969, three days after the last successful hunt was made. In effect then all the kills occurred within the period when snow cover exceeded thirty inches in depth, and the first and last kills were made very close to the times when the snow cover depth crossed the thirty-inch treshold.[2]

The distribution of kills within this period however cannot be explained simply by the depth of the snow because conditions were presumably suitable for moose hunting throughout the period, and the periods of deepest snow do not coincide with hunting periods (Figure 9-1).

No direct observations of snow crusts and densities are made as part of the regular reporting of the weather stations in or near the Waswanipi region. In order to determine the likely occasions on which crusting occurred, I have noted the weeks in which the maximum daily temperatures exceeded $32^{o}F$ ($0^{o}C$), and the number of days in each week on which this condition occurred. This rise in temperature would have provided one of the situations in which crusting of snow cover can occur, but it should be noted that this is at best an approximate measure because crusting can be caused by other conditions, both regional and microclimatic, as well.[3] Furthermore, rises several degrees above $32^{o}F$ ($0^{o}C$) may be needed to effect a substantial melt. This method is however suggestive in the present case.

There was a warming probably capable of producing a melt which would be followed

Figure 9-1. Number of Successful Moose Hunts per Week, Depth of Snow Cover on the Ground on the Last Day of Each Week, and Maximum Daily Temperature During Each Week, Winter Hunting Season, 1968-69



Footnote: 1. Data from tally sheets recorded at Chapais radar weather station (5612) and provided by crusting during the weeks of January 17-23, 1969 and January 24-30, 1969 (Table 9-2 and Figure 9-1). The temperature rose as high as 40°F (4.4°C) on one day and 36°F (2.2°C) on another. Prior to this period no successful hunts had occurred for four weeks. During the second of those two weeks and the week that followed it, six successful moose hunts occurred, three in each week (Table 9-2).

Similarly, intermittent but continuing warming occurred during the three weeks from February 28 to March 20 and six successful moose kills occurred during that period. A more steady warm period occurred in the week of March 21-27 and the two weeks from April 4 to April 17 and each of these periods was associated with one successful moose hunt. During an intervening colder week, March 28-Arpil 3, no successful moose hunts occurred.

Sixty-nine percent of successful moose hunts occurred during weeks with two or more days with maximum temperatures over 32°F (0°C), and 19 percent of successful hunts occurred during weeks following weeks of the former group (Table 9-3). Thirteen percent of successful hunts occur in all other weeks. In short, there is a clear relationship between the periods of probable occurrence of crusted snows and the dates of successful moose hunts.

While the intensive moose hunting period in March coincides with conditions described in Waswanipi hunting recipes, the January hunting period does not match the conditions described in the recipes. The March hunts coincide with the period of repeated thawing and crusting of the snow, that is with conditions of _oateiao_, and this is consistent with the relationships described in Waswanipi moose hunting recipes. The January-February hunts also occur at the predicted times, but the coincidence of moose hunts with crusting in January and February is not a feature described in Waswanipi moose hunting recipes.[4] It would appear therefore that during 1968-69 the Waswanipi may have taken advantage of a particularly early period of thawing and crusting to organize their late January and early February moose hunts. According to the recipes hunters would normally be hunting at this time on deep snow, but not necessarily crusted snow.[5]

Table 9-2 Number of Days Per Week With Maximum Daily Temperatures Over $32^{o}F$ ($0^{o}C$) and Number of Successful Moose Hunts Per Week, Winter Hunting Period, With Snow Cover Depths Over 30 Inches, 1968-69

Week 1968-1969	Number of Days With Maximum Temperature Over $32^{o}F$ ($0^{o}C$)	Number of Successful Moose Hunts Per Week
December 13 - December 19	0	1
December 20 - December 26	0	
December 27 - January 2	0	
January 3 - January 9	0	
January 10 - January 16	0	
January 17 - January 23	2	
January 24 - January 30	2	3
January 31 - February 6	0	3
February 7 - February 13	0	
February 14 - February 20	0	1
February 21 - February 27	0	
February 28 - March 6	3	1
March 7 - March 13	2	3
March 14 - March 20	3	2
March 21 - March 27	6	1
March 28 - April 3	1	
April 4 - April 10	6	
April 11 - April 17	6	1

Footnote:

1. Data for Chapais radar weather station (5612) from the "Rapport Climatologique-Québec" tally sheets, provided by the Quebec Service de Météorologie.

Table 9-3 Number of Successful Moose Hunts Per Week, and Percentage of All Successful Hunts Occurring During Weeks With Different Probabilities of Crusts, Winter Hunting Period With Snow Cover Depths Over 30 Inches, 1968-69

Classification of Weeks by Conditions For Snow Crusting	Number of Successful Moose Hunts Per Week	Percentage of All Successful Moose Hunts
A. Week with one or less days with maximum daily temperature of 32°F (0°C) or more.	0.25	13
B. Week with two or more days with maximum daily temperature of 32°F (0°C) or more.	1.38	69
C. Weeks following type B weeks.	1.50	19
All Weeks	0.89	101

ii) Geographical Distribution of Waswanipi Moose Hunting Activities

The Waswanipi model of moose hunting stresses that in the fall moose are easily located along shorelines and that there is a change in the distribution of the moose during the early winter hunting season with a progressive concentration of moose on the hills where they can be easily searched for and located.

Of the mapped locations of fourteen moose hunts in 1968-69, five moose hunts occurred on hills, three beside waterbodies, lakes, streams or rivers, two in bogs and four on sites the topographic features of which were not definitely identifiable on the scale of maps used, but which appeared to be either gently sloping, two cases, or flat land, two cases (Table 9-4). In 1969-70, with a larger sample, thirteen of thirty sites of hunts were on hills, ten sites of hunts were beside lakes, streams or rivers, three sites were on bogs, four sites were on gently sloping land and none were on flat land (Table 9-4).

Hills were clearly the most common sites of successful moose hunts, but shoreline locations were also quite frequent. While I have no systematic data on the total areal distribution of these topographic features in the Waswanipi region, I would subjectively rank gently sloping lands and flat lands as the two most common features by far, and then shorelines and bogs, and then hills in decreasing order of occurrence. If this subjective ranking is approximately correct, then the locations of successful moose hunts during the fall and winter hunting periods are not randomly distributed over the region. Gently sloping and flat lands are under-represented in the sampled sites and hills and shoreline sites are over-represented in the sampled sites.

While hills are the most common sites of successful moose hunts, the data for both years indicate that hills do not constitute fifty percent of the sites of successful hunts. In order to consider the significance of this distribution, it would be desirable to know the approximate dates of the kills on the various sites. Unfortunately, I cannot do this for the majority of sites. Due to an oversight in field recording, no adequate unambiguous record was made that allows

Table 9-4 Topographic Features of Sites of Successful Moose Hunts, During the Fall and Winter Hunts, 1968-69 and 1969-70

Topographic Feature	Hunt 1968-69		Hunt 1969-70	
	Number of Successful Hunt Sites	Percentage of Successful Hunt Sites	Number of Successful Hunt Sites	Percentage of Successful Hunt Sites
Hills	5	36	13	43
Shoreline[1]	3	21	10	33
Bog	2	14	3	10
Gently Sloping	2	14	4	13
Flat	2	14	0	0
All	14	99	30	100

Footnote:

1. Beside lake, river, or stream.

me to consistently correlate all the moose kills marked on the maps and dates of kills recorded either in the diaries or in the interview notes. However, it is possible to reconstruct with certainty the dates of some of the kills mapped because of the limited number of kills made by some hunters or hunting groups. I can date eight of the thirty 1969-70 sites. Only three of the 1968-69 sites can be dated. This is too few to be considered further.

Of the eight 1969-70 sites that can be dated, three are hill sites and all occur in the months of December and February. Of the four dated shoreline sites, two occur in the fall hunt during the rutting period in September and October, and two occur in April and March. One datable bog site also occurred in March.

The sites in this small sample are therefore clearly segregated by seasonal distribution. About half the shoreline sites occur in the fall, during the rut, when hunters travel along rivers and streams and call the moose down to the shores. And hill sites occur in mid-winter when moose are said by the Waswanipi to concentrate on the hills. The successful hunt sites that appear not to be accounted for in Waswanipi hunting recipes are the shoreline sites hunted in late winter which account for approximately one-third of the late winter period moose hunt sites.

The Waswanipi model definitely stresses hills as the easiest sites on which to hunt moose during the winter hunting period, because the hunter can easily search for the moose there. However, some accounts of specific moose hunts indicate that moose or signs of moose are also located in the course of trapping for beaver when the moose are not being specifically looked for. The interpretation that can be made of the distribution is that: hills are relatively the best places to go to search when a hunter is specifically <u>seeking</u> moose; whereas moose signs may be located along lake and river shorelines when a hunter is out travelling on other activities and <u>not</u> necessarily looking for moose. The moose killed at shoreline sites in late winter would therefore be located during the course of other activities that require travel along lakes and rivers, especially beaver hunting. Why the kills at these sites should occur primarily in March and April, andnot in January and February, would be related to snow conditions at such sites and to the activity patterns for hunting.

The snow conditions at shoreline sites would be closely related to the characteristic of the vegetational cover. I have tabulated the vegetational classifications of the sites of successful moose hunts. Eight hill sites could be located on the detailed vegetational maps (1:25,000 scale) made available by the Quebec Department of Lands and Forests. Seven were mature stands, six with predominantly coniferous cover and one with predominantly deciduous cover (Table 9-5). The eighth site was in a burned area. These sites in mature stands were presumably sheltering areas near to more open areas for feeding, on the sides of the hills. In contrast the shoreline sites for which the vegetational cover could be described included six cases of young or regenerating forest in the "pole" ("perchis") stage, two burned areas, and two mature forests, one coniferous and one deciduous. All six of the young or regenerating forests were coniferous. The young stands along the shores of lakes and rivers would be expected to have low snow cover if they were exposed to the strong winds crossing the open ice-covered waterbody, and it may be significant in this respect that those shoreline sites for which I could determine exposure were in fact north-facing sites relatively exposed to predominant winds (Table 9-6). The snow cover on these sites would be expected to be lower relatively than the snow cover on most surrounding sites and moose therefore probably occupy these sites in mid-winter as the snow cover accumulates and at about the same time they are said to be concentrating on hills, in late December, January and February.

But since the Waswanipi say that during the coldest period in January and February they hunt moose more actively, they concentrate attention at this period on the hills which are limited in number, easy to locate, not very extensive and quickly surveyable. Young coniferous stands along shorelines are much more common locations. Often hunters move to new camps after the Christmas-New Year's holiday to be near to hills for moose hunting, and they initially hunt the beaver colonies close to the new camps.

On the basis of these hunting patterns I would hypothesize that later in February

Table 9-5 Successional Stage of Vegetation and Type of Forest on Sites of Successful Moose Hunts, by Topographical Features, Fall and Winter Hunts, 1968-69 and 1969-70

Vegetational Classification of Site[1,2]	Topographical Feature: Hills		Shore Line		Gently Sloping		Other		All	
	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
Mature Coniferous	6	33	1	8	2	33	0	0	9	20
Mature Mixed	0	0	0	0	0	0	1	14	1	2
Mature Deciduous	1	6	1	8	1	17	0	0	3	7
All-Mature	7	39	2	15	3	50	1	14	13	30
Young or Regenerating Coniferous	0	0	6	46	2	33	1	14	9	20
Burns	1	6	2	15	0	0	0	0	3	7
Bogs	0	0	0	0	0	0	5	71	5	11
Unknown	10	56	3	23	1	17	0	0	14	32
Total	18	101	13	100	6	100	7	99	44	100

Footnotes:

1. Vegetational classification are defined as the equivalents of the following Quebec Department of Lands and Forests map codes: mature coniferous = Em, Ec, Ea, and Rm; mature mixed = M, Mm, M7, M6, M5; mature deciduous = Fm, F7, F6, F5; young or regenerating coniferous = Rj, Rr, R3, Pgm4; burns = Br; bogs.
2. There were no young or regenerating stands of mixed or deciduous vegetation on the sites sampled.

Table 9-6 Orientation of Slope on Sites of Successful Moose Hunts With Different Topographical Features, Fall and Winter Hunts, 1968-69 and 1969-70

Topographical Feature[1]	Orientation of Slope									
	SW	W	NW	N	NE	E	SE	S	Uncertain	Summit
Hill	1	2	2	3	1	1	4	0	2	2
Shoreline	0	0	0	2	0	0	0	0	11	0
Gently Sloping	0	1	2	1	0	1	0	0	0	0

Footnote:

1. Bog and flat sites not included.

and early March, when temperatures moderate and the Waswanipi hunt beaver more intensively and further from camp, and when they therefore travel the rivers and lakes more extensively than early in winter, they find the signs of the moose that have become concentrated in the young forest stands along the shorelines. And on appropriate days for moose hunting during March and April they return to conduct hunts for these animals. The localized habitat of moose, their tendency to remain in one area, and the pattern of daily movement between the same feeding and bedding sites over periods of several days to several weeks (Appendix 9-4), all make it possible to note moose signs and return to the area later when conditions are suitable for moose hunting.

This interpretation is compatible with the frequency of reports of men who happened upon signs of moose when not specifically looking for moose. Such stories circulate in the village, because they are considered an indication that the moose is being "given" to the hunter. In particular, stories were repeated of cases where moose were seen, but the hunter, out on other activities and without a gun, could not hunt the animals and had to return later. These stories have been cited in Chapters 5 and 6 as examples of the evidence the Waswanipi themselves use to support the claim that moose are given.

Those moose that are not caught at the locations foreseen by the hunting recipes therefore serve as demonstrations of the fact that moose are gifts from non-human beings. The evidence cited above on the actual locations of successful moose hunts suggests that hunts on which the hunter finds signs of moose without himself having searched for the signs, may account for one-sixth of all fall and winter moose hunts, and one-third of mid-winter hunts. Summarizing the data on the timing and locations of fall and winter hunts, approximately one-sixth of all hunts occur in the fall when moose come to the hunters, approximately half of the hunts occur on hills, one sixth are "given" in winter without searches, and one-sixth occur on other sites, bogs, gently sloping or flat lands. Therefore, the distributional evidence indicates that the majority of moose kills are made on the seasonally appropriate types of sites outlined by Waswanipi informants.

iii) Moose Hunting Activities and Daily Weather Conditions

In mid-winter, January and February, when hunting is typically in deep snows, the Waswanipi say they prefer to hunt moose on 'moose days', days with light snowfall, some wind, and cold but not too cold temperatures. During the late winter period, March and April, when hunting is typically on crusted snows, the Waswanipi say that they prefer to hunt on cooler days following warmer days, when a good crust will form.

From diary records I am able to date only successful hunts. Because diaries with activity records that permit me to also identify unsuccessful hunts were very limited, examination of unsuccessful hunts will be deferred to the next section of this chapter. The dates of the successful moose hunts are listed along with the basic weather variables for those dates on Table 9-1.

Light snowfall, 0.1 to 1.0 inch per day, occurred during the days on which eight of the sixteen moose hunts occurred. No snow or a trace of snow fell on the days on which six moose hunts were conducted. And two successful hunts were conducted on days with heavy snowfalls, greater than 1.0 inch.

In order to determine whether these occurrences represented a selection for days with a light snowfall, it is necessary to determine the frequency with which days with light snowfall occurred during the periods of moose hunting. Because the majority of successful moose hunts occurred during two periods of intensive hunting, it was desirable to compare the days on which hunts occurred to the other days within these same periods.

A climatologist, B. Hrebenyk, examined the weather records for the Waswanipi region for the winter of 1968-69 and on the basis of the tracks and dates of the lows and highs that traversed the region, he defined several distinct periods during that winter such that each corresponded to "the persistence of weather types over the region" (1977:2).[6]

The periods he identified on the basis of an examination of the sequences of high and low pressure systems that traversed the Waswanipi region in the winter of 1968-69 will be described more fully later. For the present, I will use his classification to define the extent of the two climatic periods in which most successful moose hunts occurred. One period Hrebenyk identified was from January 20 to February 13, 1969, another from March 7 to April 4, 1969. The first period includes the dates of the six moose hunts made over two successive weeks from January 25 to February 6, 1969, the second includes the dates of six successful moose hunts that occurred during four weeks from March 7 to March 27.

The relationship between moose hunts and the climatic periods Hrebenyk identified makes sense because the distinguishing feature of the weather types of these two periods, according to Hrebenyk, is that "weather conditions tended towards rapid changes from high to low pressure" and weather conditions were "rapidly fluctuating" (1977:5). It is precisely this rapid alternation that brought warm and cold weather successively, and which probably resulted in crusted snows.

To return to the main question then: were the days the hunters selected to hunt moose during these two climatic periods selected partly on the basis of snow precipitation conditions? During the two periods of intensive moose hunting, days withlight snowfall, occurred on 24 days, or 44 percent of the days, and 8 out of 12 hunts occurred on those days (Table 9-7). On twelve days with heavy snow fall only one hunt occurred, although such days accounted for nearly one-quarter of the total days. Finally, days with little or no snowfall accounted for one-third of the days and one-quarter of the hunts. Another way to phrase this is to say that successful hunts occurred on one-third of the days with light snowfall, one-sixth of the days with little or no snowfall, and one-twelfth of the days with heavy snowfall. Thus during the periods preferred for moose hunting, two-thirds of the hunts occur on days with light snowfalls, and such days appear to be especially selected for moose hunts.

The wind speed conditions during the moose hunts, read at noon on the days on

Table 9-7 Snowfall On All Days In Moose Hunting Periods[1] And On Days With Moose Hunts, Winter Hunting Season, 1968-69

Snowfall[2]	Number Of Days	Percentage Of Days	Percentage of Moose Hunts	Number of Moose Hunts
None or trace	18	33	25	3
0.1 to 1.0 inches	24	44	67	8
More than 1.0 inches	12	22	8	1
Totals	54	99	100	12

Footnotes:

1. For definition of moose hunting periods see text.
2. Data from tally sheets recorded at Chapais radar weather station (5612) and provided by Service de Météorologie de Québec.

which hunts were made, indicate that no hunts were made on days with winds of less than 5 miles per hour (m.p.h.). During the two periods of intensive hunting, eleven days, twenty percent of all days, had winds of less than five miles per hour at the time of observation (Table 9-8). Winds of fifteen miles per hour or more did not occur during the intensive hunting period, and only one such day occurred during the months of January, February and March. Hunts therefore occurred on days with moderate winds, 5 to 15 miles per hour, and such days were clearly selected over days with very light winds. Hunts occurred on slightly less than one day in four that had moderate winds.

The maximum daily temperature on days with moose hunts were all above $0^{o}F$ ($-18^{o}C$). The maximum daily temperature was also $32^{o}F$ ($0^{o}C$) or below on the days on which eleven of the twelve hunts occurred. Fifteen days during the period of intensive hunting, 28 percent of total, had daily maximum temperatures above $32^{o}F$ ($0^{o}C$) but only one hunt, eight percent of the total, occurred on those days (Table 9-9). This indicates a selection for moderately cold days. It should be noted however that extremely cold weather was uncommon during these two periods and daily maximum temperatures were below ($0^{o}F$ ($-18^{o}C$) on only two days. Moose hunting therefore occurred primarily on days with freezing temperatures during these periods of alternating above and below freezing temperatures.

The examination of specific weather conditions within the periods in which intensive moose hunting occurred therefore indicates that the days which were chosen for actual hunts could be characterized as having: more frequent light snowfalls, more frequent moderate winds, and fewer high temperatures, than did the total of all days typical of those periods. This suggests a selection of moose hunting days generally coincident with the days identified preferred days for moose hunting in Waswanipi hunting recipes.

The fact that this was not a typical year enhances this coincidence because if it had been typical, the Waswanipi would presumably have been hunting more on uncrusted snows. And, the recipes for hunting indicate that selection of preferred conditions is more critical on high but uncrusted snow because moose

Table 9-8 Wind Speed on all Days In Moose Hunting Periods[1] and on Days With Moose Hunts, Winter Hunting Season, 1968-69

Windspeed[2] (m.p.h.)	Number of Days	Percentage of Days	Percentage of Moose Hunts	Number of Moose Hunts
0-4	11	20	0	0
5-9	30	56	67	8
10-15	13	24	33	4
16+	0	0	0	0
Totals	54	100	100	12

Footnotes:

1. For definition of moose hunting periods see text.
2. Data from tally sheets recorded at Chapais radar weather station (5612) and provided by Service de Météorologie de Québec.

Table 9-9 Maximum Daily Temperature in Moose Hunting Periods[1] and on Days With Moose Hunts, Winter Hunting Season, 1968-69

Temperature[2] F^{o} (C^{o})	Number of Days	Percentage of Days	Percentage of Moose Hunts	Number of Moose Hunts
Below $0^{o}F$ ($-18^{o}C$)	2	4	0	0
$0^{o}F$ to $32^{o}F$ ($-18^{o}C$ to $0^{o}C$)	37	69	92	11
Above $32^{o}F$($0^{o}C$)	15	28	8	1
Totals	54	101	99	12

Footnotes:

1. For definition of Moose Hunting periods see text.
2. Data from tally sheets recorded at Chapais radar weather station (5612) and provided by Service de Météorologie de Québec.

are more mobile under those conditions than they are on crusts.

The analysis of moose hunting activity in general therefore indicates that successful hunts occur: almost entirely under the conditions of snow depth and crusting which the Waswanipi and biologists identify as being associated with concentration of moose populations and restriction of moose mobility; mainly on locations the Waswanipi claim and biological data suggest would be the areas of moose concentration in the Waswanipi area during such snow conditions; and, that the days on which successful hunts occur indicate a selection for the specific weather conditions the Waswanipi hunting recipes identify as maximizing the chances of a successful and easy hunt.

Furthermore, it is worth noting that these data also bring out how different hunters, working in isolation, all can respond to the same weather conditions with similar and culturally appropriate behavior. This is demonstrated by the clustering of activity during and around two distinctive weather periods. And, it is indicated by the fact that in the time between the two periods of intensive hunting, i.e., from February 13 to March 7, at least three moose hunts occurred on the relatively isolated date of February 19, 1969, see data in the next section. February 19 was characterized by the highest depth of snow cover up to that point in the winter, 40 inches, and by adequate winds for relatively low risk hunting.

Nevertheless, despite the general correspondence of behavior and recipes, the data also indicate that hunters took advantage of both uncommon but particularly suitable conditions for hunting and chance occasions for hunting, which were not explicitly part of the hunting recipes. While not part of the hunting recipes such events are explainable culturally and are culturally meaningful.[7]

iv) The Reliability of Waswanipi Moose Hunting Activities

The analysis of the conditions of moose hunts indicates that Waswanipi hunts generally conform to the recipes for moose hunting which the Waswanipi claim make it a reliable and efficient activity. The focus of the remainder of this discussion of moose hunting will be on evaluating the reliability and efficiency of the activity.

It must be noted first, that the analysis has to this point only considered those hunts in which moose were killed. This has been necessary because most diaries were primarily daily records of harvests, so the occurrence of a hunt was only recorded when it resulted in a kill. Only those records which either listed the various parts of the day or which otherwise listed several activities for each day included reports of the occasions on which moose were looked for but not found.[8] While five diaries provided detailed breakdowns, one was that of a young man who did no moose hunting, one was for the fall period only, when no moose hunting was done, and one did not include moose hunting data although the total harvest was reported. Two diaries therefore provide data on occasions when moose were sought but none were killed. These are the diaries from groups 68B and 68C, discussed in the Chapter 8.

Two questions seem important here: What was the ratio of unsuccessful searches to successful hunts for these two hunting groups? Can these results be compared and generalized to all hunting groups? Several problems must be noted before turning directly to these questions.

One problem is defining the hunt as a unit of activity. For purposes of this analysis I will simply define a hunt as being any day when a hunter actively sets out to find signs of a moose, or when he intentionally or unintentionally encounters a moose or moose signs whether or not a moose is killed. If one or more hunters travel together I will consider it a single hunt. This definition conforms adequately to the reports of "looking for moose" or "hunting" moose in the diary records, and it can be unambiguously applied to the data available. This however is a different definition of the hunt than the one I have been using up to this point, where the hunt was equivalent to a day with a successful harvest. I will call the unit just defined a hunt-day.

This is also a different definition than the one the Waswanipi would use, as I have indicated, and it is different especially with respect to the problem of how to distinguish among hunts. As has been indicated in Chapters 5 and 6 of this study, the process of hunting for the Waswanipi is often continuous over a long period of time. Hunts are interrelated and a particular kill of an animal may be related to a dream, or to sightings of animals, which occurred some time earlier, the previous summer, or a full year previous. In this sense the question is when does a hunt begin and end. The problem is brought out in accounts of moose hunting by the Waswanipi. One moose hunt described by an older man involved sending his sons to look for moose in a particular area. They searched the area, found many signs, but could not locate the moose. The older hunter went to the area some time later, located the moose and killed them. The older man appears to have considered this one hunt, although it involved different hunters present on different days, and although it occurred on two days. In another story, a hunter saw signs of moose on a hill and returned early in the morning several days later when he expected the weather would change and it would become a good day for hunting. The weather did not change and he simply returned home. This happened on three successive days until finally a change in the weather provided the right conditions for stalking the moose and killing them. This extended period of activity was described as a single hunt.

Accounts of the belief system given previously, and specific accounts of moose hunts, indicate that under these conditions there is only a single hunt in the view of the Waswanipi because there is one relationship involved between a particular group of animals and a particular human being, the leader of the hunting group, or a hunter. Thus in the cases described above, there was one hunt begun and successfully completed through the relationship between the leader of the hunting group and particular moose.

A single hunt, in the hunters' view, may therefore extend over a period of days and involve discontinuous hunting and several hunters as long as the presumed animal and the hunt leader are the same. And all these activities are considered to have been successful, if moose are killed at the end. In other words, the success or failure of a hunt so defined is not a daily outcome, but an outcome that may be the culmination of several days of unsuccessful activity and possibly of the activity of several people.

Because many of these complexities only became clear to me during the second year of my fieldwork, when concentrating on the belief system analysis, I do not have suitable data to interpret accurately the hunters' views of the number and identity of the hunts recorded in the diaries I collected at the end of the first year. For the present analysis and for the evaluation of success and failure of hunting activity, I can only therefore use my own definition of a hunt. While this suits the present analysis, it makes direct comparison of these results with Waswanipi statements of the reliability of moose hunting difficult.

Using the definition provided above, group 68B conducted eleven hunt-days. Of these, three resulted in moose kills, two located fresh signs of moose, one of the two cases having been discovered unexpectedly while preparing a trail to move the camp, one hunt-day was spent following up signs found on the previous day, and five did not result in any signs or moose being located (Table 9-10). The case when fresh moose signs were discovered after a search might have been followed up with additional hunt-days, but it occurred during a stay in another hunting camp on the way to their own hunting territory and they continued on to their own camp as soon as the weather was suitable for travel. I do not know if the hunters in the other hunting group followed-up those signs. The case of the hunter who unexpectedly saw some fresh moose tracks also might have resulted in a harvest under other conditions. He returned to camp immediately and the next morning he and his son returned to the site of the signs and according to the diary record kept by the son:

> "My father and I went to see the moose tracks this morning, but we didn't see the moose. He already ran away. We didn't kill it, cause it was too far to haul the meat" (Diary kept by #61).

It also may be worth noting that they had already killed five moose that winter

Table 9-10 Number of Moose Hunt-Days, and Sightings and Kills of Moose, For Two Waswanipi Hunting Groups, 1968-69

Hunters Reported In Diary	Number of Moose Hunt-Days[1]	Number of Moose Hunt-Days On Which: No Signs or Moose Were Found	Signs of Moose Were Found	Moose Were Found	Moose Were Killed	Number of Moose Killed
52 and 61	11	5	2[2]	3	3	5
53 and 59	7	5	0	2	1	2

Footnotes:

1. See text for definition.
2. Includes one day on which moose signs were found unexpectedly.

and had abundant supplies of meat. For present purposes, it seems best to include these hunt-days in the evaluation of hunting reliability, although it is also worth noting that this last moose might have been hunted and possibly killed under other conditions.

Given eleven hunt-days and three days with moose harvests, 27 percent of hunt-days of this hunting group resulted in harvests.

The diary for hunting group 68C indicates there were seven hunt-days in this group. One ended with a harvest, one ended in a moose running away, and five concluded with finding no signs or moose. Fourteen percent of hunt-days of this hunting group resulted in harvests.

Group 68C was approximately half as successful as group 68B by these calculations. Because I only have data for these two groups, the question arises whether there are grounds to consider these two groups typical of the range of the variation in the ratio of hunt-days to harvests that might be expected among all hunters. One check on this is to compare the occasions for moose hunting of these two hunting groups and see if they are similar to the distributions of the days with moose harvests recorded from the larger sample of hunting groups. Another is to consider the total harvests of these two groups in relation to the harvests of all hunting groups.

Group 68C looked for signs of moose without finding any and/or without killing any on January 17, 18 and 19, March 5, 7 and 19, and successfully killed moose on March 27, 1969. Comparing this distribution of hunt-days to the distribution of successful hunts reported earlier (Table 9-1), the first set of hunt-days in January occurred in the week immediately prior to the week in which four hunts were successful, and just prior to the commencement of the period of rapidly changing weather which began January 20, 1969. The second hunt-day period, March 5 and 7, included the day moose was sighted by hunters of group 68C, but not killed, March 5, and coincided with two successful hunts by other hunting groups on March 7, the day the second period of fluctuating weather began. The hunt-day on March 19 occurred within that second weather period and one day after a successful hunt. In general then, the hunt-days of group 68C corresponded quite closely to the distribution of successful hunting days of the larger sample of hunting groups.

Group 68B looked for signs of moose without finding any and/or without killing moose on January 6, 14, 16 and 20, February 19 and 21, and sighted signs of moose on January 7 and unexpectedly on March 12, 1969. These dates, with the exception of January 6 and 7, coincide very closely with the distribution of successful moose hunts by other groups and the times when the hunters in group 68C were also looking for moose.

The general coincidence of hunt-days which were unsuccessful with those that were successful and with appropriate conditions for relatively high hunting success indicates that at least with respect to these environmental variables the two hunting groups were similar to the larger sample.

It will also be recalled that these two hunting groups, 68B and 68C, were found to bracket the majority of all hunting groups when all were ranked in terms of their harvest of moose and beaver per adult-day of subsistence demand (Figure 8-1). It is therefore likely that the level of success attained in moose hunting activities also roughly indicates the range of success likely to have been attained by all other hunting groups. I will assume that groups 68C and 68B represent reasonable approximations of the lower and higher ends of the range of reliability of moose hunting by Waswanipi hunters. I therefore assume that most Waswanipi hunting groups would make moose harvests on between 14 and 27 percent of hunt-days.

When calculated on the basis of harvests per hunt-day the uncertainties involved in killing a moose on any given hunt-day are of the order of one in four to one in seven. There is then a significant uncertainty factor in moose hunting.

This is so, even though hunt-days are only undertaken during periods in which moose are relatively concentrated, in which the moose are immobile or less mobile than the hunter and even though the majority of hunt-days are days when the conditions for successful stalking are favorable. Because mobility of moose is highly limited on these occasions it appears that more of the uncertainty associated with moose hunting would be associated with locating the moose than with the actual stalking and killing of a moose once it has been located. This is supported by the data available. For hunters 53 and 59 the seven hunt-days resulted in the discovery of moose or moose signs on two days, and in the killing of moose on one of these two days (Table 9-10). For hunters 52 and 61, excluding the day when moose signs were found inadvertently and the succeeding day when the hunt was not pursued with vigor, nine hunt-days resulted in four sightings of moose, and in the killing of moose on three of these days. The percentage of hunt-days on which hunters were successful locating animals or signs of animals therefore were 27 and 44 percent, whereas the percentage of days on which animals or signs of animals had been found which resulted in a successful hunt was 50 and 75 percent. These figures indicate that locating moose is about twice as uncertain as is the killing of moose once the signs have been located.

This is consistent with Waswanipi beliefs. The Waswanipi say that finding signs of moose is an indication that they will be given the moose and they also say that when they find sings of moose they are "happy" because they then expect they will be "eating moose". However, even a level of 50 to 75 percent success once signs of moose are located does not fully reflect the certainty with which Waswanipi typically speak of moose hunting success. This probably stems from differences in the definition used in this analysis and that used by the Waswanipi hunters to delimit a moose hunt, and to distinguish one hunt from another.

v) The Efficiency of Waswanipi Moose Hunting Activities

While moose hunting activity has significant uncertainty attached to it, the efficiency of the activity must be assessed separately because, as the Waswanipi say, there is lots of meat. I want therefore to establish the inputs and outputs of moose hunting activity in terms of labor required and food produced, and to link these in terms of the ratio of energy outputs to energy inputs.

Data come from two diary samples which, as indicated in the previous section, had the only complete data available on the process of hunting moose. As established previously, I will continue to assume that these two cases are approximate brackets for the range of values that would likely characterize a more complete sample.

I will here define moose hunting activity as including all the time hunters spend looking for signs of moose, looking for moose themselves, killing moose, butchering moose into large sections at the site of the kills, and transporting the sectioned moose back to the camp. Moose hunting activity will be considered to be complete when the sectioned animal carcass is at the camp and is ready for further processing. The processing it receives at the camp will depend on whether it is to be used shortly, put up for long-term storage or given away. This juncture therefore will be taken as the completion of the hunt and the commencement of food processing.[9]

Because the moose hunting activities of hunters who kept diaries were concentrated primarily on two intensive periods of moose hunting, and no significant differences in timing of hunts are apparent among hunters, I will treat the data on the labor inputs to moose hunting on the basis of the allocations made during the entire period covered by the diaries. The figures will therefore be considered typical of the winter hunting periods.

Hunters 52 and 61 and hunters 53 and 59 engaged in eleven and seven hunt-days respectively during the winter of 1968-69, but a hunt-day is not an accurate measure of labor inputs. Group 68B was composed of two hunters, a father and a son, the son being an active hunter, and the father being a hunter who had just retired at the end of the previous winter. On some moose hunt-days one or the other of them went hunting alone, on other days they hunted together. On some moose hunt-days they hunted only half a day, on other days they hunted all day. Counting the number of men active each day, and counting half-days as well as full days, a total of thirteen man-days were spent looking for signs of moose and killing moose during the eleven hunt-days.

Group 68C was comprised of four adult men during the period of moose hunting, a father and three sons. The father was a retired hunter who was still physically active, one son was part-time hunter and two were inexperienced hunters. Only the father and the first son actively participated in the moose hunts, although sometimes accompanied by the two inexperienced sons. The latter will not be considered in this tabulation. The seven moose hunt-days involved a total of ten man-days of hunting, taking account of who was involved and of half-days of moose hunting.

After the moose are killed the hunters typically butcher the moose into sections on the spot, temporarily store most of the carcass, and then return to camp with several small morsels, particularly of internal organs. The hunters will then return to the site of the kill on another day shortly thereafter with toboggans and dogs in order to haul the carcasses back to their camps over the course of a day or two. Hunters 52 and 61 spent part or all of five days hauling moose, for a total of five man-days of work. Hunters 53 and 59 spent one full day, for a total of two man-days hauling moose meat. This averages to one man-day for hauling per moose harvested.

In total then, hunters 52 and 61 spent a total of eighteen man-days moose hunting during the winter, and hunters 53 and 59 spent a total of twelve man-days. To estimate the energy expenditure for work per man-day hunting moose I will use the general estimate for the daily caloric cost of work for a hunter on a hunting day in winter derived in the previous chapter, namely 2,797 Calories per man-day.

As the output of their work hunters 52 and 61 caught 5 moose and hunters 53 and 59 caught two moose. The total man-days moose hunting thus amounted to 3.6 and 6.0 man-days per moose harvested or 0.28 and 0.17 moose per man-day moose hunting (Table 9-11). Given that each moose provides 342 pounds of meat, a

Table 9-11 Number of Man-Days Moose Hunting, Harvest, Returns of Food Weight and Energy Per Man-Day, and Ratio of Energy Output to Input, for Two Waswanipi Hunting Groups, 1968-69

	Number of Man-Days Moose Hunting				Per Man-Day Hunting			
Hunters Reported In Diary	Looking For Signs and Moose	Hauling Moose Carcasses	Total Moose Hunting	Total No. of Moose Killed	No. of Moose	Pounds of Meat[1]	Calories of Available Food Energy[2]	Ratio of Energy Output to Energy Input[3]
52 & 61[4]	13	5	18	5	0.28	95	109,858	39.3:1
53 & 59[5]	10	2	12	2	0.17	57	65,915	23.6:1

Footnotes:

1. Based on 342 pounds of edible food per moose (see Chapter 8).
2. Based on 395,487 calories per moose (see Chapter 8).
3. Based on 2,797 work input per hunter per day on a full hunting schedule.
4. Hunting group 68B.
5. Experienced Hunters in hunting group 68C.

man-day of labor in moose hunting provided 95 and 57 pounds of meat. In energy terms, a moose provides an estimated 395,487 calories of energy, and a man-day of moose hunting therefore provided 109,858 and 65,915 Calories of available food energy. Given a work energy input of 2,797 Calories per man-day to produce the harvest, the output-input ratio for moose hunting was 39.3:1 and 23.6:1 for the two groups of hunters.

While I cannot compare these results directly to comparable estimates for other groups for lack of adequate activity records, I consider these values probably bracket most of the range of values that would be determined with more extensive data, for the reasons cited above. These measures indicate a very high efficiency for moose hunting, even by world standards, and I will consider these values in comparative perspective later in this chapter.

C - Beaver Hunting

The Waswanipi say that beaver colonies are easy to locate because their lodges and constructions are readily visible, and that beaver hunting is therefore a relatively reliable activity. They also say that beaver hunting is efficient at most periods of the year, but especially throughout the winter hunting season; with the exception of a brief period in the middle of winter when beaver are said to be less active.

Waswanipi models of the reliability and efficiency of beaver hunting are related to: sub-seasonal variations in hunting success, efforts and harvests; selectivity for large and medium sized beaver; and, the choice among alternative techniques of beaver hunting. Each of these general factors will be assessed below.

At a more detailed level, the reliability and efficiency of beaver hunting depend on models of decisions about trap location, timing of hunting, frequency of checks and other activities, all of which are themselves dependent on detailed knowledge of the relationship of beaver behavior to recognized environmental features. Scientific knowledge of the relationship of beaver to their environment is summarized in Appendix 9-5,[10] and a conclusion that can be drawn from that review is that scientific knowledge extensively coincides with Waswanipi knowledge. A direct assessment of the efficiency of Waswanipi micro-level hunting techniques is however beyond the scope of the data I have available. How effectively the Waswanipi put their detailed knowledge to use will therefore be evaluated by assessing the overall reliability and efficiency of Waswanipi beaver hunting. This assessment is made at the end of this section.

i) Variation in Beaver Hunting Activity by Hunting Period

In contrast to the hunting of moose, beaver were hunted every week of the winter hunting period. Weekly harvests however vary significantly, from 63 beaver in one week to 5 in another (Table 9-12). Using the harvest data in all completed diaries a weekly overview of beaver hunting can be drawn for 24 hunters in the pre-New Year's period and 25 during the post-New Year's period, which is approximately a 40 percent sample of Waswanipi hunters who were in bush camps in 1968-69. The weekly variability of beaver harvests reflects the number of hunters in the bush in different weeks, the intensity of beaver hunting while in the bush, and the relative success of beaver hunting at different times.

The winter trapping season can be divided into seven periods on the basis of Waswanipi beaver hunting activity. The first, the late fall period, began November 1 and continued for three weeks until the completion of freeze-up. The lakes in the region generally froze over between November 8 and 10, 1968, and the rivers a week or ten days later. The period of pre-freeze-up beaver hunting was therefore relatively brief because most Waswanipi hunters attempted to leave for their bush camps just a week or two prior to the expected date of commencement of freeze-up. This period was followed by the early winter beaver hunting period when beaver were hunted through the ice, which was not yet very thick.

Both periods were characterized by high levels of participation and relatively good harvest levels. During the late fall and early winter hunting periods 24

Table 9-12 Number of Hunters and Number of Beaver Harvested Per Week by Beaver Hunting Period, Winter Hunting Season, 1968-69

Beaver Hunting Period[1]	Week Beginning On:	No. of Hunters In Bush Camps[2]	No. of Beaver Harvested	Beaver Per Hunter Per Week	Average Hunters Per Week[2]	Average Beaver Per Hunter Per Week
Late Fall	Nov. 1	17	32	1.9		
	Nov. 8	24	49	2.0	21.7	1.7
	Nov. 15	24	33	1.4		
Early Winter	Nov. 22	24	35	1.5		
	Nov. 29	24	36	1.5	23.3	2.0
	Dec. 6	22	63	2.9		
Christmas-New Year's Holiday	Dec. 13	12	21	1.7		
	Dec. 20	2	5	2.5	6.7	1.5
	Dec. 27	4	6	1.5		
	Jan. 3	9	9	1.0		
Middle of the Winter	Jan. 10	21	10	0.5		
	Jan. 17	21	17	0.8	21.0	0.7
	Jan. 24	21	15	0.7		

(CONTINUED)

Table 9-12 Number of Hunters and Number of Beaver Harvested Per Week by Beaver Hunting Period, Winter Hunting Season, 1968-69 (Continued)

Beaver Hunting Period[1]	Week Beginning On:	No. of Hunters In Bush Camps	No. of Beaver Harvested	Beaver Per Hunter Per Week	Average Hunters Per Week	Average Beaver Per Hunter Per Week
Mid-Winter	Jan. 31	25	36	1.4		
	Feb. 7	25	48	1.9		
	Feb. 14	25	52	2.1		
	Feb. 21	25	43	1.7	25.0	1.8
	Feb. 28	25	44	1.8		
	March 7	25	49	2.0		
	March 14	25	36	1.4		
Easter Break	March 21	24	19	0.8		
	March 28	22	9	0.4	16.4	0.7
	April 4	12	7	0.6		
	April 11	13	12	0.9		
	April 18	11	9	0.8		
Early Spring	April 25	12	26	2.1		
	May 2	10	35	3.5		
	May 9	9	45	5.0	10.0	3.6
	May 16	12	45	3.8		
	May 23	7	29	4.1		

Footnotes:

1. See text for breakdown of beaver hunting periods.
2. Record for 24 hunters up to Christmas-New Year's Holiday and 25 hunters thereafter.

out of the 24 hunters whose harvests were recorded in the diaries were in the bush for the majority of four of the six weeks. A hunter is considered to have spent the week in the bush if he was out of the settlement at bush camps for at least four days of the week. An average of 1.7 to 2.0 beaver were harvested per hunter per week during this period (Table 9-12). It should be noted however that the latter period includes one week with an exceptional harvest, the week of December 6, the week just prior to the departure of many of the hunters for their Christmas visits to the settlements. This probably reflects a desire to bring fresh meat back to the settlements for holiday feasts and gift exchanges to people living in the settlement. From the week of December 13, 1968 to the week of January 3, 1969 was the Christmas-New Year's holiday period. An average of only 6.7 hunters were in the bush per week during these four weeks, and during Christmas week only two hunters spent the majority of the week in the bush. The number of beaver harvested per hunter per week during the holiday period, for those hunters who continued to hunt, is roughly comparable to the harvest during the late fall and early winter hunting periods, 1.5 beaver per hunter per week (Table 9-12).

The three weeks from January 10 to January 30 were distinctive in that most hunters returned to the bush camps, 21 out of 25 hunters in the post-New Year's diaries were in the bush each week, but beaver harvests per hunter per week were significantly less than those of the earlier periods, 0.7 beaver per hunter per week. This represents a fifty percent decline from the preceeding period. This decline could have been the result of either a decline in the intensity of beaver hunting efforts and/or of a decline in the harvests per unit of effort.

In order to distinguish between, and therefore measure more accurately, the impact of variations in hunting effort and of variations in hunting return per unit of effort, I have analyzed the more detailed data on daily activities that were available in the eight diaries. These detailed diaries can be used, as in the case of moose, to determine both the harvest and the actual man-days spent hunting beaver. The time spent hunting beaver which did not result in a harvest is clearly recorded in these diaries. The productive efficiency is calculated as the beaver harvested per man-day hunting. The intensity of beaver hunting is calculated as the percentage of all man-days during the period which were in fact devoted to beaver hunting.

For those hunting groups which kept comprehensive records of daily activities, it is therefore possible to compare intensity of beaver hunting and productivity of hunting for the different periods (Table 9-13).[11] These indicate that the intensity of beaver hunting in the middle of winter period is the same as in the early winter period when 54 percent of available man-days were spent in beaver hunting. The intensity of beaver hunting was also relatively high for the middle of winter period compared with the intensities in later periods (Table 9-13).

However, the detailed data show that a significant difference occurs in the productivity of hunting in the middle of winter period compared with the preceeding periods. Only 0.33 beaver were caught per man-day in the middle of winter period, whereas 1.01 beaver were caught per man-day in the early winter. While the records being compared are not all for the same hunters nor the same hunting year, the difference is considerable. The low harvest per man-day beaver hunting in the middle of winter period is also indicated by comparison with the following period when beaver harvests per man-day were up to 0.67 beaver per man-day, for many of the same hunters during the same hunting year (Table 9-13). Beaver harvests per man-day were therefore lower in the middle of winter period than in the early winter and mid-winter periods.

Waswanipi recipes for beaver hunting posit such a decline in the productivity of hunting. The Waswanipi say that the beaver are less active during this period and this explanation would appear to coincide with the winter metabolic depression in beaver physiological functioning and activity reported by biological scientists (Appendix 9-5). The metabolic depression of beaver is related to climatic conditions and appears to be a means of reducing or eliminating the energy deficit beaver experience during mid-winter conditions

Table 9-13. Man-Days Beaver Hunting, Harvest Per Man-Day, and Intensity of Beaver Hunting Activity By Beaver Hunting Periods

Beaver Hunting Period and Year[1]	Hunters Recorded In Diaries	Man-Days Hunting Beaver	Harvest of Beaver	Beaver Per Man-Day	Percentage of All Man-Days In Period Spent Beaver Hunting
Late Fall and	61	11.5	9	0.78	55
Early Winter,[2]	28	16	17	1.06	76
1969[3] (21 days)					
1968 (42 days)[1]	28	18	20	1.11	43
	All	45.5	46	1.01	54
Middle of Winter,	52 and 61	28	8	0.29	70
1969 (20 days)	68	11	5	0.45	55
	53	4	1	0.33	20
	All	43	14	0.33	54
Mid-Winter, 1969	52 and 61	41	27	0.66	48
(43 days)	68	22	14	0.64	51
	53	6	1	0.17	14
	44 and 45	56	42	0.75	65
	All	125	84	0.67	48

CONTINUED

Table 9-13. Man-Days Beaver Hunting, Harvest Per Man-Day, and Intensity of Beaver Hunting Activity By Beaver Hunting Periods (Continued)

Beaver Hunting Period and Year[1]	Hunters Recorded In Diaries	Man-Days Hunting Beaver	Harvest of Beaver	Beaver Per Man-Day	Percentage of All Man-Days In Period Spent Beaver Hunting
Easter Break, 1969 (40 days)	52 and 61	21	7	0.33	26
	68	0	0	-	0
	53	4	3	0.75	10
	44 and 45	11	5	0.45	14
	95	3	1	0.33	8
	98	2	0	0	5
	All	41	16	0.39	13
Early Spring, 1969 (35 days)	52 and 61	14	8	0.57	20
	68	3.5	4	1.14	10
	53	0	0	-	-
	44 and 45	22	25	1.14	31
	95	11	11	1.00	31
	98	10	6	0.60	29
	All	60.5	54	0.89	22

Footnotes:

1. For definitions of the periods see text. No data are available for one period, Christmas-New Year's holiday, and the one hunter who provided data on the late fall period is grouped with the data on early winter of 1968.
2. Data from two hunters for the early winter period are from the beginning of the 1969-70 winter hunting season, data for all other periods are for the 1968-69 winter hunting season.
3. Freeze-up came somewhat later in 1969-70 than in 1968-69, so that the early winter period probably includes data for about one week when not all water bodies were frozen. Beaver hunting, however, would have been most active on the lakes and streams that freeze first.

when the quality of food available is relatively poor and considerable energy must be spent maintaining body temperatures and the temperature of the lodges during the cold period. However, whereas the scientists attribute the mechanism initiating the metabolic depression to the changing periods of daylight, the Waswanipi simply say that it is the extreme cold of mid-winter that explains the change in beaver activity.

The week following the period from January 10 to 30 was one of both active moose hunting and also of active beaver hunting, indicating that it is possible to pursue both activities intensively. This can be done because moose hunting generally does not involve many man-days. For the seven weeks from January 31 until March 14, all 25 hunters recorded in the post-New Year's diaries were in the bush and harvests per hunter per week ranged from 1.4 to 2.1 (Table 9-12). The average 1.8 beaver per hunter per week was approximately the same as during the early winter period. The latter three weeks of this period coincided with the second period of intensive moose hunting without causing any shift in beaver caught per hunter per week.

From the detailed man-day data it would appear that the intensity of beaver hunting during this period was somewhat lower than in the previous period, but that there was a relatively good harvest of beaver per man-day of work, 0.67 beaver per man-day (Table 9-13).

From March 21 to April 24 a period of declining participation in hunting occurred as hunters came out of the bush for the Easter holidays. The decline was slow, not all hunters made trips to town, and those trips that were made did not overlap as extensively as at Christmas, so that there were always more than ten hunters in the bush during this period (Table 9-12).

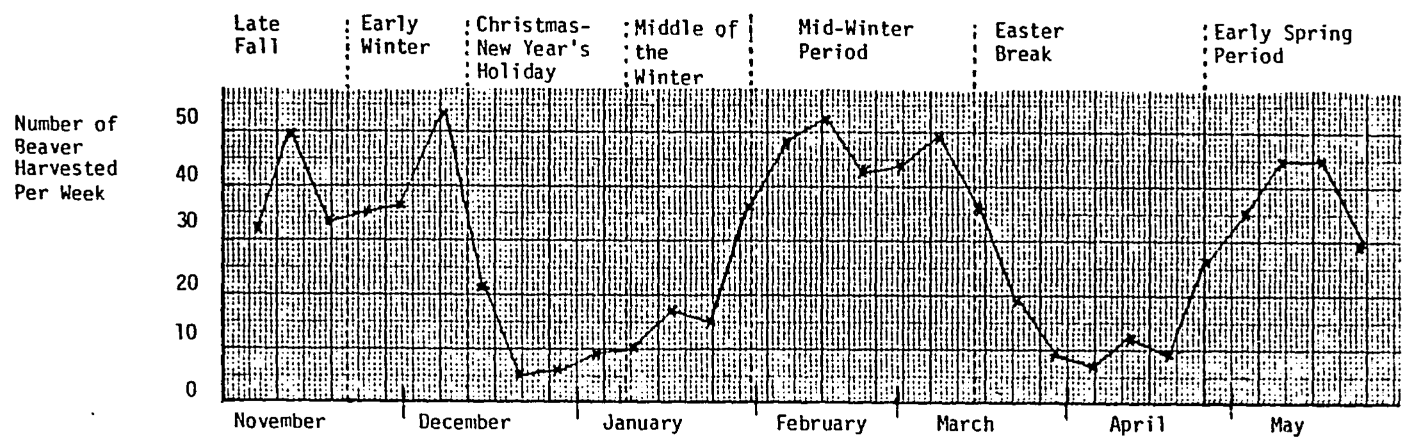
The harvests of beaver per hunter per week declined significantly to 0.7, the level characteristic of the middle of winter period (Table 9-12). The reduction in harvests of beaver per hunter per week is attributable to both a decline in beaver hunting effort and a decline in the efficiency of effort. The data on harvests of beaver per man-day of hunting during this period indicate a productive return of 0.39 beaver per man-day or about 42 percent less than the previous period (Table 9-13). The percentage of man-days spent beaver hunting also declined from 48 to 13 percent. The reduction from 48 percent of available man-days to 13 percent is not simply a question of holiday visits, which only occur during part of the period. If the periods of holiday visits are excluded, hunting occupied 32 percent of all available man-days in the bush or about one-third less time than during mid-winter.

This reduction of beaver hunting effort is related to the supply of bush foods already produced as well as to the relatively low efficiency of beaver hunting during this period. This is indicated by the fact that whereas beaver hunting is not quite as inefficient during this period as during the middle of winter period, the intensity of beaver hunting during the middle of winter period is substantially greater than during the Easter break.

The final period begins the last week of April and extends to the end of May. Break-up occurred on shallow lakes on April 29, 1969, so that most of this period had open water. Many hunters did not return to bush camps after the Easter break preferring to stay in the settlements and do waterfowl hunting and fishing from the settlements. Those who stayed in bush camps participated in those hunting activities, but also were able to hunt beaver intensively, shooting them in open water. The hunters who did this averaged 3.6 beaver per hunter per week or double the rate of the mid-winter and early winter hunting periods (Table 9-12), which reflects an increase in the harvests of beaver per man-day of beaver hunting (Table 9-13).[12]

The overall pattern of the weekly harvests of beaver is graphically presented on Figure 9-2 and it indicates the three peak periods of harvests, early winter, mid-winter and early spring.[13] These periods correspond to the non-holiday periods with the highest rates of efficiency of beaver hunting. However, as already indicated, beaver hunting intensity does not simply reflect the relative efficiency of beaver hunting.

Figure 9-2. Number of Beaver Harvested Per Week, Winter Hunting Season, 1968-69



ii) Selectivity and Termination of Beaver Hunting

The Waswanipi models of beaver hunting give priority to methods and means for hunting beaver that are said to make it possible to harvest a higher proportion of large and medium sized beaver and a lower proportion of small beaver than actually occur in the population being harvested. Waswanipi knowledge of beaver behavior and organization coincides so extensively with biological findings on the same topics that the claim to be able to harvest selectively is plausible and worth testing.

After the winter hunting season of 1969-70, a series of hunters were asked to indicate on maps the beaver colonies at which they had hunted the previous season and what number and size of beaver had been caught at each colony. A total of 30 hunters were interviewed in this series. I analyzed only the data from those hunting territory areas for which data were available on all the hunters who had used that area during the season.[14] The data have thus been aggregated into nine hunting territory units for analysis. Some hunters were active on more than one unit, others on none of these nine hunting territories.

The 27 hunters included caught a total of 814 beaver while hunting on these territories, at a total of 258 beaver lodges, for an average harvest per lodge of 3.16 beaver.[15] The range from hunting territory to hunting territory was from 4.00 beaver per lodge to 2.31 beaver per lodge (Table 9-14). The hunters were clear that this does not represent a full trapping of all beaver at the colonies. The hunters consider that they have, in most cases, stopped hunting at colonies before all the beaver were caught. On one hunting territory, four of forty-nine colonies were said to be trapped out, and on another territory 4 of 32 colonies. These limited data suggest that only 1/6 to 1/12 of lodges hunted are considered to be trapped out by the hunters themselves.

The actual distribution of the sizes of the beaver caught has been totalled by hunting territory (Table 9-15). Overall, 47 percent of the beaver caught were large beaver, 31 percent were small and 23 percent were medium sized. The assessment of these figures requires an evaluation of how many colonies included large, small and medium beaver, and the probable number of beaver of each size in the population.[16]

Table 9-14 Beaver Hunters, Beaver Colonies, and Beaver Harvests for Mapped Colonies, 1969-70

Hunting Territory Number	No. of Hunters	Colonies		Beaver Harvested		
		Number Hunted	Per Hunter	Number	Per Hunter	Per Colony
I	2	27	13.5	94	47.0	3.48
II A+B	6	46	7.7	151	25.2	3.28
VII	3	27	9.0	65	21.7	2.41
XII	2	11	5.5	44	22.0	4.00
XIII	4	32	8.0	74	18.5	2.31
XV	7	49	7.0	163	23.3	3.33
XVIA	4	28	7.0	94	23.5	3.36
XVIII	2	11	5.5	42	21.0	3.82
XIX	2	27	13.5	87	43.5	3.22
ALL	30[1]	258	8.6	814	27.1	3.16

Footnote:
1. Some hunters used more than one of these traplines.

Table 9-15 Size Structure of Beaver Harvests by Hunting Territory for Mapped Colonies, 1969-70

Hunting Territory Number	Number of Beaver Harvested				Percentage of Beaver Harvested		
	Large	Medium	Small	Total	Large	Medium	Small
I	36	40	18	94	38	43	19
II A+B	70	38	43	151	46	25	28
VII	29	11	25	65	45	17	38
XII	22	0	22	44	50	0	50
XIII	35	15	24	74	47	20	32
XV	89	26	46	161[1]	55	16	29
XVIA	40	24	30	94	43	26	32
XVIII	20	3	19	42	48	7	45
XIX	38	26	23	87	44	30	26
All	379	183	250	812[1]	47	23	31

Footnote:

1. The sizes of two beaver caught on hunting territory XV were ambiguously recorded by the author in the field, and these two beaver have been dropped from the analysis of beaver sizes.

The case of large beaver is relatively simple. All beaver colonies can be assumed to have had large beaver present. While it is not entirely impossible to have no adults present because of previous harvesting, this is unlikely in the present context because the data used here are complete for the hunting season and it is unlikely that any colony formed in the fall prior to the hunting season which did not have adults.

Given that adults were present in all 258 colonies, large beaver were actually caught at 219 colonies or 85 percent (Table 9-16). Furthermore the most common harvest of adult beaver at a colony was two adults, and two adults or more were caught at 51 percent of all colonies (Table 9-17). In one-third of the cases only one large beaver was caught before harvesting was ceased and at fifteen percent of the colonies no large were caught. Thus, while it was most common to harvest two large beaver per colony, there was an approximately equal number of colonies at which less were harvested.

A rough estimate of the intensity of utilization of large beaver can be made on the basis of a number of assumptions. In the great majority of colonies it can be assumed that only two large were present, one mating adult male and one adult female. Only in cases of colonies in over-populated regions may offspring beaver stay with the colony past their second year and, thereby, create a situation where more than two large beaver live in the same colony (Appendix 9-5). In fact, the hunters caught more than two large beaver in 18 of the colonies trapped, 7 percent of the total colonies. This is therefore a minimum estimate of the number of colonies with more than two large beaver. A minimum estimate of the number of large beaver in the population living in the colonies hunted by this sample of hunters would therefore be: 258-18 = 240 colonies with two large beaver each, or 480 large beaver; plus 18 colonies with at least an average of 3.5 large beaver (Table 9-17) or 63 large beaver; total minimum estimate, 543 large beaver. The actual harvest of 379 large beaver at these 258 colonies is therefore seventy percent of estimated minimum number of large beaver present.

Table 9-16 Number of Beaver Colonies and Percentage of Beaver Colonies at Which Large, Medium and Small Beaver Were Harvested Respectively, Mapped Colonies, 1969-70

Sizes of Beaver	Colonies	
	Number	Percentage
Large	219	85
Medium	103	40
Small	130	50
All	258	-

Table 9-17 Number of Each Size of Beaver Caught at Individual Mapped Colonies, 1969-70

Size of Beaver Caught at Colony	Colonies at at Which That Size Was Caught	Harvest Per Colony	Number Caught Per Colony 0	1	2	3	4+
Large							
Number of colonies	219		39	86	115	9	9
Percentage of all colonies (N=258)	85		15	33	45	3	3
Harvest at all colonies		1.47					
Small							
Number of colonies	130		60	51	52	18	9
Percentage of colonies assumed with small (N=190)[1]	68		32	27	27	9	5
Harvest at colonies assumed with small (N = 190)[1]		1.32					
Medium							
Number of colonies	103		N.A.[3]	35	61	3	4
Percentage of colonies with medium (N=?)[3]	N.A.[3]		N.A.[3]	34	59	3	4
Harvested at colonies with medium (N=?)[3]		N.A.[3]					

Footnotes:

1. Number of colonies in which medium or small beaver were captured.
2. Number of colonies in which medium or small beaver were caught. Definitely a low estimate.
3. Not available.

A comparable assessment must be made for the harvest of small sized beaver. Small sized beaver were harvested at 130 colonies or 50 percent of all colonies (Table 9-16). Small beaver, however, are not found in all colonies. When a new colony is established it will consist only of adults the first winter and the young will be born in the spring and every year thereafter. The number of colonies at which only large beaver were caught, 68 colonies. is therefore a maximum estimate of the number of colonies in which there may not be small beaver. Because harvesting was incomplete at some 85 to 90 percent of the colonies, it is reasonable to assume that continued harvesting would have uncovered additional small and or medium beaver at some of these colonies, so that at least 190 colonies had small beaver present.

In one-third of the colonies assumed to have small beaver, no small beaver were harvested, 60 colonies (Table 9-17). By way of contrast then, the Waswanipi harvested the highly desirable large beaver at 85 percent of the colonies at which they occurred, whereas they harvested less desirable small beaver at a maximum of 68 percent of the colonies at which they occurred (Table 9-17).

The harvest of 1.47 large beaver per colony assumed to have large beaver may be contrasted to a maximum of 1.32 beaver per colony which have small beaver (Table 9-17). This difference would be greater if the actual number of large and small beaver in each colony were considered. There would be expected to be at least two and a half to three small beaver per colony with small beaver (Appendix 9-5), that is there would probably be more small beaver per colony than there are large beaver per colony. As I have already noted, the harvest of large beaver is seventy percent of the number of large beaver present. If there were 2.5 small beaver per colony, then the reported harvest of small beaver would have been a maximum of 53 percent of the total number of small beaver present, and if there were 3 small beaver per colony then the percentage would be a maximum of 44 percent harvested.

The internal data on the harvests therefore indicate a selectivity for large beaver and/or a selectivity against small beaver in Waswanipi harvesting. The status of medium beaver cannot be readily evaluated. The extent of the selectivity however is not as extensive as might have been expected, a total of 31 percent of the beaver harvest is small beaver. It would appear then that while the Waswanipi are selective with respect to the size of the animals they harvest, they are only successful to a partial degree.

One dimension of choice which affects the actual number of small and medium beaver which are caught is the decision concerning when to stop trapping at a colony or group of colonies. Two rules were identified in Chapter 6 for terminating trapping: to stop when two large beaver have been killed, and to stop when all the large plus medium beaver have been killed. I hypothesized in that chapter, that the rule for more intensive hunting might be used when a series of approximately five beaver colonies were located along a stream or adjacent streams so that they could form a convenient daily circuit for checking traps. And, I hypothesized that where a circuit that did not permit efficient checking on a daily round of colonies could not be created, for example on isolated streams with only one or two colonies, or on some lakes or rivers, then hunting would be terminated according to the less intensive rule.

The actual distributions of harvests at a lodge are indicated on Table 9-18. Since both of the rules cited would result in the capture of two or more large beaver, I have grouped together all lodges at which two or more large beaver were caught. These account for 52 percent of the colonies sampled. However, at one third of the colonies only one large beaver was caught, and at 15 percent no large beaver were caught. The percentage was approximately the same whether medium beaver were caught or not. Thus, at nearly 50 percent of the colonies hunted the capture of beaver was stopped before two large beaver were caught, and this indicates that fewer beaver are caught than the explicit rules would indicate.

This could be the result of terminating hunting at colonies that were located where they could not form convenient daily circuits. But, because only 19

Table 9-18 Frequency With Which Two or More, One, or No Large Beaver Were Caught at a Colony

Whether Medium Beaver Were Caught	Number of Large Beaver Harvested		
	Two or More Large Beaver	One Large Beaver	No Large Beaver
No medium caught	80	60	15
Medium Caught	53	26	24
Total	133	86	39
Percentage of Total	52	34	15

percent of the colonies are not located on streams (Table 9-19), this would require that there was less intensive hunting on streams as well as on lakes and rivers. The data on this possibility indicate only a weak relationship.

The average number of beaver harvested on streams with only two and three colonies, as opposed to streams with four or five colonies was similar, 2.9 large plus medium beaver in both cases (Table 9-20). However, medium beaver were caught more frequently at colonies on two and three colony streams. This implies that these were larger colonies, and that hunting was terminated more frequently at these colonies before two large beaver were caught. Using a modified Waswanipi model for deciding on beaver colony size and composition, based on the presence or absence of the various sizes of beaver in the harvest, I have classified the type of colony present at each lodge and have estimated the number of beaver in each colony. Using this estimate I have calculated the percentage of the beaver present that were harvested. This hypothetical calculation suggests a slightly less intensive harvest of beaver at colonies on streams with only two and three colonies as opposed to streams with four and five colonies. In the former case an estimated 70 percent of the colony was harvested, in the latter 74 percent. The difference however is relatively small and it does not explain the high frequency of colonies at which trapping is terminated before two large beaver are caught.

The data therefore indicate that the Waswanipi terminate their hunting at nearly half the beaver colonies they hunt before they have caught either two big beaver or all the big and medium beaver. This is probably related in some cases to the spatial organization of the colony groups, but it appears to be a more wide spread phenomena than would be caused simply by that feature. An alternative explanation of the reasons for terminating hunting at beaver colonies can be offered. I would hypothesize that whether a hunter is visiting two or five beaver colonies on a daily circuit, he must make a decision whether or not to return to continue to hunt those colonies as a group. Once he has caught the desired number of beaver, either two adults or all large plus medium, at a colony he will take his traps out from that colony, so that

Table 9-19 Type of Water Body on Which Mapped Beaver Colonies Were Located

Type of Water-Body	Number of Colonies	Percentage of Colonies
Stream	240	81
Lake	43	14
River	10	3
Unidentified	5	2
	298	100

Table 9-20 Comparison of Beaver Harvest Intensities at Colonies on Streams With More Than Two And With Two or Less Beaver Colonies

Streams and Colonies	Average Number of Beaver			Harvested Beaver as a Percentage of Beaver Present[1]
	Harvested		Unharvested[1]	
	Large Plus Medium	All		
4 & 5 Colony Streams	2.9	3.7	1.3-1.4	74
3 & 2 Colony Streams	2.9	3.8	1.7-1.8	70

Footnote:

1. Assumes minimum colony size, see text.

the number of colonies he will visit the next trip will be reduced. When he has removed his traps from approximately half the colonies at which he was trapping on that circuit he will generally remove his traps from the remaining colonies rather than continue until he has taken the number of beaver formulated in the rule from every last colony. This would not apply, of course, in cases where the remaining colonies on a circuit may be conveniently regrouped with other colonies to form a new circuit. Such practice would explain why the number of beaver caught at about half the colonies is less than the rules for terminating hunting would lead one to expect. Unfortunately, I did not see this issue when doing fieldwork and I do not have data on beliefs or action that are adequate to test the hypothesis.

iii) Choice of Methods of Harvesting

Two main techniques of hunting beaver during the period of the ice cover are recognized by the Waswanipi, trapping, and waking the beaver and driving them out of the lodge, a technique that may be accompanied by breaking the dam and/or the setting of nets. Trapping is said to be selective with respect to the size of the beaver caught, to be more efficient if few beaver are to be caught, to require fewer people, and be usable at all sites. Waking the beaver is said to be relatively unselective with respect to size in the sense that the whole colony is disrupted, to be less efficient unless it is desired to kill most of the beaver at a large colony, to require a minimum of two persons, and to be usable only at some stream locations. Waking the beaver is said to have the advantage of producing harvests more quickly than trapping, but the disadvantage of usually disrupting the colony with more severe reproductive and conservational consequences than trapping. Choice between the methods can therefore be based on and constrained by several factors, including locational and manpower requirements, comparative reliability and efficiency, immediacy of needs and conservational considerations.

Most of the beaver colonies are located on streams in the Waswanipi region and most beaver colonies hunted are on stream locations (Table 9-19). In a recent aerial survey by helicopter of beaver colonies on the La Grande River to the far north of the Waswanipi region, 71 percent of colonies located were on streams, 20 percent were on lakes and 9 percent on rivers (Brodeur, Tessier, Cloutier, 1977:13). While these figures need not apply precisely to the Waswanipi region, the fact that two times as many colonies occurred on streams as occurred on lakes and rivers in the La Grande basin suggests that it is also likely that stream locations are more common than river and lake locations over a much wider area. An aerial survey of the Waswanipi region which lightly surveyed the area indicated that 88 percent of the active colonies seen were on streams, 9 percent were on lakes and 3 percent on rivers (Emond, 1967). This corresponds reasonably well to the distributions identified by the more intensive aerial surveys on the La Grande River considering that the aerial survey at Waswanipi was made from an airplane, and that river and lake shore colonies are hard to identify from the air because they do not usually build dams, and may not build lodges (Appendix 9-5).

Therefore, approximately three-quarters of the colonies at which the Waswanipi hunters might have hunted were on streams. While it is unknown exactly how many of these colonies had sites that met the other physical conditions needed to successfully use the techniques for waking the beaver, from general discussions with hunters I would say that it is likely that a substantial percentage of the colonies located on streams were suitable for the use of this technique. Thus, while techniques of waking the beaver can only be used on stream sites that meet certain physical conditions this constraint appears to be broad and probably at a majority of sites a choice is possible between trapping techniques and techniques for waking the beaver.

Similarly, while waking the beaver requires two hunters at a minimum, most beaver hunting was in fact done by two or more hunters working together, whether waking the beaver or trapping. Therefore, the choice between methods must in fact be made usually on grounds other than the manpower requirements of the methods _per se_.

Three of the diary records with detailed daily accounts include details of the methods of beaver hunting used during the post-New Year's period.[17] The record of hunters 52 and 61 and the accompanying map indicate that they woke the beaver at nine of the twenty-eight colonies at which they hunted, or just under one-third of the colonies. They trapped at the other nineteen colonies. The diary and maps for hunter 68 indicate that he woke the beaver at seven of twenty lodges hunted, or just over one-third, and that he trapped at the others. The records of hunters 44 and 45 indicate that they woke the beaver at 5 colonies, but I do not know the total number of colonies at which they trapped.

Time spent waking the beaver acounted to 2.0 or 2.1 man-days per hunter per colony (Table 9-21)[18]. The man-day totals include the time of other members of the commensal units who occasionally joined the hunters to wake the beaver, the wife of hunter 52 joined on three occasions, and the widowed mother of hunter 68 joined on one occasion. Hunter 68 usually hunted with another hunter for whom there is no diary record. Therefore, the labor inputs and the harvests of this hunter are not included in these tabulations, although his participation was critical to the ability of hunter 68 to use the method of waking the beaver.

Comparing the data from diary records and interviews, there are several differences in the use of the techniques of waking the beaver between the hunters. Hunter 68 and his partner would drive the beaver out of the lodge to catch them either in the net, bank burrows or a trap. But he did not generally report breaking the lodge open. Presumably the beaver were driven out by noise and by poking sticks into the lodge but without destroying the lodge. Hunters 44 and 45 generally followed a similar pattern setting a net on all but one occasion, when they staked a lodge closed and opened the lodge to catch the beaver inside. Hunters 52 and 61 usually, although not always, drained the water from the pond, even in mid-winter when this must have been quite difficult, before breaking the lodge. This led to somewhat different daily scheduling. On several occasions hunters 52 and 61 broke the dam late on one afternoon and then returned to camp without trying to capture the beaver. On one occasion they had to wait another day and return on the third day before the pond finished draining and only then did they begin to search for the beaver.

Table 9-21 Man-Days Beaver Hunting by Different Methods, Diary Records, 1968-69

Method Beaver Hunting	Hunters Reporting in Diary	Man-Days Per Hunter Beaver Hunting	Number of Beaver Colonies Hunted	Man-Days Per Hunter Per Colony
Waking the Beaver	52 and 61	21.5	10	2.1
	68	10	5	2.0
	44 and 45	6	-[1]	-[1]
	All	37.5	15	2.1[2]
Trapping	52 and 61	27.5	19	1.5
	68	22.5	14	1.6
	44 and 45	33	-[1]	-[1]
	All	83.0	33	1.5[2]

Footnote:

1. Not available.
2. Only for hunters 52, 61 and 68.

This difference is related to another feature of the hunting. Hunters 52 and 61 consistently returned to a colony, whereas hunter 68 did this less often. Not counting the dates on which only the dam was broken and no searching was done, hunters 52 and 61 averaged 2.4 visits to colonies at which hunting was done by waking the beaver. Hunter 68 and his partner, however, hunted several colonies by waking the beaver while they were on overnight trips and hence returned less often to these colonies, averaging 1.8 visits per colony. The fact that hunter 68 generally did not break the lodges may be a response to the fact that he and his partner did not anticipate returning regularly to follow up the hunt. One colony to which they did return several times was visited once every few days, a technique that I believe would have been ineffective if the lodge had been broken, because of a low survival rate of the beaver in cold weather without adequate shelter (Appendix 9-5).

Differences between the methods of waking the beaver and trapping are also clear. Only one colony being hunted by waking the beaver was visited a day and each colony required extended, often full day, stays. Several colonies that were being hunted with traps could be visited a day. The nineteen colonies that were trapped by hunters 52 and 61 were visited a total of at least 55 times, a minimum of 2.9 times each, but the total man-days per hunter per colony was only 1.5 compared to 2.1 man-days per colony hunted by waking the beaver (Table 9-21). Data on the frequency of visits are not available for hunter 68, but the total man-days he spent per colony at trapped colonies was also lower than the total man-days he spent per colony at colonies where he woke the beaver (Table 9-21). Thus, there were more frequent visits to colonies being trapped but less total time was spent at a trapped colony than at colony where the beaver were hunted by waking them.

However, hunters 52 and 61 averaged three times as many beaver harvested per hunter per colony when they were waking the beaver than when they were trapping and hunter 68 averaged 27 percent more beaver per hunter per colony by waking the beaver than trapping (Table 9-22). This suggests a higher reliability and efficiency when waking the beaver than when trapping.

Table 9-22 Beaver Harvested Per Colony at Colonies Hunted by Different Methods, Diary Records, 1968-69

Method of Beaver Hunting	Hunters Reporting in Diary	Number of Beaver Harvested Per Hunter	Beaver Harvested Per Hunter Per Colony	Percentage of Colonies "Cleaned Out"
Waking the Beaver	52 and 61	15	1.5	44
	68	7	1.4	-[1]
	44 and 45	6.5	-[1]	
	All	28.5	1.5	
Trapping	52 and 61	10	0.5	-[1]
	68	16	1.1	-[1]
	44 and 45	24.5	-[1]	
	All	50.5	0.8[2]	

Footnote:

1. Not available.
2. Only for hunters 52, 61 and 68.

In terms of overall reliability, that is, the percentage of the days which beaver are sought which resulted in the harvest of at least one beaver, the method of waking the beaver is more reliable than trapping, although the patterns for the different groups of hunters were not consistent.

Overall, hunters 52 and 61 had greater reliability when waking the beaver than at trapping, in the case of hunter 61 very much greater reliability, whereas hunters 68, 44 and 45 had somewhat higher reliability trapping than they did waking the beaver (Table 9-23).[19] There are much greater differences in the reliability of hunting by different hunters when they are trapping than when waking the beaver. This may be indicative of a greater difficulty of trapping.

With respect to overall efficiency of hunting by the two methods, waking the beaver is usually more efficient than trapping, and is at least as efficient as trapping. Hunter 68 harvested almost the same number of beaver per man-day by trapping as by waking the beaver, 0.71 versus 0.70, whereas hunters 52 and 61 and hunters 44 and 45 were substantially more efficient waking the beaver than they were trapping (Table 9-24).

These data indicate that although more man-days may be spent per colony when waking the beaver than when trapping, the catch of beaver per colony is higher when waking the beaver than when trapping, and waking the beaver produces at least as many and generally more beaver per man-day than will trapping, even though fewer colonies are trapped per week.

This indicates a relative efficiency for waking the beaver that was not reported to me in the Waswanipi recipes for hunting. It is therefore interesting to examine the contexts in which waking the beaver was used as a harvesting method to see whether the hunters give general priority to the more efficient method.

Before examining the situations in which hunters chose to wake the beaver by hunting, I want to note that waking the beaver does produce harvests more quickly than does trapping. Of the five colonies at which hunter 68 harvested

Table 9-23 Percentage of Days With Harvests When Beaver Hunting by Different Methods, Diary Records, 1968-69

Method Beaver Hunting	Hunters Reporting in Diary	Number of Days Searching or Checking	Number of Days With Harvests	Percentage of Days With Harvests
Waking the Beaver	52	21	12[1]	57
	61	20	12[1]	60
	68	8	4	50
	45	6	4[1]	67
	44	6	4[1]	67
	All	61	36	59
Trapping	52	22	10[1]	45
	61	36	9[1]	25
	68	22	12	55
	45	30	21[1]	70
	44	30	21[1]	70
	All	140	73	52

Footnote:

1. Hunters 52 and 61 and hunters 44 and 45 always worked together when waking the beaver and sometimes worked together when trapping beaver, so these are not separate cases. Because they reported combined harvests on days when they worked together I have assumed that if two or more beaver were caught each hunter caught one, and I have also assumed that the days when only one beaver was caught it was caught one time by one hunter and the next time by the other.

Table 9-24 Efficiency of Hunting Beaver by Different Methods, Diary Records, 1968-69

Method of Beaver Hunting	Hunters Reporting in Diary	Man-Days per Hunter	Number of Beaver Harvested Per Hunter	Beaver Harvested Per Man-Day
Waking the Beaver	51 and 62	21.5	15	0.70
	68	10	7	0.70
	44 and 45	6	6.5	1.08
	All	37.5	28.5	0.76
Trapping	51 and 62	27.5	10	0.36
	68	22.5	16	0.71
	44 and 45	33	24.5	0.74
	All	83.0	50.5	0.61

by waking the beaver, harvests were made on the first day at three colonies or 60 percent. They were caught only on the third day at a fourth colony, and not at all at one colony visited only once. Not counting days when only the dam was broken but beaver were not searched for, hunters 52 and 61 caught beaver on the first day at six of the nine colonies hunted by waking the beaver and, on the second day, at the other three. Thus, beaver were caught on the first day 60 to 67 percent of the time when using the method of waking the beaver and they are caught on the second day on most other occasions. Trapping would not provide comparably quick returns because traps are checked at the minimum on the second or third day following setting.

One reason for waking the beaver was to make a rapid harvest while travelling Hunters 52 and 61 hunted by waking beaver while travelling to their camp after the Christmas-New Year's holiday. They had been stopped at the camp of another hunter, a son of hunter 52, by weather conditions that were not suitable for travelling on to their own camp. Hunters from both camps went out on five successive days to wake the beaver at one colony. Each day hunters 52 and 61 thought they might be able to depart the next day, but the weather kept them at the camp where they had stopped. Other times when the beaver were hunted by being woken, as a means to have a quick harvest, occurred on two of the occasions when hunter 68 was travelling.

The second type of occasion when the beaver were awakened was when habitation sites were changed either to a new camp or when returning to a camp from trips to town or vice versa. Beaver are awakened at this time presumably because fresh food supplies at the camp are desired and waking the beaver will bring in a fresh supply quickly. It is so especially when a new camp is moved into, because there either is no bush food supply, or the supply of bush food already accumulated will often have to be moved to the new camp later, on special trips sometime after the camp and personnel have moved. Arrival at camps were by far the most common occasions for waking the beaver. Hunters 52 and 61 woke the beaver immediately following camp moves on four occasions. On three of these they hunted at one lodge each time. On the other occasion they rapidly hunted at four lodges close to their camp in succession, over a period of eight days, and then moved camp again. This may have involved both hunting after a move and hunting during a travel sequence. Hunter 68 woke the beaver on two occasions immediately after returning to his bush camp from extended visits to the settlement. Hunters 44 and 45 hunted the beaver by this method on two occasions just after returning to their camp, and once just before leaving camp for the settlement. The latter hunt presumably was to bring additional fresh food with them to their habitation in town.

A third reason for wanting a quick harvest was the approach of break-up. Hunters 44 and 45 set a beaver net just before break-up in the late winter, again presumably to assure themselves of having fresh food during the few days of break-up when hunting normally stops.

One final occasion for waking the beaver was a failure of trapping. On January 12, 1969, during the middle of winter period, hunters 52 and 61 returned to their camp from New Year's holidays and set traps at several colonies in an area which they had other traps already set. On the next four consecutive days they checked the traps in rotation getting nothing the first day, and a muskrat in one of the beaver traps on each of the next three days. The next day, January 17, 1969, they broke the dam of a beaver colony and then returned for four consecutive days to wake the beaver. They got nothing the first day and then one beaver a day for three days. On this last day, January 21, 1969, they started checking their traps again and got nothing the first day, a muskrat the second day and then they caught one beaver on each of the two successive days. In the next two weeks they only trapped. This situation includes a number of indicators of 'bad luck' with trapping which occurred prior to the choice to wake the beaver. The capturing of muskrats is a sign that a hunter will not catch beaver until there is a change of season or hunting method and it was the middle of winter when beaver are known not to be very active. Waking the beaver brought them 'luck', and after that they returned to trapping with somewhat better success.

All together, these four types of occasions account for 87 percent of the occasions on which these hunters woke the beaver (Table 9-25).

Table 9-25 Reasons for Using the Method of Waking the Beaver, Diary Records, 1968-69

Reason for Waking the Beaver	Hunters Reporting in Diary				
	52 and 61	68	44 and 45	All Cases	Percentage of Cases
Returned or leaving bush camp	4[1]	2	3	9	56
Travelling, short stay	1	2	0	3	19
Break-up approaching	0	0	1	1	6
'Bad luck' trapping	1	0	0	1	6
Unknown	0	1	1	2	13
	6	5	5	16	100

Footnote:

1. Includes one occasion on which four colonies were hunted in rapid succession. Might be also considered a case of a short stay at a camp.

This indicates that, despite the fact that waking the beaver is generally more efficient than is trapping the beaver, it is in general only used as a technique on certain kinds of occasions, most commonly when a quick harvest is required. Thus, in total only one-third of the colonies were hunted by this method, although it appears likely that many more colonies could have been hunted by waking the beaver had the hunters so desired. The reasons for limited utilization of this method would appear to rest more heavily on the known conservational factors that weigh in favor of trapping and against waking the beaver, than they rest on factors of the relative efficiency of the methods, or the limitation of physical site requirements, or man-power needs. Thus, although Waswanipi hunting recipes indicate a number of criteria for the priority of trapping, it appears that the conservational factor is the most important one that most weighs in its favor,[21] and the rapidity of harvest is the most important factor in favor of waking the beaver. The seasonal distribution of beaver hunting activities, the selectivity of harvests and the priority use of a harvesting method that is less efficient but is better for conservation all demonstrate the general correspondence between recipe and performance, although specific points of disagreement have been noted. This correspondence would appear to to depend on the extensive knowledge the Waswanipi have of beaver populations and behavior. Such knowledge would also be the basis of the Waswanipi claim that beaver hunting is relatively reliable and efficient.

iv) Overall Reliability of Beaver Hunting Activities

There is a total of six diaries which included information on the days spent checking traps and searching for beaver at ponds after chasing them out of the lodge, and whether or not beaver were in fact harvested on that day. These diaries include the records of nine hunters, the five analyzed in the previous section, and four others.[22,23]

The percentage of days spent checking traps, or actively searching for beaver at lodges at which the beaver had been awakened, and on which harvests were actually made varied from 31 to 71 percent, with a mean of 54 percent for nine hunters (Table 9-26).

Table 9-26 Percentage of Days Beaver Hunting With Harvests, Diary Records, 1968-69

Hunters Reporting in Diary	Period Reported	Number of Days Searching or Checking	Number of Days With Harvests	Percentage of Days With Harvests
28	11/1/68-12/22/68	14	10	71
95	4/7/69-5/15/69	13	4[1]	31[1]
98	4/7/69-5/15/69	12	7[1]	58[1]
53	1/8/69-4/30/69	6	3	50
Above		45	24	53
61	1/6/69-5/24/69	56	21[1,2]	38[1]
52	1/6/69-5/24/69	43	22[1,2]	51[1]
68	1/6/69-5/6/69	31	16	52
44	2/3/69-5/25/69	46	30[1,2,3]	65[1]
45	2/3/69-5/25/69	46	30[1,2,3]	65[1]
Above		222	119	54
All		267	143	54

Footnotes:

1. Hunters 95 and 98, 44 and 45 and hunters 61 and 52 often hunted together in pairs at the same colonies. The data for each individual of a pair are therefore not completely separate cases.

2. In order to separate hunters who recorded their harvests aggregated together with those of another hunter, I have assumed that days on which only one beaver was caught and one hunter did not make a harvest were split evenly between the hunters; and, I have assumed that days on which two or more beavers were caught, both hunters caught at least one.

3. The total for hunters 44 and 45 are not the sum of the previous totals for beaver caught by trapping and waking because additional harvests by hunting from a canoe in early spring are included in this table.

There was, however, some variation by hunting period. I have grouped the hunting dates into the three broad periods, early winter or pre-Christmas, middle of winter plus mid-winter or New Year's to Easter, and late winter plus early spring or post-Easter. In the early winter hunting period of 1968-69 there is only one diary record, and it has a relatively high percentage of beaver hunting days with harvests. In order to check this value, two partial records were kept during the early winter hunt of 1969, see Footnote #11, one by hunter 28 and one by hunter 61. They had 58 and 79 percent respectively of beaver hunting days with harvests, average 67 percent. This figure is similar to the early winter hunt of number 28 in 1968, and relatively higher than for the other hunting periods in 1968-69. In the New Year's to Easter period hunters averaged 53 percent of days with harvests, similar to the yearly average, and after Easter the percentage was about the same, 50 percent (Table 9-27).

There was, in short, a greater reliability before Christmas, and a decline in the reliability of beaver hunting after the Christmas-New Year's holiday. This may coincide with changes in beaver activity levels.

v) Overall Efficiency of Beaver Hunting Activities

The efficiency of Waswanipi beaver hunting activities has been described for the different techniques of beaver hunting and for various periods of beaver hunting. To estimate the overall efficiency of beaver hunting, the man-days spent looking for beaver colonies and the man-days setting traps and breaking dams must be included along with the man-days spent checking traps and searching for beaver that have been driven from the lodge (Tables 9-28 and 9-13). Aggregating all data for 1968-69, the difference between the efficiency of the hunters (Table 9-29) is less variable than the difference in efficiency previously reported by beaver hunting period (Table 9-13). Since differences between hunters appear to be less significant than differences between hunting periods, the analysis of the range of efficiencies is based on variations between hunting periods.

When the data are tabulated by hunting period (Table 9-30), the range of beaver

Table 9-27 Percentage of Days Beaver Hunting With Harvests, by Hunting Period, Diary Records, 1968-69

Hunting Period	Hunters Reporting in Diary	Number of Days Searching or Checking	Number of Days With Harvest	Percentage of Days With Harvests
Early Winter Hunting (Nov.-Dec.)	28	14	10	71
Middle of Winter and Mid-Winter Hunting (Jan.-March)	53	6	3	50
	44	31	20[1,2]	65[1]
	45	31	20[1,2]	65[1]
	61	44	16[1,2]	36[1]
	52	22	14[1,2]	65[1]
	68[3]	28	13	46
	All	162	86	53
Late Winter and Early Spring Hunting (April-May)	95	13	4[1]	31[1]
	98	12	7[1]	58[1]
	61	12	5[1,2]	42[1]
	52	21	8[1,2]	38[1]
	44	15	10[1,2]	67[1]
	45	15	10[1,2]	67[1]
	All	88	44	50

Footnotes:

1. See footnote 1, Table 9-26.
2. See footnote 2, Table 9-26.
3. Hunter 68 only hunted beaver on three days during late winter and early spring period, so only the January to March harvests are included on this table.

Table 9-28 Total Man-Days Beaver Hunting, Diary Records, 1968-69

Hunters Reporting in Diary	Man-Days Beaver Hunting Per Hunter		
	Looking for Colonies	Setting or Checking Traps, Nets, Breaking Dam or Searching Pond	Total
28	4	14	18
95 and 98	5	13.5	18.5
53	4	10	14
44 and 45	3.5	49	52.5
52 and 61	3	49	52
68	4	32.5	36.5
All	23.5	168	191.5
Percentage of All Man-Days	12	88	100

Table 9-29 Efficiency of Beaver Hunting, Diary Records, 1968-69

Hunters Reporting In Diary	Period Reported	Man-Days Beaver Hunting	Beaver Harvested	Beaver Harvested Per Man-Day
28	11/1/68-12/22/68	18	20	1.11
95 and 98	4/7/69-5/15/69	37	16	0.43
53	1/8/69-4/30/69	14	5	0.36
Above		70	41	0.59
52 and 61	1/6/69-5/25/69	104	50	0.48
68	1/16/69-5/6/69	36.5	23	0.63
44 and 45	2/3/69-5/25/69	105	73	0.70
Above		245.5	146	0.59

hunting efficiencies by period varies from 1.01 beaver per man-day in the late fall and early winter, to 0.33 beaver per man-day in the middle of winter, with an overall total of 0.68 beaver per man-day. A weighted average based on the distribution of man-weeks by season is slightly higher, 0.72 beaver per man-day.

The beaver harvested per man-day are the equivalent of between 5 and 16 pounds of food per man-day beaver hunting, annual average 11 pounds per man-day and between 8,851 and 27,088 Calories per man-day of beaver hunting, annual average 19,310 Calories per man-day. Assuming that an average man-day of beaver hunting requires an input of 2,797 Calories of work, see Chapter 8, then the ratio of energy inputs to outputs for beaver hunting at different periods varies from 3.2 to 1 to 9.7:1 and averages 6.9:1.

Beaver hunting is therefore more reliable, but less efficient than moose hunting. In order to consider the relative importance of those factors to hunting decisions, I will review the harvest schedules, reliability and efficiency of the hunting of fish, small game, waterfowl, and fur-bearers.

D - Fishing Activity

Fishing is done throughout the main periods of the year, most commonly with gill nets. Between freeze-up and break-up the nets are set under the ice by an ingenious method, and once they are set they can be checked later by just cutting open two holes in the ice, one at each end of the net.[24] In winter cutting the ice is heavy work. To set a net a series of holes must be cut and the time involved varies with the thickness of the ice. When the ice is thin in early winter, setting the net may take only a few hours, but when the ice is three or more feet deep by mid-winter a full day may be required for two men to set a net. Checking the net with thick ice may take more than two hours. During the mid-winter period hooks may also be set through the ice, especially when and where burbot spawn. During the period of open water, travel is by canoe with outboard motor and the travel work is presumably somewhat lighter than in winter. However, a recent study of energy costs of hunting activities in an arctic community indicates that the actual process of checking nets is similar

Table 9-30 Beaver Harvested Per Man-Day Beaver Hunting, Diary Records, 1968-69 and 1969-70[1]

Beaver Hunting Period, Dates[2]	Number of Hunters' Records	Man-Days Beaver Hunting	Beaver Harvested	Beaver Harvested Per Man-Day
Late Fall and Early Winter Nov. 1 to Dec. 12	3	45.5	46	1.01
Middle of Winter Jan. 10 to Jan. 30	4	43	14	0.33
Mid-Winter Jan. 31 to March 20	6	125	84	0.67
Easter Break March 21 to April 24	7	41	16	0.39
Early Spring April 25 to May 29	7	60.5	54	0.89
All	8	315	214	0.68
Weighted Average				0.72[3]

Footnotes:

1. Data from diary records listed on Table 9-13.
2. No data are available for the Christmas-New Year's holiday period.
3. Weighted by distribution of man-weeks.

Table 9-31 Beaver Per Man-Day Beaver Hunting, Return of Food Weight and Energy Per Man-Day, and Ratio of Energy Output to Input, by Beaver Hunting Period, Diary Records, 1968-69 and 1969-70[1]

Beaver Hunting Period	Per Man-Day Hunting: No. of Beaver	Per Man-Day Hunting: Pounds of Meat[2]	Per Man-Day Hunting: Calories of Available Food Energy[3]	Ratio of Energy Output to Energy Input[4]
Late Fall and Early Winter	1.01	16	27,088	9.7:1
Middle of Winter	0.33	5	8,851	3.2:1
Mid-Winter	0.67	11	17,969	6.4:1
Easter Break	0.39	6	10,460	3.7:1
Early Spring	0.89	14	23,870	8.5:1
All	0.72	11	19,310	6.9:1

Footnotes:

1. Based on diary records listed on Table 9-13.
2. Based on 15.8 pounds of food weight per animal.
3. Based on 26,820 calories per animal.
4. Based on 2797 calories of work energy expended per full day of hunting.

to the energy cost per unit of time for digging holes in the ice. While checking the net itself may be easier, stabilizing and moving the canoe by paddle while a second person is checking the net requires skill and considerable strength and energy (Shephard and Godin, 1976: Figure 1, page 108). The ecology of fish resources in the sub-arctic region is reviewed in Appendix 9-5.

Diary records which include the fish harvests of eleven hunters are available for the period up to the Christmas-New Year's holidays and those with the harvests of nine hunters for the periods thereafter. The weekly involvement and harvests vary considerably over the winter hunting season (Table 9-32 and Figure 9-3), and the entire season may be broken into six fishing periods on the basis of these variations. The periods roughly correspond to the beaver hunting periods.

During the two weeks before freeze-up more men were fishing than in any winter period, average of 8.5 men a week out of 11 hunters, and the fish harvest per fisherman per week was higher than during any period with an ice cover. In the following period, early winter, there was a drop in participation in fishing but only a limited decline in harvest per fisherman per week. In order to distinguish between changes in fishing intensity and fishing efficiency I have examined in detail the records for which the number of checks of the fishing equipment could be clearly established. The check of a net or of a series of set hooks is used here as a unit of fishing intensity. The frequency of net checks was lower during early winter than during pre-freeze-up, i.e., the number of days between checks was higher, 3.1 versus 2.3 (Table 9-33) and the harvest per net check was also lower after the freeze-up. Thus both fishing effort and fishing efficiency declined somewhat after freeze-up, partly because of the formation of the ice cover.

During the mid-winter period, when the ice was progressively thicker, these trends were accelerated. As a whole the mid-winter period was characterized by fewer fishermen per week than the pre-Christmas periods, longer periods between checks of nets or hooks, and fewer fish per check (Tables 9-32 and

Table 9-32 Number of Fishermen, and Fish Harvest Per Week by Fishing Periods, Diary Records, Winter Hunting Season, 1968-69

Fishing Period	Week Beginning	Fishermen[1]	Fish Harvest	Average Fishermen Per Week[1]	Fish Harvest Per Fishermen Per Week
Pre-	Nov. 1	10	170		
Freeze-up	Nov. 8	7	174	8.5	20.2
Early	Nov. 15	5	66		
Winter	Nov. 22	5	159		
	Nov. 29	6	64	5.6	16.1
	Dec. 6	6	73		
	Dec. 13	6	88		
Christmas-	Dec. 20	0	0		
New Years	Dec. 27	2	7	0.7	3.5
Holiday	Jan. 3	0	0		
Mid-Winter	Jan. 10	4	21		
	Jan. 17	4	25		
	Jan. 24	2	21		
	Jan. 31	2	14		
	Feb. 7	9	117	4.2	8.7
	Feb. 14	8	98		
	Feb. 21	4	29		
	Feb. 28	4	6		
	March 7	2	2		
	March 14	3	31		
Easter	March 21	6	60		
Break	March 28	4	24		
	April 4	0	0	2.0	8.4
	April 11	0	0		
	April 18	0	0		

(CONTINUED)

Table 9-32 Number of Fishermen, and Fish Harvest Per Week by Fishing Periods, Diary Records, Winter Hunting Season, 1968-69 (Continued)

Fishing Period	Week Beginning	Fishermen[1]	Fish Harvest	Average Fishermen Per Week[1]	Fish Harvest Per Fishermen Per Week
Early	April 25	0	0		
Spring	May 2	4	24		
	May 9	7	147	3.4	24.5
	May 16	4	161		
	May 23	2	84		

Footnote:

1. Record for 11 hunters up to Christmas New Year's holiday and 9 hunters thereafter.

Figure 9-3. Number of Fish Harvested Per Week, Winter Hunting Season, 1968-69

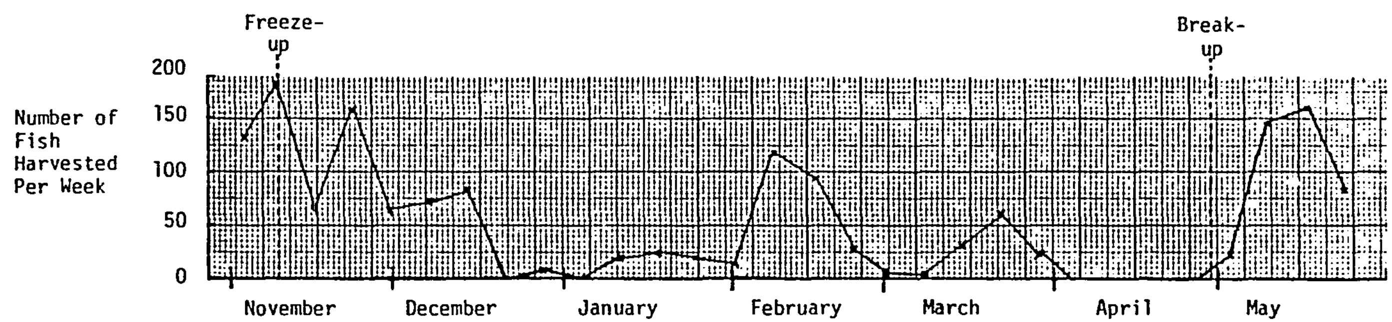


Table 9-33 Frequency of Checks of Fishing Equipment, Fish Harvest, and Number of Fish Per Check by Fishing Period, Diary Records, Winter Hunting Season, 1968-69

Fishing Period	Hunters Reporting in Diary	Number of Checks	Average Number of Days Between Checks	Fish Harvest	Average No. of Fish Per Check
Pre	44 and 45	7	1.5	156	22.3
Freeze-up	97 and 58	3	3.7	52	17.3
(14 Days)	81 and 87	5	1.5	77	15.4
	25	4	2.7	34	8.5
	All	19	2.3	319	16.8
Early	44 and 45	15	1.6	101	6.7
Winter	81 and 87	10	2.6	220	22.0
(35 Days)	25	5	5.0	111	22.2
	All	30	3.1	432	14.4
Mid-Winter	44 and 45	6	4.7	100	16.7
(70 Days)	97 and 58	7	6.4	47	6.7
	81 and 87	11	2.7	111	10.1
	25	3	16.0	31	10.3
	68	2	6.0	49	24
	95 and 98	6	4.2	9	1.5
	All	35	6.7	347	9.9
Easter	44 and 45	4	1.7	42	12.3
Break	81 and 87	3	3.5	42	14.0
(35 Days)	All	7	2.6	84	12.0
Early	44 and 45	9	1.7	151	16.8
Spring	52 and 61	2	1.0	19	9.5
(35 Days)	93 and 94	16	1.5	290	18.1
	All	27	1.4	460[1]	17.0

Footnote:

1. This total is larger than that listed for the early spring period on Table 9-32 because it includes a harvest of 47 fish on May 31, 1969.

9-33). The differences between these periods is due not only to ice conditions, it is also due to other factors. Just before freeze-up the whitefish spawning runs occur and some of the efficiency of the pre-freeze-up fishing compared to the underice fishing may be attributed to the concentration and accessibility of fish during spawning runs. In addition, fish nets can be checked frequently during the runs. Thus a net may be checked twice a day, and the chances of a catch on each check are high as I will indicate below. When hunters first arrive in the bush camp in the fall, fishing is therefore often one of the first activities undertaken, because it will provide bush food quickly and with relatively low uncertainty. Furthermore, a supply of fish for dog food is usually built up just after freeze-up, which will be sufficient to feed the dogs until harvests of other bush foods are sufficient to provide adequate viscera and surplus food with which to feed the dogs. There are thus several reasons why fishing is intense and efficient in the earlier seasons, and why both generally decline later.

The mid-winter period however is characterized by highly uneven weekly participation and harvests. The weeks of February 7 and 14, participation quadrupled from the previous two weeks, and the harvest more than quadrupled. This two-week period of intense, productive and relatively efficient fishing coincides with the spawning period of the burbot. The spawning was therefore a period in which higher harvesting efficiencies could be achieved and significant increases in the intensity of fishing occurred presumably in response to the increase efficiency. This corresponds with high participation in fishing during the pre-freeze-up fish runs, although several other reasons for high levels of participation in fishing during the pre-freeze-up period have been noted above.

During the Easter break period the efficiency of fishing is comparable to the mid-winter period and net checks are frequent, but as the break-up approaches fishing stops completely for about a month. Following the break-up of the ice, fishing recommences and, although participation is relatively low, 3.4 fishermen per week (Table 9-32), those who are fishing do so intensively. The number of days between net checks is only 1.4 and the harvest per check returns to the same level as characterizes the pre-freeze-up period, 17.0 fish per check.

In order to compare the efficiency of fishing to the efficiency of other harvesting activities it is necessary to convert the harvest per check into a harvest per man-day. This calculation must take account of the fact that while it is typical for two or more people, hunters or a hunter plus another person, to check fish nets together, checking a net does not usually take all day. In addition, the time spent setting and removing nets and hooks must be added to the time spent checking nets. I have therefore calculated the harvests per man-day by season for those diary records for which: I can identify all kinds of fishing activities; I know the number of people involved in the fishing; and I have data on the portion of each day which fishing activities occupied. These restrictions unfortunately limit the diaries that are usable to five diaries, and the hunters reporting in these diaries generally did not fish continuously but only during certain periods. I have therefore sought to evaluate and then aggregate the individual records by fishing periods.

The fish harvest per man-day by fishing periods varies in a pattern similar to the fish harvest per check. The harvest per man-day is similar in the pre-freeze-up and post-freeze-up periods and lower in the mid-winter and Easter break periods (Table 9-34). One anomaly occurs in the early winter period for which a particularly low efficiency was recorded, 3.2 fish per man-day (Table 9-34) in the only diary record available for the period. This one record reports a harvest per check of less than one-third the harvests per check reported in two other diaries for which harvests per man-day could not be calculated. Thus, hunters 44 and 45 harvested 6.7 fish per check in early winter versus 22.0 and 22.2 fish per check for hunters 81 and 87 and for hunter 25 respectively (Table 9-33). The difference suggests that the average harvest per man-day for the early winter period should be two to three times higher than it is for the group for which this variable can be calculated. This would place it between the ice-free and mid-winter values. Because of the apparent unrepresentativeness of this single value for the early winter period, I have dropped it from further analysis.

Table 9-34 Man-Days Fishing, and Harvest Per Man-Day by Fishing Periods, Diary Records, Winter Hunting Season, 1968-69

Fishing Period	Hunters Reporting in Diary	Man-Days Fishing	Fish Harvest	Fish Harvest Per Man-Day
Pre-Freeze-up	44 and 45[1]	16	156	9.7
	97 and 58[1]	6	52	8.7
	All	22	208	9.4
Early Winter	44 and 45[1]	32	101	3.2
Mid-Winter	44 and 45	11	100	9.1
	97 and 58	16	47	2.9
	68	4	72	18.0
	All	31	219	7.1
Easter Break	44 and 45	7	49	7.0
Early Spring	44 and 45	12	151	12.6
	93 and 94[1]	34	290	8.5
	52 and 61	1.5	19	15.3
	All	47.5	460	9.7
All Periods (excl. Early Winter)[2]		107.5	936	8.7

Footnotes:

1. Assumes two man-days setting and removing nets.
2. See text for discussion.

The efficiency of fishing by fishing period and for the entire winter hunting season have been calculated assuming 2.08 pounds of food per fish specimen, 1,190 Calories per fish specimen, and 2,797 Calories of work input per man-day fishing (Table 9-35). The range of caloric returns per man-day of fishing are from 8,330 to 11,543 Calories per man-day, and the average is 10,353 Calories per man-day fishing. This represents an efficiency of Caloric output to input of 3.0:1 during the period of ice cover, 4.0:1 during the open water periods just before and after the ice cover period and an average of 3.7:1 for the entire harvest of the winter hunting period. Fishing is therefore less productive than beaver hunting, although the least efficient periods of beaver hunting are about as efficient as fishing.

In terms of reliability, there were no cases of checking fishing gear without some harvests reported. In this sense fishing is 100 percent reliable. This may, however, over-state the case because a harvest of only one, two or three fish is being counted as a successful harvest. But one fish only provides 1,190 edible Calories and, given that 2,797 Calories may be expanded to catch that fish by a pair of fishermen, it would be somewhat misleading to say that the harvest was a success. I therefore measured success as a surplus of energy output over energy input. If we assume two fishermen working to check a net half a day each, then roughly three fish would be required to provide a caloric output greater than the input. On this basis, 12 percent of daily harvests were not successful. Fishing then is not more efficient than big game hunting, but it is more reliable, 88 percent reliable,

E - Hare and Grouse Hunting

Hare and the various grouses, including ptarmigan, are hunted throughout the winter hunting period. A cursory review of hare and grouse ecology appears as Appendix 9-6. From the perspective of the present analysis, the most important point to note is that these species are characterized by extreme variations in population sizes. In the case of hare the variation between peak population densities and low point population densities for the same area may be as much as 1000-fold difference. While such extraordinarily high variation would

Table 9-35 Fish Per Man-Day Fishing, Return of Food Weight and Energy Per Man-Day, and Ratio of Energy Output to Input by Fishing Period, Diary Records, Winter Hunting Season, 1968-69[1]

Fishing Period	Per Man-Day Fishing: No. of Fish	Per Man-Day Fishing: Pounds of Fish Food[2]	Per Man-Day Fishing: Calories of Available Food Energy	Ratio of Energy Output to Energy Input
Pre-Freeze-up	9.4	19.6	11,186	4.0:1
Mid-winter	7.1	14.8	8,449	3.0:1
Easter Break	7.0	14.6	8,330	3.0:1
Early Spring	9.7	20.2	11,543	4.1:1
All	8.7	18.1	10,353	3.7:1

Footnotes:

1. Data from diary records listed on Table 9-34.
2. Assumes a food weight of 2.08 pounds per fish specimen.
3. Assumes 1,190 calories per fish specimen.
4. Assumes 2,797 calories of work input per day of fishing.

not be typical of all areas, it is clear that the variations commonly exceed one order of magnitude, i.e., ten-fold increases and declines. With such variations it is impossible to speak of typical harvests or of typical hunting reliability or efficiency. For example, it is possible to compare the harvests of hare at the community of Fort George, Quebec, over a four-year period during a decline in populations. From 1971-72 to 1973-74, during a three-year interval, the estimated harvests of hare at that community dropped from 48,840 to 12,778 a drop of 74 Percent (Salisbury et al., 1972 and Weinstein, 1976). This continued for another year, the estimated harvest for 1974-75 being 2,340 hare (NHR, 1976a, Vol. 1: Table G-1, p. 308). Thus, in a four-year period a twenty-one fold decline in hare harvests occurred. Declines of a similar magnitude were reported at Eastmain (see NHR, 1976a, Vol. 1: Table G-8, p. 315).

During the actual period of the present study the hare and the grouses were all considered by the Waswanipi to be at relatively low levels of occurrence. These species are considered to have cyclical variations by some biologists, with five to ten year periodicities. The most that can be claimed for the present figures, therefore, is that they reflect the situation in the low years of the variations. Such years may account for some five or six years out of every ten years. In any case, the results presented here must be viewed judiciously because it is likely that not only total harvests, but also the reliability and efficiency of hunting activity, will vary under these significantly different conditions.

The harvests of hare and grouse per week vary from 0 to 70 hare and from 0 to 64 grouse for the nine hunting groups which reported harvests in the diaries (Table 9-36). This has been calculated as a harvest per hunting group rather than as a harvest per hunter because it was often unclear how many individuals were involved in the harvesting activity. Part of the ambiguity comes from the fact that the women in the hunting groups frequently set snares for hare and hunt grouses, as do the older boys and girls who are not pursuing other adult harvesting activities. While the harvests of the women and sub-adults were included in the diaries, their activity records were not usually included.

Table 9-36 Harvests of Hare and Grouse Per Week and Harvests Per Hunting Group By Week and By Hunting Period, Diary Records Winter Hunting Season, 1968-69

Hunting Period	Week Beginning	Hunting Groups Reporting	Hare Harvest	Hare Per Hunting Group	Grouse Harvest	Grouse Per Hunting Group	Hare Per Hunting Group Per Week	Grouse Per Hunting Group Per Week
Late Fall	Nov. 1	9	28	3.1	43	4.8		
and Early	Nov. 8	9	31	3.4	57	6.3		
Winter	Nov. 15	9	38	4.2	55	6.1	4.3	4.1
	Nov. 22	9	27	3.0	24	2.7		
	Nov. 29	9	31	3.4	35	3.9		
	Dec. 6	8	70	8.7	5	0.6		
Christmas-	Dec. 13	4	16	4.0	5	1.3		
New Years	Dec. 20	0	0	0	0	0	2.9	4.5
Holiday	Dec. 27	1	1	1.0	1	1.0		
	Jan. 3	3	6	2.0	30	10.0		
Mid-Winter	Jan. 10	7	14	2.0	52	7.4		
	Jan. 17	7	14	2.0	34	4.9		
	Jan. 24	7	4	0.6	35	5.0		
	Jan. 31	9	5	0.6	28	4.0		
	Feb. 7	9	9	1.0	45	5.0	1.5	5.1
	Feb. 14	9	10	1.1	37	4.1		
	Feb. 21	9	25	2.8	64	7.1		
	Feb. 28	9	19	2.1	56	6.2		
	March 7	9	12	1.3	43	4.8		
	March 14	9	13	1.4	39	4.3		

(CONTINUED)

Table 9-36 Harvests of Hare and Grouse Per Week and Harvests Per Hunting Group By Week and By Hunting Period, Diary Records Winter Hunting Season, 1968-69 (Continued)

Hunting Period	Week Beginning	Hunting Groups Reporting	Hare Harvest	Hare Per Hunting Group	Grouse Harvest	Grouse Per Hunting Group	Hare Per Hunting Group Per Week	Grouse Per Hunting Group Per Week
Easter	March 21	8	5	0.6	27	3.4		
Break	March 28	6	7	1.2	31	5.2		
	April 4	6	8	1.3	1	0.2	1.2	2.3
	April 11	5	6	1.2	2	0.4		
	April 18	5	11	2.2	9	1.8		
Early	April 25	4	23	5.7	15	3.7		
Spring	May 2	4	10	2.5	14	3.5		
	May 9	4	6	1.5	22	5.5	4.8	4.8
	May 16	4	29	7.3	55	13.7		
	May 23	2	19	9.5	58	29.0		

As a consequence, the number of harvesters usually could not be determined.

The harvests of hare per hunting group per week were highest in the pre-Christmas holiday seasons and in the early spring season, 4.3 and 4.8 hare per hunting group per week respectively; and the mid-winter and Easter break harvests were significantly lower, 1.5 and 1.2 hare per hunting group per week.

The harvests of grouse are roughly stable during the hunting periods of the winter hunting season, except for the Easter break period (Table 9-36). This decline at the Easter break appears to correspond to the brooding period of grouse hens when they would be scarce (B. Hrebenyk, 1977:1). Brooding lasts for three to four weeks.

In terms of overall reliability, only limited data are available and they indicate that hare are harvested on about one-half of the days on which they are explicitly hunted, whereas grouse are harvested on nearly 80 percent of the days that they are explicitly hunted.

If, however, we only call a day successful when the caloric work inputs of a hunter are met by the harvest, then two hare and three grouse are required for a successful hunt. By this standard 24 percent of hare hunt-days are successful and 58 percent of grouse hunt-days are successful (Table 9-37).

As was reported previously in Chapter 6, the Waswanipi say that the harvests of hare and grouse are gifts to them, gifts from the winds, God and the animals. Harvests of these animals are often cited as demonstrations of the role of the winds in the giving of animals to hunters, probably because of the conditions under which hare and grouse are generally caught. The actual process of hunting these animals indicates that the animals are given. Hare are caught primarily in snares made of thin wire set in the trails which the hare repeatedly use as the snow accumulates and gets deeper. The success of hare hunting therefore depends on snow and weather conditions in the Waswanipi view, and the cyclical periods of high populations may also be triggered by climatic conditions (Appendix 9-6). Some hare are also encountered while pursuing other

Table 9-37 Percent of Hunt-Days Explicitly Hunting Hare and Grouses on Which Successful Harvests Were Made, Diary Records, Winter Hunting Season, 1968-69

Hunters Reporting in Diary	Hunt-Days Hare	Hunt-Days With Successful Hare Harvests[1]	Hunt-Days Grouse	Hunt-Days With Successful Grouse Harvests	Percent of Hunt-Days With Successful Harvests	
					Hare	Grouse
28	4	3	2	1	75	50
68	5	0	2	1	0	50
53 and 59	35	7	10	8	20	80
52 and 61	2	1	2	0	50	0
44 and 45	0	0	3	1	-	33
All	46	11	19	11	24	58

Footnotes:

1. Days with two or more hares harvested.
2. Days with three or more grouse harvested.

activities and may be shot on those occasions, as unexpected gifts, but such harvests amount to only approximately ten percent of the total.

With grouse, however, which are hunted mainly by shooting them with small calibre rifles or with sling shots, hunters much more commonly make harvests when they run across grouse in the course of other activities. Thus, while hunters will explicitly go out on some days in order to look for and hunt grouse, nearly one-half of all grouse reported harvested in the diaries, 47 percent, were reported to have been killed in the course of other activities (Table 9-38). Grouse then are frequently harvested when hunting them is not the major activity underway.

As one informant quoted in Part II of this study said, when they find grouse in the course of moving their camp, he says the grouse are being given to them so they will have something to eat. Discussions with Waswanipi indicate that many hunters not only see these grouse as having been given to them because they were not mainly looking for grouse at the time, they also suggest that they find grouse under certain weather conditions that indicate that the animals are given by the winds. While finding grouse when not looking is an indication to the hunters that the animals they harvest are given to them by the animals themselves, this alone does not indicate how the winds can be involved in the giving. Because the Waswanipi themselves say that the winds give them the smaller animals they hunt as well as the larger animals, I have sought to examine the relationship between hare and grouse harvests and weather conditions. To undertake this study I asked for the assistance of a climatologist.

The relationship of Waswanipi harvests of hare and grouse to weather conditions were examined by B. Hrebenyk, a graduate student in geography at McGill University. As indicated previously, Hrebenyk divided the winter hunting season of 1968-69 into periods which correspond to "the persistence of particular weather types" over the Waswanipi region. The beginning and end of each period were defined subjectively on the basis of the hunting record and the periods should be viewed as part of a continuum rather than as separate entities (Hrebenyk, 1977:2).

Table 9-38 Numbers of Hare and Grouses Harvested When Being Looked for and When Chanced Upon in the Course of Other Activities, Diary Records, Winter Hunting Period, 1968-69

Hunters Reporting in Diary	Hare				Grouse			
	Looked For		Chanced Upon		Looked For		Chanced Upon	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
28	10	100	0	0	6	100	0	0
68	3	100	0	0	3	30	7	70
53 and 59	26	93	2	7	52	51	49	49
52 and 61	2	100	0	0	1	25	3	75
44 and 45	0	0	2	100	15	60	10	40
All	41	91	4	9	77	53	69	47

During the pre-Christmas portion of the winter hunting season, Hrebenyk identifies three distinct periods. From November 4 to November 18, 1968, "an extended period of high pressures prevailed over the region" (Hrebenyk, 1977:3). Little precipitation occurred as storm tracks passed relatively far from the study area, and the high pressure systems brought winds mainly from the north, northeast and northwest, interspersed with calm conditions. During this period 98 hare and 142 grouse were reported harvested in the diaries, or 7.0 hare per day, and 10.1 grouse per day, which represent a relatively successful hunt (Hrebenyk, 1977:3) (Table 9-39).

The second period lasted from November 19 to November 27, 1968, and "was marked by a rapid sucession of storms bring heavy precipitation" (Hrebenyk, 1977:3). Wind direction varied widely during the period, but southwest winds were characteristic as a storm system approached. A total of 36 hare and 33 grouse were reported harvested, 4.0 and 3.7 per day respectively, indicating a sharp drop in hunting success. The grouse catch dropped more sharply than the hare catch probably because grouse, being feathered animals, restricted their activities more than hare under the wet weather conditions (Hrebenyk, 1977:3-4).

The third period, from November 28 to December 11,1968, was typically a period "in which neither high nor low pressure prevailed for any length of time" (Hrebenyk, 1977:4). Grouse catches declined after December 4 in a way "which suggests that the Cree were not hunting these any longer" (Hrebenyk, 1977:4). Therefore only hare could be considered during this period and the data indicate that it was a successful period. As in the first period, "peak catches of hare tend to occur while the region is under the influence of high pressure systems, although on at least two days they occur after the passage of storm systems as well" (Hrebenyk, 1977:4). The specific date of capture of a hare may however be obscured by the delay between its capture in the snare and the date the snare is checked. This problem of delayed retrieval does not exist for grouse.

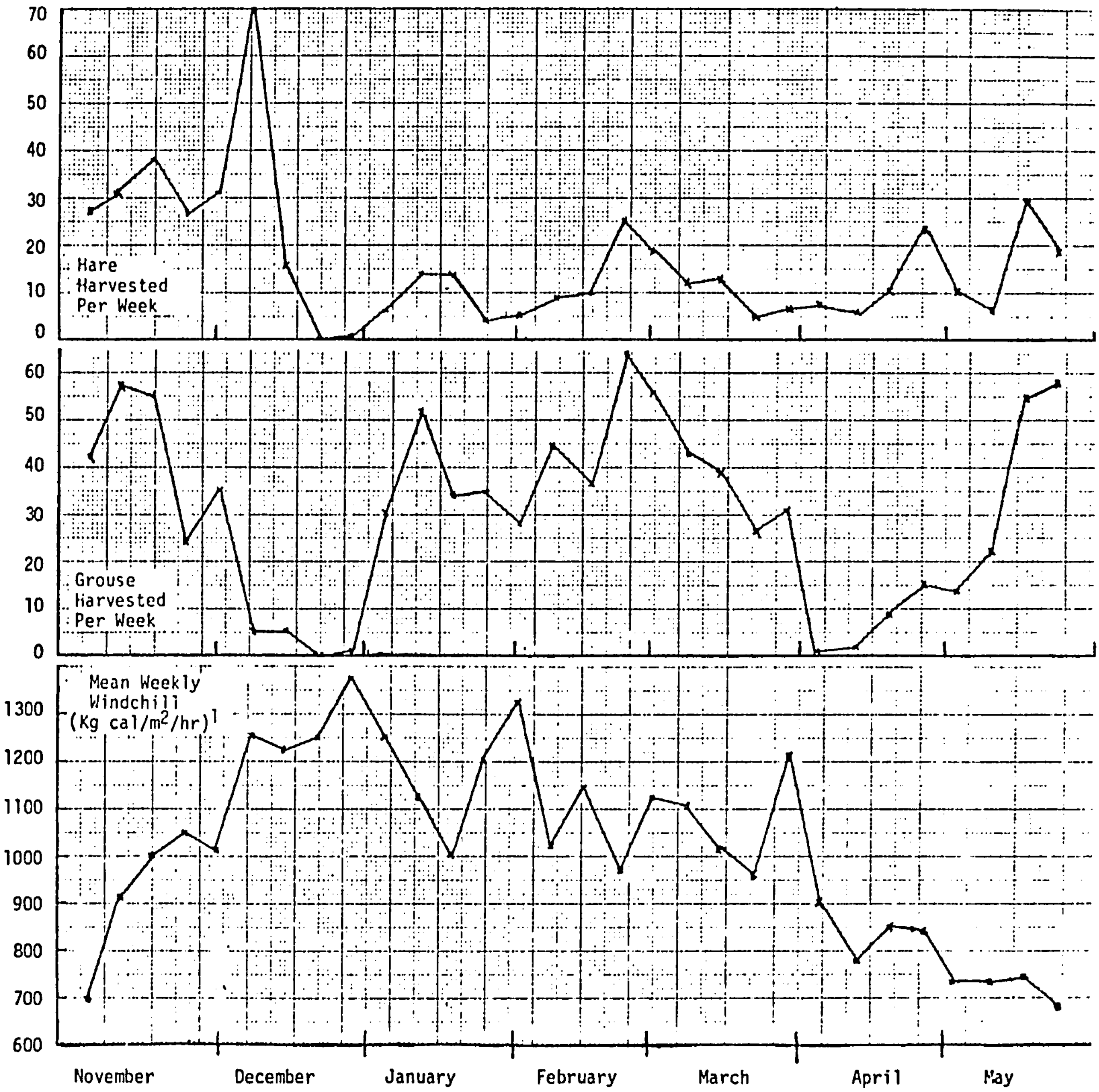
In summary, during the pre-Christmas part of the winter hunting season, when seasonal temperatures are relatively high although falling, stable high pressure conditions which produce least precipitation tend to be associated with large catches. "Low pressure systems with extensive precipitation produce the opposite results, although hunting may be quite good on a day immediately after the end to precipitation" (Hrebenyk, 1977:6).

During the New Year's to Easter portion of the winter hunting season harvests of hare were too low to permit detailed analysis in relation to specific climatic conditions. The lower harvests of hare during this period would appear to be associated with the colder weather, because it has been reported that hare are less active during cold periods (Banfield, 1976:81). Thus, during the mid-winter period cold weather, frequently associated with high pressure systems, brings reduced hare activity and harvests, the opposite of the conditions in the fall. The general relationship between cold, measured as mean weekly windchill, and harvests of hare and of grouses can be seen on Figure 9-4. Weeks with high windchill are generally associated with low harvests, and weeks with lower windchill with higher harvests of both groups of species. There are exceptions, however, such as the peak hare harvest in early December, and the low harvests during the Christmas-New Year's and Easter holidays, and the April brooding period of the grouses.

Within the post-New Year's portion of the winter hunting period, Hrebenyk identifies four climatically defined periods. The first, from January 7 to January 19, 1969 is like the last pre-Christmas period characterized by neither high nor low conditions. Catches are good during this period, 8.5 grouse per day, and peak catches of grouse tend to occur "either when the region was under high pressure but with relatively weak wind conditions, or after the passage of a storm system from the south brought warmer air" (Hrebenyk, 1977:4). When a day had low daytime temperatures and windy conditions, it tended to be associated with lower harvests.

The second period from January 20 to February 13, 1969 was characterized by rapid changes from high to low pressures and a mid-winter thaw. The grouse

Figure 9-4. Hare and Grouse Harvests Per Week and Mean Weekly Windchill, Winter Hunting Season, 1968-69



Footnote:

1. Data from tally sheets recorded at Chapais radar weather station (5612) and pr vided by Service de Météorologie de Québec.

harvests are relatively low, 122 being caught in 25 days, or 4.9 per day (Table 9-39).

In summary, the mid-winter period is similar to, but more complex, than the pre-Christmas period. Harvests are better, in general, during high pressures with light winds, but when the highs bring extreme cold and moderate winds, harvests are lower. Lower pressure systems which bring relief from the cold also are associated with good harvests, except during extensive precipitation (Hrebenyk, 1977:6) (Table 9-39).

Summarizing for the whole winter season, periods of high pressures and periods of persistence of neither highs nor lows are associated with the highest rates of harvest. Within these periods light winds, cold temperatures and little precipitation are generally associated with higher harvests, and moderate or high winds, extreme cold temperatures or persistent precipitation with lower harvests. This would appear to support the view of Waswanipi hunters that there are clear relationships between hare and grouse harvests and weather conditions associated with weather conditions from the west and northwest quadrant.

Data on the efficiency of hare and grouse hunting are limited for the reason cited previously, the difficulty of identifying the number of harvesters. Those data that are available often are for limited periods. The available data have therefore not been grouped by season, with the exception of the late fall and early winter hare harvests, which I have separated from the post New Year's harvests. The average harvest of grouse per man-day was 4.4 (Table 9-40). The average harvest of hare per man-day was 0.9, but the late fall and early winter record was 2.5 hare per man-day whereas the mid-winter and Easter break records averaged 0.8 hare per man-day.

These rates of efficiency are equivalent to 3,128 Calories per man-day hunting grouse, 2,533 Calories per man-day hunting hare before Christmas, and 912 Calories per man-day hunting hare in mid-winter. Because hunting of grouse and hare does not involve either cutting of ice, hauling heavy loads or rapid pursuits, the energy input to these activities is probably best estimated as

Table 9-39 Climatic Variables, Climatic Periods, and Hare and Grouse Harvests, Winter Hunting Period, 1968-69[1]

Dates of Climatic Period	Persistent Weather Types	Harvest per Day: Hare	Harvest per Day: Grouse	Comments
11/4 - 11/18	High pressures	7.0	10.1	- Little precipitation. North winds and calms.
11/19 - 11/27	Storms in succession	4.0	3.7	- Heavy precipitation. Wind directions variable, and SW.
11/28 - 12/11	Neither high nor low	8.5	-[2]	- Peak catches generally associated with highs.
1/7 - 1/19	Neither high nor low	-[2]	8.5	- Peak catches come during highs with weak winds, or after passage of storms from south. Wind direction has no relation to harvests.
1/20 - 2/13	Rapid changes, including a thaw	-[2]	4.9	- Rain during the thaw.
2/14 - 3/7	High pressures	-[2]	8.8	- Most but not all peaks on days with light northerly winds. Extreme cold strong winds create poor hunting conditions.
3/8 - 4/4	Rapidly fluctuating conditions	-[2]	4.8	- Declining participation. No clear relationship of peaks to weather.

Footnotes:

1. Abstracted from Hrebenyk, 1977.
2. Data insufficient for comparative analysis (Hrebenyk, 1977).

Table 9-40 Man-Days Hare and Grouse Hunting, Harvests, and Harvests Per Man-Day, Diary Records, Winter Hunting Season and Selected Periods, 1968-69

Hunters Reporting In Diary	Man-Days Hare Hunting	Hare Harvest	Man-Days Grouse Hunting	Grouse Harvest	Hare Harvest Per Man-Day	Grouse Harvest Per Man-Day
28	4	10	2	6	2.5	3.0
68	3.5	3	2	3	0.9	1.5
53 and 59	35.5	26	10	52	0.7	5.2
52 and 61	1.5	2	1.5	1	1.3	0.7
44 and 45	0	0	2	15	-	7.5
All	44.5	41	17.5	77	0.9	4.4
Late Fall and Early Winter	4	10			2.5	
Mid-Winter and Easter Break	40.5	31			0.8	

somewhat less than the 2,797 Calories assumed to be consumed hunting moose, beaver or fish. As a rough approximation I have taken the average of 2,797 and 1,528 the caloric requirements of a camp day, 2,163 Calories as an estimate of caloric inputs.

This value results in an energy return on inputs ratio of 1.5 to 1 for grouse hunting, 1.2 to 1 for hare hunting in late fall and early winter and 0.4 to 1 in mid-winter (Table 9-41). These returns are exceptionally low and indeed indicate that hare hunting in mid-winter may cost more energy than the activity produces. The results are striking in relation to the other harvesting activities analyzed. This was, however, a low year in the populations of the hares and grouses so that this may indicate the situation when conditions are poor. The situation might be quite different when populations are at or near peaks.

It is striking with respect to these low returns that it is common for women and sub-adults to hunt hare and grouse as well as the adult men. The reasons for this become clear in the hypothetical case where a hunting group tried to gain a significant portion of its food from hare and grouse hunting, as may have occurred several decades ago. A harvester can only produce a little more than the caloric inputs, that is a harvester can at best just meet his or her own total caloric requirements. It would be vital, therefore, that each individual who is able provides his or her own inputs and harvests. There is, at least under these conditions, no surplus; at best a person can feed himself or herself. The division of labor is consistent with this fact.

Considering total daily adult caloric requirements during the mid-winter, about 3,900 Calories, the low output for hare hunts appears to be consistent with the widespread northern dictum, also expressed by the Waswanipi, that you slowly starve to death if you are forced to live solely off of hare. On the basis of the figures calculated here, this is a literal statement of fact. Fortunately, this has not been the situation of any Waswanipi, at least in the present century. In general then, Waswanipi hunting recipes appear to be consistent with both biological data, and with the analysis of Waswanipi hunting practice; and the experienced results of that practice would confirm and support the Waswanipi belief system.

Table 9-41 Hare and Grouse Per Man-Day Hunting, Return of Food Weight and Energy Per Man-Day, and Ratio of Energy Output to Input, Diary Records, Winter Hunting Season and Selected Periods, 1968-69

Small Game	Per Man-Day Hunting			Ratio of Energy
	Number Harvested	Pounds of Food	Calories of Available Food Energy	Output to Energy Input[5]
Hare	0.9	1.5[1]	912[3]	0.4:1
- Late fall early winter	2.5	4.3[1]	2533[3]	1.2:1
- Mid-winter Easter break	0.8	1.4[1]	810[3]	0.4:1
Grouses	4.4	5.3[2]	3128[4]	1.5:1
Hare and Grouses	5.3	3.4	2020	0.9:1

Footnotes:

1. Assumes 1.7 pounds of edible weight per specimen.
2. Assumes 1.2 pounds of edible weight per specimen.
3. Assumes 1,013 calories available for consumption per specimen.
4. Assumes 711 calories available for consumption per specimen.
5. Assumes energy input of 2163 calories per man-day of hunting.

F - Waterfowl Hunting

Most waterfowl hunting occurs in the spring throughout the summer and in early fall. The data on the winter hunting season therefore exclude most of the waterfowl hunting periods. It includes the last two weeks of the fall hunt when a few birds are harvested and, more importantly, the early portions of the spring waterfowl hunt, when ducks, geese and then loons return to the region (Table 9-42 and Figure 9-5).

Data on the reliability and efficiency of harvests are extremely limited because few diaries were kept during the early spring period. The two records that were kept indicate that harvests were made on just under one half of the days on which waterfowl were hunted. Successful harvests, those which provide more energy return than the hunters expenditure, would require a harvest of a goose or a loon, or four ducks. Such harvests were made on 35 percent of hunt-days (Table 9-43). Ducks were the most frequently caught waterfowl,[25] which contrasts with the harvests of the Cree communities on the James Bay coast where geese are the most important waterfowl harvests.

The ratio of energy output to input in waterfowl hunting is 2.0 to 1 (Table 9-44) which may be typical of the waterfowl hunt in an inland region away from the James Bay coast. Nevertheless, it should be noted that the diaries that were kept during the early spring were for families who often continued to hunt beaver during this period. The hunters operating from the settlement in early spring may have hunted waterfowl more intensively. It is likely that these figures would not reflect the situation at the James Bay coastal communities where larger number of water fowl are harvested per man-day and where geese, which provide more food per specimen than do ducks, are the predominant harvest.

G - Fine Fur Animal Hunting

Fine furs with the exception of muskrat are harvested in very limited numbers, the most important harvest being the marten (Figure 9-6). The harvest per

Table 9-42 Waterfowl Harvested Per Week, Diary Records, Winter Hunting Season, 1968-69

Week Beginning	Hunting Groups With Harvests	Harvests: Ducks	Harvests: Geese	Harvests: Loons	Waterfowl Per Hunting Group Per Week
Nov. 1	1	2			2.0
Nov. 8	1	7			7.0
April 11	1	2			2.0
April 18	1	2			2.0
April 25	2	5			2.5
May 2	4	13	5		4.5
May 9	4	9	2	5	4.0
May 16	4	35	2	1	9.5
May 23	1	13	8		21.0

Figure 9-5. Number of Ducks Plus Geese Harvested Per Week, Winter Hunting Season, 1968-69

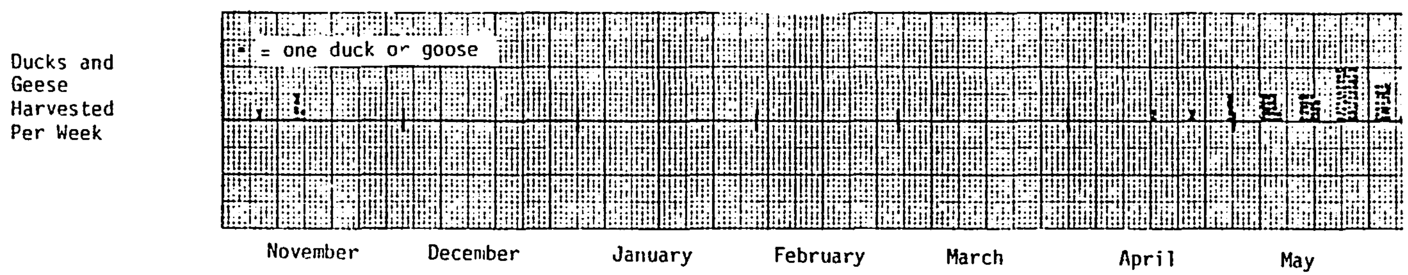


Table 9-43 Days Hunting Waterfowl, Days With Successful Harvests, Percent of Hunting Days with Successful Harvests, Man-Days Hunting Waterfowl, Harvests, Diary Records, Early Spring Period, 1968-69

Hunters Reporting in Diaries	Hunt-Days Waterfowl	Hunt-Days With Successful Harvests[1]	Percent of Hunt-Days With Successful Harvests	Man-Days Waterfowl Hunting	Harvests		
					Ducks	Geese	Loons
52 and 61	13	5	38	10.5	13	7	4
44 and 45	4	1	25	4	22	4	0
All	17	6	35	14.5	35	11	4

Footnote:

1. A successful harvest is a goose, or a loon, or four ducks.

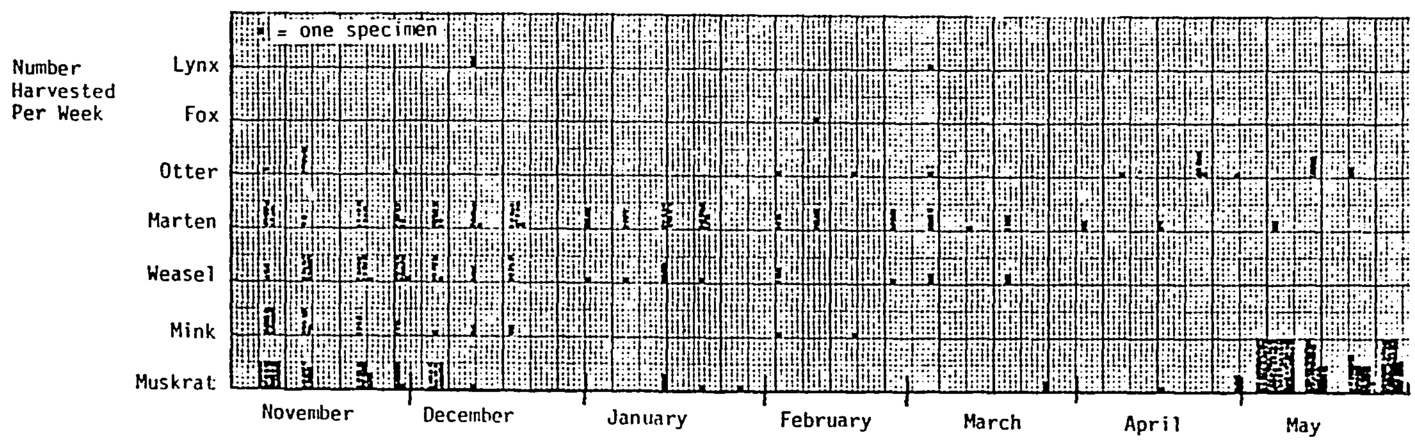
Table 9-44 Harvests of Waterfowl Per Man-Day, Return in Pounds of Food, Calories of Available Food Energy, and Ratio of Energy Output to Input in Waterfowl Hunting, Diary Records, Early Spring Period, 1968-69

Species	Per Man-Day			Ratio of Energy
	Harvest	Pounds of Food	Calories of Available Food Energy	Output to Input
Ducks	2.4	2.4[1]	1411[4]	
Geese	0.8	3.5[2]	2404[5]	
Loons	0.3	0.7[3]	595[6]	
All Waterfowl	3.5	6.6	4410	2.0:1

Footnotes:

1. Assumes 1.0 pounds of food portion per specimen.
2. Assumes 4.4 pounds of food portion per specimen.
3. Assumes 2.4 pounds of food portion per specimen.
4. Assumes 588 calories available in food portion per specimen.
5. Assumes 3,005 calories available in food portion per specimen.
6. Assumes 1,982 calories available in food portion per specimen.
7. Assumes energy input of 2163 calories per man-day of hunting.

Figure 9-6. Harvests of Fine Fur-Bearing Mammals Per Week, Winter Hunting Season, 1968-69



man-week is highest in the fall and early winter and declines thereafter (Table 9-45). Muskrat on the other hand are hunted in the late fall and early winter, are caught in mid-winter almost entirely by accident in beaver traps, and are harvested most intensively immediately after break-up in the early spring (Table 9-45 and Figure 9-6).

Some days, or portion thereof, may be set aside to set and check marten traps or mink traps during the late fall, early winter or mid-winter. Mink traps however are usually set along waterways and are typically checked on the way to and from beaver hunting and often do not therefore take special allocations of blocks of time. This is sometimes not possible with marten traps, which are typically set in mature coniferous forests away from shorelines. Most weasel were unintentionally caught in traps set for other fur-bearers, and lynx may be hunted when chanced upon, or they may be snared in areas in which hare are being snared. Lynx population densities are highly variable and are linked to the cycles of the hare, its prime prey (Appendix 9-7). The low harvest reported in 1968-69 was for a low population of lynx and would not be typical for years in which population increases or peaks were occurring.

From the limited data available, over 80 percent of the days specifically allocated to the harvesting of fine fur were days on which harvests were made, but it is possible that there was an under-reporting of days without harvests. If a successful harvest must provide enough food to replace caloric inputs of the hunter, then one lynx or otter, four muskrat or marten, or five mink, or combinations thereof, must be harvested to have a successful hunt. By this criterion 17 percent of hunt-days are successful (Table 9-46). The ratio of energy output of fine fur animals harvested to inputs on those days specifically allocated to the harvesting of fine fur is extremely low, ranging from a high case of 0.7:1 to a low of 0.1:1. In terms of energetics and food, fine fur hunting provides less output than the required input. However, it must be noted that the main output of this labor was the cash received for the pelts rather than the food produced and much of the food was not highly valued in any case. It is unlikely these animals would be regularly sought were it not for the fur trade, with the possible exceptions of spring muskrats and lynx.

Table 9-45 Number of Hunters, Muskrat Harvest and Other Fine Fur Harvest Per Week, by Hunting Period, Diary Records Winter Hunting Season, 1968-69

Hunting Period	Week Beginning	No. of Hunters In Bush Camps	Muskrat Harvest	Other Fur-Bearer Harvest[1]	Harvest Per Hunter Week	
					Muskrat	Fine Fur
Late	Nov. 1	17	20	23		
Fall	Nov. 8	24	9	24	0.7	1.1
	Nov. 15	24	13	24		
Early	Nov. 22	24	6	22		
Winter	Nov. 29	24	15	14	0.4	0.8
	Dec. 6	22	1	17		
Christmas	Dec. 13	12	0	18		
New Years	Dec. 20	2	0	0	0.0	1.0
Holiday	Dec. 27	4	0	5		
	Jan. 3	9	0	5		
Mid-	Jan. 10	21	3	14		
Winter	Jan. 17	21	1	9		
	Jan. 24	21	1	0		
	Jan. 31	25	0	9		
	Feb. 7	25	0	5	0.02	0.2
	Feb. 14	25	0	2		
	Feb. 21	25	0	5		
	Feb. 28	25	0	9		
	March 7	25	0	1		
	March 14	25	0	5		
Easter	March 21	24	2	0		
Break	March 28	22	0	2		
	April 4	12	0	1	0.04	0.1
	April 11	13	1	2		
	April 18	11	0	6		

(CONTINUED)

Table 9-45 Number of Hunters, Muskrat Harvest and Other Fine Fur Harvest Per Week, by Hunting Period, Diary Records Winter Hunting Season, 1968-69 (Continued)

Hunting Period	Week Beginning	No. of Hunters In Bush Camps	Muskrat Harvest	Other Fur-Bearer Harvest[1]	Harvest Per Hunter Week	
					Muskrat	Fine Fur
Early	April 25	12	3	1		
Spring	May 2	10	75	2		
	May 9	9	29	4	3.3	0.2
	May 16	12	22	2		
	May 23	7	36	1		

Footnote:
1. Includes: lynx, fox, otter, marten, weasel, mink.

Table 9-46 Hunt-Days for Fine Fur, Hunt-Days With Successful Harvests, Percentage of Hunt-Days With Successful Harvests, Man-Days Hunting Fine Fur and Harvests, Diary Records, Winter Hunting Season, 1968-69

Hunters in Diary	Hunt-Days Fine Fur[1]	Days With Successful Harvests[1]	Percent of Days Hunting With Successful Harvests	Man-Days Hunting Fine Fur	Harvests: Species	Harvests: Number
28	2	0	0	3	Mink	1
					Weasel	2[2]
68	1	0	0	1	Marten	1
					Lynx	1[4]
53 and 59	8	0	0	10	Marten	5[3]
					Muskrat	1[4]
52 and 61	12	3	25	11	Marten	2[5]
					Weasel	1[6]
					Otter	2[4]
					Muskrat	27[7]
44 and 45	3	1	33	6	Marten	1
					Mink	3
					Otter	1
All	23	4	17			

(CONTINUED)

Table 9-46 Hunt-Days for Fine Fur, Hunt-Days With Successful Harvests, Percentage of Hunt-Days With Successful Harvests, Man-Days Hunting Fine Fur and Harvests, Diary Records, Winter Hunting Season, 1968-69 (Continued)

Footnotes:

1. A successful harvest is a lynx, or a otter, or four muskrat, or four marten, or five mink.
2. Caught in traps set for mink.
3. One shot while checking traps set for marten, one shot while beaver hunting.
4. One caught in trap set for beaver.
5. One caught when beaver hunting.
6. Caught in a trap set for marten.
7. Five caught in traps set for beaver.

Table 9-47 Food Harvests of Fine Fur Animals Per Man-Day, Return in Calories of Available Food Energy, and Ratio of Energy Output to Input in Fine Fur Hunting, Diary Records, Winter Hunting Season, 1968-69

Hunters Reported in Diary	Per Man-Day[1] Pounds of Food[2]	Per Man-Day[1] Calories of Available Food Energy[3]	Ratio of Energy Output to Input[4]
28	0.5	227	
68	1.1	544	
53 and 59	0.5	272	
52 and 61	3.0	1521	
44 and 45	2.0	975	
High in Sample			0.7:1
Low in Sample			0.1:1

Footnotes:

1. Only includes harvests made during man-days devoted to fine-fur hunting.
2. Assumes values on Table 8-10.
3. Assumes values on Table 8-12.
4. Assumes energy input to 2163 calories per man-day of fine-fur hunting.

H - Maintenance and Support Activities and Total Time Hunting, Working and for Leisure

This assessment of hunting efficiencies is incomplete because hunting not only involves the actual time spent looking for, killing and retrieving an animal, hunting also depends on a number of other support and maintenance activities. I define support activities as those which directly provide equipment and materials for the hunt and that involve processing the harvests of the hunt. Maintenance activities I define as activities which provide for the basic shelter, clothing and transportation for the hunter and his co-residential group.[26]

From the five detailed diary records available it is possible to provide rough estimates of the time allocated to these support and maintenance activities by the hunters themselves. Women and adolescents also perform many support and maintenance tasks, but no detailed data on their time allocations are available. Thus, while the tasks they perform will be noted below, only the actual time inputs of the hunters can be specifically determined.

Maintenance activities of the men include mainly travel, camp construction and maintenance, moving camp and firewood provisioning. Travel time between sites of permanent settlements and the sites of bush camps has been significantly reduced over the last decades since the Waswanipi hunters began to use chartered aircraft to move to the bush and return. As indicated elsewhere, however, the costs of such transportation are high and comprise a significant portion of the total costs of hunting. As a consequence those hunters who do not have far to travel and who can use sites easily accessible by roads, railways or rivers, usually will not use airplanes. Few people plan to spend more than one day per trip in actual travel between settlement and bush camps. However, more time may actually be consumed in travel between the settlement and the bush camp because poor weather may delay departure or travel for one or more days. This is especially so when airplanes are being used because they appear to be more easily immobilized by weather conditions than are people themselves.

The actual times spent in travel between bush and settlement by the hunters covered by diaires are listed on Table 9-48.

These times include the time required to re-activate bush camp sites. Most hunters return often to the same bush camp sites, where tent poles, tent frames, wooden camps, or log cabins are available. When such sites are being re-used they are easily made habitable within an hour or so of arrival, because a supply of firewood is typically left from the last habitation period. Structural repairs, minor expansion and insulation may require an additional day or two of work to fully activate a camp and these are included here with travel time.

Bush camps may be moved at several times during the year, as will be discussed elsewhere. The distances moved are generally modest, six to ten miles, and the move can be completed in a day if it is to a formerly used camp site. If there are many harvests to move or if a new camp is to be built, additional time will be required; how much time depends on the type of camp planned. If the camp is only for brief occupancy of a few days or weeks, only a tent may be set up in which case the hunters may spend half a day preparing a site and setting up camp before moving the entire hunting group. More substantial camp construction is typically done in the fall, and may take one to two weeks for two or more men to build. No such camps were built by the men who kept the diaries, although hunters 52 and 61 built two camps for brief occupancy during the 1968-69 winter. Women spend an approximately equal time to that spent by the men in travel, camp moves, and camp construction and maintenance.

Once a camp is established, the most regular and recurring shelter related need is for firewood. All bush camps were heated with light sheet metal wood burning stoves of various designs. They consumed and required large quantities of firewood to keep the tent frames and uninsulated cabins heated, despite the use of snow banked along the outside walls to cut winds and heat losses. Gathering firewood, cutting it to short stove lengths and splitting it was a job task shared by both men and women. Men frequently worked gathering or preparing the firewood during the early evenings, after completing their hunting

Table 9-48 Man-Days Spent in Hunting, Support and Maintenance Activities and Leisure, Diary Records, Winter Hunting Season, 1968-69

Hunters Reporting in Diaries	Support and Maintenance Man-Days						Hunting Man-Days	Leisure Man-Days		
	Travel and Camp Maintenance	Moving Camp	Firewood Provisioning	Supplying and Resupplying in Town	Equipment/ Product Processing	Total Man-Days		Visiting Bush Camps	Holidays	
									In Camp	In Town
52 and 61	14	21	18	8	11	72	148	39	16	5
53 and 59	10	6	20.5	8	18	62.5	95.5	4	4	56
68	4	8	3	4	0	19	47	2	7	37
44 and 45	6	0	16	4	2	28	147	0	16	53
28	3	2	6	1	6	18	30	0	5	0
All	37	37	63.5	25	37	199.5	467.5	45	48	151

activities. However, they also spent some whole or part days gathering firewood as well. The forest is generally dense in the Waswanipi region, but since camps are used for extended periods and on repeated occasions, naturally dry wood can become depleted in the vicinity of camps. Green wood will be burned with dry wood in the stoves, and wood is stored near the stove where it will be dried as much as is possible before use. In addition, when hunters plan to return to a camp a year or two later, they may remove the bark of some of the trees nearby and leave them to dry out in anticipation of future firewood needs. Nevertheless, despite these methods, gathering firewood often requires travel and hauling of wood from some distance away from the camp. Dogs were used to help with the hauling. In some hunting groups where there were relatively many women, they would do the major part of the firewood supplying, but more typically the work was said to be divided about evenly between men and women. The man-days listed on Table 9-48 are only the times put in by the hunters and therefore probably represent about one-half of the total man-days spent on the provisioning of firewood. I would estimate a total man-day input of approximately 125 man-days for provisioning of firewood by both men and women, which would be approximately one-quarter as many man-days as were spent in all hunting activities.

Among the men's activities involved in direct support of hunting activities, I would include outfitting time in the settlement, equipment manufacture and repair and product processing. Hunters and other members of the commensal groups must carefully plan for and provide the purchasable equipment and supplies they need in advance of departing for the bush. The amount of time actually required for such activities is generally one or two man-days per adult in the fall and at the major vacations at Christmas and at Easter. In addition, a shortage of supplies and/or a desire to sell furs as early as possible in order to get higher prices may result in additional re-supply trips to town. When camps are located far from the settlement, such short trips to town may not be profitable, but the majority of camps are close enough that one or more trips are made for re-supply at other than the main holiday periods. During the fall such trips are less common than during the mid-winter period. The man-days spent in supply and re-supply by the men are included on Table 9-49, but they do not include the day or two presumably spent prior to commencement of the hunting in the fall, before the diary records began. Women probably spent comparable times to those of the men, as most trips included one or more women. Women generally purchase foods and domestic items, while men purchase hunting supplies and large equipment. Most husbands and wives accompany each other during purchases, but responsibilities for purchases are divided; although husbands earned or received most of the money, and, significantly, they most often retained possession of the money. Husbands and wives jointly pack and arrange supplies for transportation to the bush, but women have the leading and active role in this task.

The production and repair of equipment are an important part of Waswanipi activities because many domestically produced items are either not available commercially or are clearly superior to commercial alternatives. Among the activities recorded in the diaries as occupying blocks of time are the making of snowshoes, toboggans and dog harnesses, and the repair of snowshoes, canoes and outboard motors. In addition many smaller items are made in the evenings and are not included in specific time allocations, including crooked knives, cradle boards, skin fleshers, ice chisels, fur stretchers and other items. Women co-produce some items and solely produce others. For example, men make snowshoe frames and women lace the snowshoes. In addition, some work on equipment is done in summer usually including changes of canoe canvas and major overhauls of the outboard motors. I estimate that these summer activities amount to a minimum of seven to ten man-days of work per active hunter. Much of the equipment repaired in summer is used in summer activities and only part of the labor time would properly be allocated to winter hunting. However, no adjustment for summer equipment repair has been made in those tabulations.

Product processing by the hunters generally is in the form of specific contributions to processing tasks which are mainly performed by the women. Women are generally responsible for the skinning and preparation of fur pelts, the tanning of moose hides, the collection, drying and storage of castor sacks and other special animal organs, and the regular butchering and preparation of meat and food.

Beaver pelts are removed using a flesher made from moose bone. Removing a pelt takes about an hour. After removal, the skin is scraped and then sewn to an oval hoop stretcher made of a flexible tree trunk. The pelt is then frozen outdoors for about 2 hours, if the day is cold, and scraped with an axe while frozen. It is then thawed inside, washed with soap and scraped with a semi-lunar knife to remove excess water. The holes where the arms and legs were are sewn up and then the stretched skin is hung out in the cold for 3 or 4 days to a week to dry and be softened by the soap and cold. The flat oval processed pelt is then taken off the stretcher, combed and rolled for storage until sold. All steps in this process are normally done by women, although men occasionally do the processing when the women are too busy with other activities, or if there are too few women or too many pelts. One diary includes a hunter who processed his own beaver pelts and indicates that he spent four man-days processing 22 pelts, an average of 5.5 a day. This however is possibly a more intense daily rate of processing than would be typical for the women who could only spend a part of each day processing pelts, because they would be cooking and doing other tasks as well. If women averaged five beaver pelts a day along with other chores, then a harvest of 30 to 60 beaver would represent 6 to 12 days of work per winter. If, however, the harvest were 120 beaver then this could provide up to 24 days of work. The processing of other fine furs, which is generally less complicated and time consuming, would have to be added to this.

Preparing and tanning a moose hide is as complicated as preparing beaver pelts. The hide is removed in the initial butchering, and the first steps in processing are to cut the hair off and then scrape the hair and meat off both sides. The hide is then stretched with twine on a square frame made of heavy rigid poles. It is frozen, scraped, taken off the stretcher and thawed. It is then repeatedly put in lukewarm water and then wrung out, three of four times, and then dried. A mixture of lard and soap which has been boiled for two to three hours is then rubbed into the hide and it is allowed to be absorbed and "work" for 3 days. The hide is then softened by being stretched by hand and by hitting it with a dull axe or a specially made wooden mallet. The hide may then be smoked over a fire of rotten wood, preferably poplar, if partial waterproofing is desired. One diary reports the processing of two moose hides and a total of five man-days of work were expended on each. A commensal group will use one to three moose hides per year, so that up to 15 man-days of work may be required for processing the hides. The diary records report men helping with the processing of moose hides especially at the point when the hides must be stretched. The total time spent by the men on the production and repair of equipment and the processing of products of the hunt, skins and furs, are listed on Table 9-48.

Women spend much more time than do men in processing of the products of the hunt. Women also spend considerable time in the production of clothing, including moccasins and mitts of moose hide, bags and pouches for carrying small game and shells and hunting supplies, and general clothing and bedding. In addition, women do the cooking on all but certain ceremonial occasions, such as a bear feast, and when the men stay at an overnight camp by themselves on a longer hunting trip. The women also do the laundering and washing, get water and prepare boughs for the floors of those camps which do not have wooden floors.

I have no record of the total time involved in these activities, but it is quite considerable, and the general impression given in discussions by the Waswanipi is that women work as long and as continuous hours as do the men. My observations would support this conclusion.

Table 9-48 gives a broad picture of the man-days the hunters themselves spend in support and maintenance activities, and on average these activities require about half as many man-days in total as does direct hunting activity.

The remainder of the time recorded in the diaries may be classed as leisure time. I have grouped it into three categories, visiting other bush camps, "holidays" in camp, the time spent in the settlements during the holiday visits. Where the camps of different hunting groups were located close enough together, visits between the members of the hunting groups occurred. Other leisure days were spent in the hunting group's camp when hunters reported they "didn't do anything", or they "had a holiday". Sometimes these periods coincided with Sundays. While it is likely that small chores were done on these days, they do not warrant re-allocation of major blocks of time. Finally, most hunting groups visited the settlements for periods of a few days to two or three weeks at the Christmas-New Year's and/or Easter holidays. One record, that of hunter 28, did not include such time because the period covered ended just prior to the beginning of the Christmas-New Year's holiday.

Leisure time in the bush amounted to about 40 percent of all leisure time, and leisure time as a whole occupied more than half as many man-days as did hunting and twenty-five percent more days than did support and maintenance activities. In summary then, of the total of 910 hunters' man-days covered by the periods of records of these five detailed diaries for the winter hunting season of 1968-69, 51 percent of man-days were spent in hunting activities, 27 percent in leisure activities and 22 percent in support and maintenance activities (Table 9-49).

To give some comparative standard for the evaluation of this distribution, the percentages may be applied to a seven-day week. On average, the hunters were hunting for three and a half days a week and they were working at other activities to maintain and support themselves and their commensal groups for one and a half days. That is, they worked five days a week. Two days of this hypothetical week were spent in leisure. It should be recalled however, that although the Sabbath is observed, activities were not organized by days of the week. Leisure time for example often came as blocks of days or weeks visiting the settlement, rather than as two days out of every seven.

In terms of hours, the few diary entries which included times of departure and return from hunting, averaged 7.5 hours away per hunting day, with a range from 4.0 up to 14.5 hours. Thus, not including evening support and maintenance activities the Waswanipi hunters were hunting away from their camps an average of twenty-six hours a week. If two to three hours are added per day for evening

Table 9-49 Percentage of Man-Days Allocated to Hunting, Support and Maintenance Activities, and Leisure, Diary Records Winter Hunting Season, 1968-69

Hunters Reporting In Diaries	Hunting Period Covered in Diaries	Total Man-Days	Percentage of All Man-Days Spent				
			Hunting	Support and Maintenance	Leisure		
					Bush	Settlement	All
52 and 61	1/5-5/25	280	53	26	20	2	21
53 and 59	1/9-5/1	222	43	28	4	25	29
68	1/16-5/5	112	42	17	8	33	41
44 and 45	2/3-5/25	244	60	11	7	22	29
28	11/1-12/22	53	57	34	9	0	9
All		910	51	22	10	17	27

support and maintenance activities, which the diaries indicate were common, then the work day was approximately 10 hours long. On a weekly basis, hunters then put in an average of 50 hours of work a week.[27]

During the hunting season, the Waswanipi adults, both men and women, work roughly the equivalent of a five-day, fifty-hour week. The duration of work is therefore higher than in most industrial employment. But, as I have indicated in Chapter 8, the actual physical intensity of the work the men do while they are out hunting is greater than virtually any kind of industrial work. By all standards then the Waswanipi work long and hard during the hunting season.

While it would be desirable to consider the Waswanipi work schedules on an annual basis, the data available from diaries, interviews and direct observation are insufficient to independently assess summer activities. A very general picture can however be constructed on the basis of the data available from other studies.

In summer, the time spent hunting takes up a lower proportion of the total time available, partly because many hunters seek summer employment and partly because leisure time is greater in summer. A recent study by the James Bay and Northern Quebec Native Harvesting Research Committee (JBNQNHRC) has estimated that in a typical summer Waswanipi hunters would fish and hunt waterfowl an average of fifty days each (NHRC, 1978: Table J-1, p. 206). Adjusting these values for the somewhat higher intensity of hunting done by what the JBNQNHRC calls intensive hunters i.e., those most likely to hunt from winter hunting camps, and adding approximately four to five man-days for early fall moose hunting, I would estimate that hunters who joined hunting groups in winter average 60 days of hunting each during the summer. This amounts to one-third of available man-days in summer as opposed to one-half the available winter man-days. If support and maintenance activities, exclusive of firewood provisioning which is much more limited in summer, are half the ratio to hunting days as they are in winter, then they spend an additional 8 days in summer in support and maintenance activities. Hunting, plus hunting related support and maintenance then account for 38 percent of summer man-days, the remainder being divided between employment and leisure.

In 1969-70, approximately 63 percent of the men who hunted actively for most of the previous winter took employment. A study of summer employment patterns in the neighboring community of Mistassini in the summer of 1967 by Ignatius LaRusic indicated that, on average, men seeking part-time work, worked 43 percent of the available weeks (1970, B-24 to B-27). Assuming this figure would apply to Waswanipi hunters, then the 63 percent of the men who worked in summer would have worked for 43 percent of the summer period. Averaging all hunters who were members of winter hunting groups, the estimated distribution of summer time would be: 33 percent hunting, 4 percent in hunting related support and maintenance activities, 27 percent employed, and 35 percent in leisure.

On an annual basis then, a Waswanipi hunter would spend an estimated 153 days hunting, 48 days in maintenance and support activities, 49 days in employment, and 114 days in leisure activities. Total work time would then be 240 days per year. And, assuming a 7-hour work day applies in summer, as my observations would indicate it does during summer fishing and hunting periods and during employment in the bush, a total of approximately 1,100 hours would be spent a year in hunting, 700 hours in hunting related maintenance and support activities, plus 350 hours of wage employment for a total of 2,150 hours of work per year.

On an annual basis then, Waswanipi hunters work longer hours than is typical of industrial employment, and they do work that is physically more demanding than almost all industrial employment.

By comparison, Bushmen spend 12-19 hours a week hunting and gathering or, assuming an average of 15 hours a week, 780 hours a year in direct production (Lee, 1968:37). Australian aborigines are reported to spend 4 to 5 hours a day in food production and processing (McCarthy and McArthur, 1960; and Sahlins, 1972:17), or 1,500 to 1,825 hours per year. And Hanunoo swidden agriculturalists put in 1,200 hours of agricultural work a year (Conklin, 1975 (1957):151), and New Guinean Enga spend 1,063 hours a year in food production, 338 hours in other subsistence tasks, and 161 hours in commercial activities (Waddell, 1972: Table 22, p. 97).

The picture that emerges then of Waswanipi hunters is that while they are abundantly productive with respect to their immediate subsistence needs, as I demonstrated in Chapter 8, they work relatively long hours and extremely hard in order to produce at the levels they attain. They have an abundance of food, but have comparatively limited periods of leisure. In this respect also, then, they do not fit the image of hunters or subsistence producers (Sahlins, 1972).

I - Overall Reliability and Efficiency of Waswanipi Hunting and its Basis in Knowledge

The overall efficiency of Waswanipi hunting can now be calculated for the five detailed diary records available. Considering only the time spent hunting and all animals harvested, the overall ratio of food energy output to work inputs varies from 5.6:1 to 9.0:1 and averages 7.4:1. Considering all man-days spent by hunters in hunting, maintenance and support activities, but not including the support and maintenance activities of women, the energy ratios vary from 4.6:1 to 7.0:1 and average 5.9:1 (Table 9-50).

By any comparative standards moose hunting is an extraordinarily productive activity. The ratio of energy output to input in moose hunting, 24:1 to 39:1 is as high or higher than the efficiency of horticultural production for almost all other societies reported in the literature. Tsembaga horticulturalists attain approximate ratios of 17:1 and 16:1 in taro-yam and sugar-sweet potato gardens in New Guinea (Rappaport, 1967), and estimates by Marvin Harris indicate ratios of 10:1 for Dyak rice swiddens in Borneo, and ratios of 13:1 to 29:1 for Tepotzlan swiddens in Meso-America (cited in Rappaport, 1967). Nietschmann reports returns of 30:1 for coastal swiddens of the Miskito in eastern Nicaragua (1970). Ratios of 16:1 and 7.5:1 have been calculated for Enga and Miyanmin horticulture (Little and Morren, 1976:81 and 77).

No other Waswanipi hunting activity, however, is as efficient as moose hunting. Beaver hunting, by comparison, has a ratio of only 6.9:1 and overall Waswanipi hunting has a ratio of 7.4:1 for hunting work inputs and 5.9 for all direct

Table 9-50 Overall Efficiency of Winter Season Hunting Activities, Diary Records, 1968-69

Hunters Reporting in Diary	Total Caloric Output[1]	Man-Days Heavy[2]	Man-Days Medium[3]	Man-Days Light[4]	Calories of Available Food Energy Per Man-Day[5]	Ratio of Energy Output to Hunting Input[6]	Ratio of Energy Output to Input[7]
52 and 61	3,406,596	124	14	72	16,222	9.0:1	7.0:1
53 and 59	1,623,513	41	54.5	62.5	10,275	7.0:1	4.9:1
68	716,876	41	6	19	10,862	5.6:1	4.6:1
44 and 45	2,671,296	135	12	28	15,265	6.6:1	6.0:1
28	605,026	23	8	18	15,513	7.4:1	5.5:1
All	9,023,307	364	94.5	199.5	13,713	7.4:1	5.9:1

Footnotes:

1. Based on harvests reported previously and caloric values of animal specimens on Table 8-12.
2. Man-days hunting moose, beaver and fish.
3. Man-days hunting waterfowl, grouse, hare and fine fur animals.
4. Man-days in support and maintenance activities from Table 9-48.
5. Based on 2,797 Calories for heavy man-days, 2,162 Calories for medium man-days, and 1,528 Calories for light man-days.
6. Includes only heavy and medium man-days, see footnotes 2 and 3.
7. Includes all man-days, see footnotes 2, 3 and 4.

inputs by hunters. These ratios are very similar to those cited for the hunting activities of other northern populations. Inuit hunters on Baffin Island produce a return of 7.3:1 on hunting work inputs, 4.7:1 on hunting and camp work inputs by men only, and 3.3:1 on all direct inputs by men and women (based on figures in Kemp, 1971:108-109).[28] The Inuit of Igloolik produce 7.5 to 8.4 times as much caloric yield as the estimated caloric expenditure in hunting (based on figures in Shephard and Godin, 1976: Tables 1 and 2, pages 110 and 111, and Godin and Shephard, 1973: Tables 8 and 9, pages 208 and 209).[29]

In addition, these efficiencies also compare favorably to those reported for the hunting activities of other populations as well. For Miskito hunting and fishing Nietschmann found returns of 7.1:1 for hunting and 5.5:1 for green turtle fishing (Nietschmann, 1973). Miyanmin shifting cultivators and hunter-gatherers produce returns on "hunting and collecting labor" of 8.9:1 in these activities. Harris has calculated that the Bushmen produce returns to work of 9.6:1 in their gathering and hunting activities (Harris, 1971).

The significant point is that moose hunting, beaver hunting and fishing, the activities that produce the great majority of subsistence food production, are equal or more efficient and/or productive than are the hunting and fishing activities reported for groups living at lower latitudes, and in some cases, in presumably more biologically productive environments. Overall Waswanipi hunting seems to be of comparable efficiency and/or productivity to that attained by hunters living in tropical and temperate regions. Thus, while it is important not to ignore the variability of sub-arctic ecosystems and animal populations, and such variations may mean that efficiencies vary from year to year, the first point is that under what the Waswanipi considered to be within normal variations, Waswanipi hunting does not appear to be characterized by low efficiency relative to hunting and fishing in other regions with more biologically productive and possibly less frequently perturbed environments. Thus, while biological productivity is more limited in the sub-arctic regions, and the environmental systems are probably more frequently perturbed than at low latitudes, animals are not unpredictable and erratic as such, and the hunter's efficiency at harvesting, at least in a "normal" year, can be comparable to the hunting efficiencies in biologically less severe regions.

The comparatively high efficiency of sub-arctic hunting, relative to the efficiency of hunting activities elsewhere is significantly dependent on the extensive knowledge and expertise of the Waswanipi hunters about their environment and about the resources on which they depend. The Waswanipi recognize perturbation in their environment in the form of the idiosyncracies they perceive in the behavior of the personal beings of their universe. But, despite such unpredictables, the Waswanipi hunters depend on their ordered knowledge of their world, and see their world itself as essentially ordered and dependable. Animal behavior is not perceived as erratic but as subtly responsive to the land, the winds and weather, the presence of other animals, and the activities and thoughts of men. And, men can learn and understand these relationships in the course of hunting activities. As I have been able to show at a number of points, the Waswanipi view is supported by their hunting related experiences. And, the Waswanipi recipes are consistent with the results of biological studies. The Waswanipi perception of the world as benevolent, but requiring informed and active participation by human is therefore an accurate perception.

J - The Allocation of Time

If Waswanipi hunting is relatively efficient when compared to hunting activities from other regions, however, the total time commitments required of the Waswanipi would appear to be much higher than is common elsewhere.

The long work hours relative to other regions appear to be a function of four features: the production of almost all foods by hunting; the quantity of foods produced; market production; and, the extent of maintenance and support activities. While the efficiency of Waswanipi hunting is roughly comparable with the efficiency of hunting in at least some tropical regions, groups such as the Miskito and the Bushmen provide only a part of their food requirements by hunting.

Most of their food requirements are provided by more efficient horticultural or gathering practices. The Waswanipi hunters, by contrast, provide for most of their food requirements from hunting alone. This plus the quantity produced account for long hours despite the relative efficiency of hunting activities. The Waswanipi over-produce above the use of the production group by about 20 percent, as shown above, and this probably accounts for at least 20 percent of work time because if all moose were kept, fewer beaver might be harvested, and beaver are less efficiently harvestable.

Another factor in the heavy work load of the Waswanipi is the extent of labor demands for subsistence and support activities. Hunters spend about 33 percent of their annual working hours on maintenance and support activities, and women who work comparably heavy schedules, probably spend over 90 percent of their working hours on maintenance and support activities. While comparative data are limited, the work loads of both men and women at Waswanipi are higher than the times implied by the studies cited above for other hunters and gatherers (c.f., Sahlins, 1972). Part of the difference would appear to be in the support and maintenance activities. The need to build and maintain more substantial camps, to produce appropriate fuel to heat the camps, to produce a range of specialized equipment for transportation, the need for specialized clothing, and the need for different equipment and clothing in summer and in winter, all place greater demands on sub-arctic hunters than they do on hunters and gatherers in warmer, snowless climates. It is these needs that demand a significant part of the hunters' time, and much of the time of Waswanipi women.[30]

Involvement in the cash economy also accounts for a portion of Waswanipi working man-days. Direct employment in wage labor has been estimated to account for 16 percent of the annual working hours. Hunting of fine fur animals would account for another 2 percent. The assessment of beaver hunting is however more difficult. While hunting of beaver accounted for approximately 14 percent of annual working hours, the activity produces both a highly valued food and salable furs. In general, the Waswanipi say both are important to them. If one third of this time is allocated to cash production, somewhat arbitrarily, then production for market accounts for 23 percent of Waswanipi hunters' annual working hours. The cash produced however increases the hunters' hunting labor efficiency and reliability. This is the Waswanipi hunters' own view, and it is probably true in fact as well. However, I am unable to quantify such improvements. It is probably worth noting though that the tools and services acquired through market exchanges have probably had at least as significant an impact on the support and maintenance activities, including travel, camp construction and heating, and clothing, as they have had on hunting activity, narrowly defined.

To review then, production above the needs of production units accounts for at least 20 percent of labor time of hunters, support and maintenance account for 33 percent of labor time of hunters, and production for market accounts for about 23 percent of the labor time of hunters. The latter, however, according to hunters, provides some means of more efficiently using labor time, if not of actual savings of time. In summary, that the Waswanipi have to work longer times than have been reported in earlier studies appears to depend on several factors, including habitat specific conditions, non-subsistence goals, and market exchanges.

From this perspective then, it is interesting to return to consider the goals which relate to the way the Waswanipi allocate their labor time, particularly hunting labor time. The Waswanipi themselves do not compare their hunting with nut gathering or turtle fishing, they compare moose hunting with beaver hunting, fishing, small game hunting and waterfowl hunting.

Summarizing the data on the efficiency and reliability of hunting activities, each activity may be comparatively ranked with respect to its frequency of successful hunts and the ratio of energy output to input. In terms of the frequency of successful hunts, fishing is in a class by itself with 88 percent of hunt-days producing successful harvests (Table 9-51). Beaver hunting and grouse hunting and waterfowl hunting all have a frequency of one-third to two-thirds of hunt-days with successful hunts. Finally, moose hunting, hare hunting and

Table 9-51 Reliability and Efficiency of Different Hunting Activities, Summary for Winter Hunting Season, 1968-69

Activity	Percentage of Hunt-Days With Successful Harvests	Calories of Available Food Energy Per Man-Day (Range and/or Mean)	Ratio of Energy Output to Input (Range and/or Mean)
Moose Hunting	22	109,858-65,915	39.3:1 to 23.6:1
Beaver Hunting	49	27,088-8,851 19,310	9.7:1 to 3.2:1 6.9:1
Fishing	88	11,543-8,330 10,353	4.1:1 to 3.0:1 3.7:1
Waterfowl Hunting	35	4,410	2.0:1
Grouse Hunting	58	3,128	1.5:1
Hare Hunting	24	2,533-810 912	1.2:1-0.4:1 0.4:1
Fine Fur Hunting	17	1,521-227	0.7:1 to 0.1:1

fine fur hunting all have low percentages of successful hunts, under one-quarter of the hunt-days.

While comparative data are very limited, it is interesting to note that Bushmen hunting has a reliability of 0.23, that is, the probability of a single hunter making a kill on a given day is 23 in 100 (Lee, 1968:40). By comparison, not only fishing, but beaver hunting, and grouse hunting are significantly more reliable activities for the Waswanipi than is hunting for the Bushmen.

With respect to the efficiency of a man-day spent in the different hunting activities the ranking of activities is quite different than with respect to reliability. Moose is in a class by itself with returns of over twenty to one (Table 9-50). Beaver can produce returns of up to nearly ten to one and average returns are nearly seven to one. Fishing produces returns of three or four to one. All other hunting activities produce low returns of two to one or one to one, or negative returns of less than one to one (Table 9-51).

The comparative grouping of all activities by categories of reliability and efficiency (Table 9-52) makes clear the choices available to hunters with respect to these two variables. The efficiency ranking is first moose, then beaver and then fish; the reliability ranking is the reverse.

Only moose hunting, beaver hunting and fishing among the activities available to the Waswanipi are not either low or negative in efficiency (Table 9-52). Moose hunting, beaver hunting and fishing are clearly the major sources of bush food, but it is moose and beaver alone which provide over eighty percent of the winter bush food. This suggests that efficiency is more important than reliability of the harvesting activity. Clearly Waswanipi hunters make significantly less use of fish than the high reliability of fishing activity would lead one to expect and they make more use of moose than the low reliability would lead one to expect. In this respect the size of the harvests corresponds better to the scale of efficiency of returns than to the scale of reliability.

Table 9-52 Hunting Activities by Categories of Reliability and Efficiency, Winter Hunting Season, 1968-69

Activity	Reliability	Efficiency of Return
Moose Hunting	Low	Very High
Beaver Hunting	Moderate	High
Fishing	High	Moderate
Waterfowl Hunting	Moderate	Low
Grouse Hunting	Moderate	Low
Hare Hunting	Low	Low-Negative
Fine Fur Hunting	Low	Negative

However, decisions are not based simply on the efficiency of the activity because if the basis of the decision were solely related to efficiency it would follow that significantly more use would be made of the moose resource than of beaver because moose is at least two to four times more efficiently procurable. Moose and beaver, however, provide roughly equal amounts of food. The allocation of time indicates that much less time is spent moose hunting than beaver hunting (Table 9-53)[31] despite the fact that weather conditions suitable for efficient moose hunting were sufficiently abundant, that at least twice as much labor could have been spent moose hunting under conditions that should have been highly productive. While doubling the time moose hunting would have been expected to produce somewhat lower efficiencies than those recorded, it would still be likely to be more efficient than beaver hunting, especially in the winter periods.

Thus, while these data generally confirm the widely claimed importance of efficiency as a factor in resource use decisions, the data also indicate an anomaly with respect to the application of the principle of least effort in hunting decisions. An explanation for this anomaly will be examined in the next chapter.

In the present chapter I have shown that there is a general correspondence between Waswanipi hunting practice and the appropriate parts of Waswanipi hunting recipes, and that the practical experiences of hunting confirm Waswanipi recipes, and they support Waswanipi belief in general.

There is also a high correspondence between Waswanipi beliefs and scientific accounts of the relationships between animals and features of their environment, and Waswanipi belief is claimed to be a critical component of the reliability and efficiency of Waswanipi hunting activities. The overall efficiency, and possibly reliability, of Waswanipi hunting are comparable both to results from other northern studies, and with the results of studies of hunters in more biologically productive environments. However, the total time allocated to all work activities by the Waswanipi is relatively higher than in other hunting

Table 9-53 Percentage of Hunting Man-Days Allocated to Different Hunting Activities, Diary Records, Winter Hunting Season, 1968-69

Hunters Reporting in Diaries	Hunting Periods Covered by Diary	Percentage of Hunting Man-Days Spent: Moose Hunting	Beaver Hunting	Fishing	Waterfowl Hunting	Grouse Hunting	Hare Hunting	Fine Fur Hunting
52 and 61	1/5 - 5/25	12	70	1	7	1	1	7
53 and 59	1/9 - 5/1	13	29	N.A.[1]	0	10	37	10
68	1/16 - 5/5	0	78	9	0	4	7	2
44 and 45	2/3 - 5/25	0	71	20	3	1	0	4
28	11/1 - 12/22	0	63	10	0	7	0	20
All		6	62	8	3	4	10	7

Footnote:

1. Not available.

and horticultural populations, probably the most important reason being the extra support and maintenance activities required at northern latitudes.

Waswanipi hunting activities vary widely with respect to both efficiency and reliability, and the distribution of these two factors does not coincide. Fishing is reliable, but less efficient than big game hunting. The allocation of time, as well as the total food produced from each kind of activity, correspond better to the goal of minimizing effort than of maximizing reliability. However, the correspondence is not complete, and two instances have been stressed when effort is not maximized. Beaver hunting methods are chosen more on the basis of conservation, and the desire for a rapid harvest, than on the basis of efficiency. And moose are under-utilized with respect to both time and amount produced given the efficiency of the activity.

Footnotes for Chapter 9:

1. Appendix 9-1 surveys the general features of sub-arctic ecosystems. Appendix 9-2 reviews the data on the climate of the Waswanipi region and Appendix 9-3 the land and forests. These appendixes serve to illustrate how the characteristics and interaction of the general features of the physical environment and the vegetation of Waswanipi conform to general patterns of the sub-arctic, as outlined in Appendix 9-1. They also serve as background to the appendixes on the ecology of the wildlife resources of the region: 9-4 on moose; 9-5 on beaver; 9-6 on fish; 9-7 on other mammal resources; and Appendix 9-8 on avifaunal resources. Wherever it was possible the appendixes are organized so as to parallel the issues discussed in the main text of the chapter so the relevant biological data may be read in parallel, section by section. This, however, has not always been accomplished.

2. It should be noted however that the depth of snow at the weather station is probably a minimum estimate for the snow cover depth on those forested sites which intercept little snow, such as deciduous stands. This is because the station is exposed to relatively direct wind action which is likely to reduce snow accumulations. Whether it is also an under-estimate of snow cover depths under coniferous stands which intercept much of the snow is less clear.

3. See Rikhter, 1954, and for an outline see Appendix 9-2.

4. The possibility of crusting at this season was noted in discussions of snow conditions where a distinction is made between _oateiao_ which occurs in _pipun_ as opposed to that which occurs in _sikun_. The former was said not to involve the repeated melting and crusting that is common in _sikun_, see Chapter 6.

5. The daily climatological report sheets available to me include those of five winters previous to 1968-69 from Chapais and of four winters previous to 1968-69 from Matagami. It seems likely that temperatures of 35^{o}F (2.2^{o}C) or more would be required to create widespread melting and crusting under the forest cover. Such temperatures occurred on one occasion only durin the five winters previous to 1968-69. In 1966, temperatures rose to 40^{o}F (4.4^{o}C) and 41^{o}F (5.0^{o}) on two consecutive days in January. While these records are for a very brief period, these data suggest that early January and/or February snow crusting occurs infrequently in the region. The winter of 1968-69 would not have been typical in this respect.

6. Hrebenyk notes that he defined the boundaries of each period subjectively, and that the periods "must be viewed as a part of a continuum rather than as separate entities with clearly defined boundaries" (Hrebenyk, 1977:2). Since the classification was prepared in order to analyze the relationship of climatic variables to the success/failure of hare and grouse hunting, the boundaries between the periods were drawn on the basis of the hunting record for these species "wherever it seemed most appropriate that a period of poor hunting ended and a period of good hunting began, or vice versa

(Hrebenyk, 1977:2). However, since each period was relatively long, a shift of boundaries by one or two days either way "would not likely affect the general character of the period as one of success or failure" (Hrebenyk, 1977:2).

7. Indeed, such events may be associated with particularly important meanings, as is suggested by the recitation of occasions on which moose are found without being looked for.

8. Looking for signs of moose was an activity that was not recorded in those diaries that listed only one activity per day. The reason for this, I believe, is that hunters prefer to hunt moose in the morning because of the activity patterns of moose and presumably because there would then be ample time for a pursuit, should it be necessary, and for the butchering the animal and returning to camp before dark. On days on which signs of moose are not found during the early part of the day, hunters often undertake other activities later in the same day. These other activities were listed in preference to the unsuccessful search for moose because they often resulted in harvests of some species other than moose, harvests which had to be reported in the diaries.

9. This is consistent with the Cree view of hunting and the cycle implied in the terminology for the hunting cycle. As aptly phrased by Adrian Tanner, hunting is the process of "Bringing Home Animals" (Tanner, 1976). Interestingly enough the phrases used in some of the Waswanipi diary records echo this view. It is not common to read that "I killed two beaver today", but rather that "I got two beaver in my traps today", and in a couple of cases just "I brought two beaver today".

10. This review includes data on the distribution and general adaptations of beaver colony and territorial organization, and behavior in relation to winter features of the environment.

11. The eight diaries which had data for such calculations included: one diary covering two hunters who often hunted as partners (hunters 52 and 61); one covering a single hunter (hunter 68); one covering two active men and one retired hunter, of which only the active hunters are included here (hunters 44 and 45); another covering two hunters who generally did not hunt as partners and which I have listed as two separate records (hunters 95 and 98); and one covering a retired hunter who worked with one part-time hunter (hunter 59), whose beaver hunting could not be determined with confidence so that the data on latter's activities are not tabulated, and only those of the senior retired, but not inactive, hunter are included (hunter 53). All these detailed diaries began after the Christmas-New Year's break of 1968-69, after the fall diaries were checked and hunters offered to keep more detailed records. In order to have records from the late fall and early winter periods, one hunter reconstructed for me his daily activities and harvests during the fall of 1968 (hunter 28), and two hunters were asked to keep partial records for the 1969-70 fall hunting season (hunters 28 and 61). Both did not hunt actively before the early winter period so

only data for the early winter season of 1969-70 were in fact available. These data are examined in comparison with the data for the post New Year's hunting periods of 1968-69. Unfortunately, the records kept in 1969-70 were highly intermittent partly because of the activity patterns of the recorders that particular year, so that these data have proved valuable for only a few of the analyses conducted in this chapter.

12. On a per man-day basis the harvest was not as high as for the early winter period (Table 9-13), whereas the beaver per hunter per week was much higher in early spring than in early winter (Table 9-12). This discrepancy is a result of very high harvests of two hunting groups which kept diaries, but did not report the man-days of beaver hunting effort. This suggests that the beaver harvest per man-day average for a period, calculated on Table 9-13, may be lower than would be the case were a larger sample of detailed data available.

13. Generally, beaver harvests do not show a clear relationship with weather conditions. It is difficult to examine the relationship of beaver harvests to weather conditions because the exact dates on which beaver enter traps are unknown, only the dates on which the traps are checked are known. However, even at the general level of periods characterized by different weather systems, there is no consistent difference between beaver harvests during periods characterized by highs, or lows, or by changing conditions. Beaver harvests appear to be more clearly related to general conditions of freeze-up and break-up and to conditions of extreme cold than they are to the greater variability in the passage of weather systems.

14. Because more than one hunter may trap at the same colony it was considered undesirable to use data from areas where not all the hunters who had been active in the area the previous winter had been interviewed. In addition, because of this multiple hunting by various combinations of partners, data could not be tabulated on a hunter by hunter basis and were organized by geographical unit. As a result the data from twenty-seven men were analyzed, but even among these, only part of the data from six was subjected to analysis, that part which occurred on the hunting territories that were subjected to analysis.

15. These hunters also reported a total of 34 colonies at which no beaver were hunted and 6 colonies at which the harvest was not decisively recalled. These colonies are not included in the present tabulations. It is unfortunate that I failed to clearly distinguish those colonies at which beaver were not caught because hunters decided not to hunt them as opposed to those colonies at which an effort was made to harvest beaver but none were successfully caught. Approximately one-half of the colonies without harvests occurred in groups or on separate streams, and these are the cases most likely not to have been trapped. On this basis I think that no more than 17 colonies were hunted without harvests, or six percent of the colonies possibly hunted. In other contexts hunters indicated that ceasing to hunt at a colony before catching beaver usually occurs when a hunter is planning to return to an area the next year, and he says those beaver do not want to be caught now, and he will leave those beaver until he returns.

16. Although there are various studies in the literature which discuss the age structure of sampled beaver populations, it is difficult to assess, and the age structure of this population of beaver is unknown. Age structures can vary significantly, depending on the phase of the growth cycle of a population, and depending on the intensity and history of the hunting of the population. It is therefore impossible to determine if the Waswanipi harvests are selective with respect to the size of the beaver harvested by comparing the sizes and presumed age classes of the Waswanipi beaver harvests to a normal age structure for a beaver population. Rather, an assessment of the selectivity of the harvesting must be made with respect to inferences about the beaver populations of the Waswanipi region based on the internal structure of the harvest data.

17. Hunters 53 and 59 only hunted at five beaver colonies during this period, too few for consideration in this analysis.

18. Some man-days were spent looking for beaver lodges. While this labor has been included previously and will be included below when analyzing the overall efficiency of beaver hunting activities, time looking for colonies has not been included in man-days hunting by either waking the beaver or trapping. The time spent looking for beaver colonies could not readily be divided between the time attributable to harvesting by one or the other method. The labor spent looking for colonies amounts to about 12 percent of all beaver hunting man-days (Table 9-28).

19. Hunters 52 and 61 and hunters 44 and 45 hunted as partners when waking the beaver and sometimes while trapping and reported their collective harvest on these occasions. As the reliability measure used here is sensitive to the aggregation of harvests of a number of hunters, I had to make certain assumptions and calculate separate percentages for these hunters. When two or more beaver were caught I assumed at least one was caught by each hunter. When only one beaver was caught I assumed the successful hunter alternated. While these assumptions would lead to some over-estimating of the percentage of hunting days with harvests, I think the error introduced has been small, as some of the relatively low trapping percentages would appear to indicate.

20. This comparison may however somewhat exaggerate the difference. It is likely that more of the colonies hunted by waking the beaver were trapped out, for example, hunters 52 and 61 cleaned out 4 of 9 colonies and left only one beaver in another colony. The fact that they caught nearly all the beaver at approximately half the colonies hunted by waking the beaver suggests that the beaver caught with this technique may have had a higher percentage of small beaver than was the case when beaver were trapped. Unfortunately, I do not have the detailed harvest records by size of beaver for these colonies.

21. These conclusions must however be qualified by noting that they rest on data for only five hunters and that I do not have the data to directly check these results against a wider sample of hunters. During the general

determination of the overall reliability and efficiency of beaver hunting however, in the next few pages, there will be an opportunity to compare the overall performance of these hunters to that of a slightly wider sample of hunters. These data indicate that the present sample do not differ from the wider sample in overall reliability and efficiency (Tables 9-26 and 9-29).

22. The five analyzed previously included data on the methods of hunting used, whereas the data on the other four indicated daily activities, but did not systematically distinguish methods and harvests by different methods.

23. In each case I have separated the harvests of individual hunters. This was done because the percentage of days with harvests generally increases when data on two hunters are grouped because the chances of two men making a catch are higher than if only one is checking traps, as noted above. See footnote 19.

24. See Rogers, 1973 for description.

25. It is interesting to note that in one of the diaries the recorder put down what kind of waterfowl he went out to hunt each day, and what he caught. In many cases, he caught species other than those intended. Thus he hunted for ducks on four days, and caught one duck on one of those days. However, he caught ducks on four days while out hunting for geese and on two days while hunting for loons. Duck hunting may be more of a secondary activity to goose and loon hunting in early spring. Later in summer duck hunting is the predominant activity.

26. While the definition of such activities can become exceptionally complicated, I have only considered those activities which make direct and obvious contributions. The detail possible in the analysis is constrained by the detail in the diary records, both with respect to the limited number of activities listed, and with respect to the size of blocks of time which are accounted for. The analysis is however sufficient for present purposes.

27. Rogers reports 43 hours of work per man-week in subsistence activities plus travel time, for a Mistassini hunting group in the winter hunting season of 1953-54 (Rogers, 1973:80).

28. Little and Morren calculate efficiencies based on the data by Kemp as well, but they estimate the ratio to be 3:1 (1976:51). There are two reasons for the difference. First, I use as the output of production all the food actually consumable by the humans, whereas they exclude that portion of the "consumable total" which was in fact fed to dogs. In this case, the portion fed to dogs amounts to 59 percent of all consumable food produced. Second, I have only included in "camp work" the specific contributions Kemp lists as such, which include the contributions of both men and women to the "material culture environment". Little and Morren appear to include in camp work all energy not included in other specific activities, including the energy consumption of children and, presumably, the basal metabolic

energy consumption of adults. The basis for the inclusion of these items in the "camp work" category is not explained.

29. The energy expenditure in this calculation appears to include not only work inputs, but total metabolic expenditures on hunting days by hunters, and the energy output appears to include the harvests of labourers and the sedentary unemployed, who all hunt occasionally.

30. There are no directly comparable data on support and maintenance activities of other hunters. Kemp's study of Inuit use of energy is however instructive on this point. He indicates that 1,746,171 Calories were expended in direct hunting activities, whereas 1,001,531 Calories were expended by men in camp work. Exclusive of employment and production of soapstone carvings for sale, the men thus expended 36 percent of the work they performed on work related to the "material culture environment". Women expended 16 percent more energy in camp work than did the men. While these figures are not directly comparable to my own, they indicate that activities related to support and maintenance occupy a significant portion of the work of the Inuit hunters and their families, as they do of the Waswanipi. The literature on Bushmen and Aborigines does not permit a quantitative comparison, but it gives a different impression of the time spent in support and maintenance activities (Lee, 1968; Sahlins, 1972).

31. For a Mistassini hunting group in 1953-54, Rogers has provided data that indicate: 67 percent of the hours devoted to subsistence activities were spent trapping, mainly beaver and fine fur; 8 percent were spent fishing; and 24 percent were spent hunting, mainly moose, caribou, waterfowl, grouses, and possibly hare (Rogers, 1973: Table 5, page 80). These figures are strikingly similar to the averages reported on Table 9-53.

CHAPTER 10 - ANIMAL POPULATIONS, ANNUAL HARVESTS, AND THE MANAGEMENT OF WILDLIFE RESOURCES

A - General Considerations Concerning the Possibility that Hunters Can Control and Manage Their Resources

The Waswanipi say that they could take more animals than they do, including more moose and more beaver, and that one of the things that limits what they harvest is that they only take those animals that are given to them. In Chapter 6, I show that the signs of when an animal is being given include the trends in the local populations of the species. It is therefore possible that limiting harvests to animals that are given may in fact serve as a culturally encoded model for sustained yield harvesting of the resource populations. If hunting activities were in fact found to be in conformity with this interpretation of Waswanipi beliefs, then this might be one explanation why the harvest levels of particular species and the time allocated to the hunting of a given species does not conform to simple rules of least effort or of need.

Despite the fact that the question of the possible under-exploitation or over-exploitation of animal populations by subsistence hunters has a long history in the literature in anthropology and biology (c.f., Speck, 1915b, 1938; Heizer, 1955; Leacock, 1954; Knight, 1965, 1968; Martin and Wright, 1967) there have been very few, if any, detailed quantitative analyses of the harvests of subsistence hunters in relation to the parameters of the game populations they harvest, with only very recent and partial exceptions (cf., Marks, 1976; Nietschmann, 1973).

While it is entirely plausible that hunters should determine the harvest levels of game populations based in part on their judgments of the harvests those populations could sustain, such an interpretation runs counter to some of the basic assumptions that have been made by anthropologists about man-environment relationships among peoples which harvest non-domesticated plant and animal resources.

It is a common assumption that people who gather or who hunt wild plants and animals have little influence over the species they harvest. In particular it has been assumed that most hunters exercise control in their subsistence affairs almost entirely by exercising control over themselves because it is beyond their control to affect the productivity, yield, and carrying capacity of their environments and of the wild resources they harvest.

> "The technologies of modern hunters and gatherers are highly limited in terms of the control they give men over their environments and the efficiency with which investments of energy yield a return. They are also highly ingenious. At this technological level, man adjusts to an environment, changing his patterns of living to follow cycles of an ecosystem...
> "The relationship of men to resources is fragile and largely beyond direct human control" (Keesing and Keesing, 1971:136-137).[1]

Parallel with these interpretations it has been emphasized that people who harvest wild game and plant resources do not use the full resource potential of their environments, they under-utilize the resources available to them (Washburn in Lee and deVore, 1968:84; Sahlins, 1972). It has been widely noted that hunters and gatherers generally use only a limited number of the total number of potentially edible species in their environment (Lee, 1968; Rogers, 1963). And, it has been noted that they generally do not harvest all the specimens available of any of the kinds of plants or animals that they do harvest (Lee, 1968). But detailed considerations of the intensity of use of resources in relation to the reproductive potential and harvestable yields have not been made, with few exceptions.

This general failure to examine the intensity of resource use follows from the assumption that the parameters of wild game and plant populations are largely beyond the control of the harvesters of such populations. And, that these parameters are not controlled appears to be consistent with, if not confirmed by, the fact that populations depending on non-domesticated resources have been said not to harvest all or most of the available yields of those resources. This lack of control or influence is virtually the <u>sine qua non</u> of human populations that depend on wild animals and plants as opposed to those human populations which depend on domesticated plants and animals and hence appropriate or manage the environmental side of the man/environment relationship. The latter control and regulate subsistence, in part, through control of the distribution and reproduction of the plants and animals on which they depend. Because they exercise some control over the distribution and reproduction of the species they harvest, they are capable of creating at least some of the conditions they desire for future harvesting, and they are capable of planning for the conditions of future harvests, with varying degrees of success. This decision-making and control can be expressed by saying that they manage the subsistence resources. This feature seems largely to have been assumed to be absent from hunter and gatherer subsistence.

It is surprising that populations living off of non-domesticated resources would not try to regulate the major resources on which they depend, and gain some control over the conditions of future harvests. It has been widely assumed that hunting and gathering peoples are concerned with the efficient use of their productive time and labor. And, as I have indicated in the last chapter, even among peoples who use predominantly animal resources, as opposed to vegetal resources, there are significant differences in the efficiencies with which different resources can be harvested. The implication would be that people living off non-domesticated resources would try to use more intensively those resources which can be harvested efficiently as opposed to those that can be used less efficiently. And, they could reasonably be expected to try to control current and future distributions and reproduction of those resources they were using intensively.[2]

It has not been adequately appreciated how the process of harvesting animals and modifying the environment can have clear and foreseeable impacts on important biological parameters of the populations being harvested. In the long run, for example, the number of individuals of a species present in any location may be a function of the state of development of the non-human ecosystem, but that stage of development can be influenced by human action, at least through the use of fire which can maintain vegetation at a sub-climax level or create a disclimax (Lewis, 1977). In the short run, a population of mammals may be significantly affected by the levels of the harvests made in the previous years, and densities, productivity and yield may be influenced by human hunting. Assuming hunters will have observed such relationships, hunters have within their technological limits, an ability to partially control the local population of a species by choice among the different strategies of hunting that they can adopt. It is possible to anticipate the present state of a resource on the basis of experience of the effects of past hunting and it is therefore possible to take decisions about hunting at one time and know what some of the consequences will be for the animal populations in the future. This means that at several levels hunters do have controls, of some significant degree, over the distribution and reproduction of species on which they depend. In some senses they may not only "adapt to", but "manage" these resources. Such management may itself be a form of adaptation, as I will discuss later.

This view of hunting as a system of management is significantly related to the view that hunters' subsistence systems are reliable, efficient and abundant - for these features may be associated, and indeed may be a product of management of the distribution and productivity of animal populations. Sahlins has suggested that the fact that hunters seem "neither harassed nor anxious" (1968:87) and that they dispose of food on hand with a certain confidence, "as if they had it made", is a reflection of the control they exercise on themselves, and on their needs. I would argue that, in some cases at least, this confidence in the harvest of the morrow may be based not only on easy satisfaction of needs, as such, but on the extent of managerial control actually exercised by the population over its resources and their reproductive capacities. Needs will be met because they can and have been planned for.

In short, I believe the concept of management may be basic to understanding the functioning of some hunters' subsistence systems, and may provide a clue to some of the factors making subsistence among wild game harvesters reliable and efficient. Furthermore, I would argue that the structure of management decisions is related to the ethnoecological principles of the hunters.

In this chapter, I will consider for each of the main resources which are used: if there are indicators of whether the harvest levels are below or in excess of the sustainable yields of the populations; what the intensity of use is, i.e., how much of the sustainable yields are being harvested; and, I will give an assessment of whether the indications are that the activities of the hunters themselves are having an impact on the productivity and yields of the harvested populations. In short, I will consider if the Waswanipi are conserving and managing resources. In each case I will briefly review present biological knowledge on how and to what extent hunting can control population parameters. In the next chapter I will consider how the spatial and social organization of Waswanipi hunting is structured to facilitate the implementation of management principles in harvest decisions affecting the relations between men, the land, and animal populations. This will extend the initial assessment made here of the impact of hunting on the distribution and reproduction of the harvested populations. The next chapter will address the question of who actually takes management decisions, and what the units of management are.

However, before turning directly to the assessments of specific resources and harvests, I will briefly summarize some relevant concepts and analytic models that have been used by wildlife biologists for the management of big-game animal populations. These tools, developed in part to manage wildlife resources and the sport hunting activities which affect them, provide a general framework which defines the choices open to wildlife authorities for managing the populations of animals under their jurisdiction. The models identify the options available, and consequences that follow from actions based on each option; and I think they potentially apply to the analysis of subsistence hunting as well as to the analysis of sport hunting.

B - Some Concepts of Wildlife Resource Management[3]

For each species in a particular habitat there is a limit to the numbers of individuals that will occur in that habitat, a limit set either by one or another of the life essentials (including food, cover, water, etc.) or by some social factors regulating population densities. Where this limit is related to limits in life essentials, the limit may be termed the carrying capacity. For a population at carrying capacity the young born each year represent a surplus, and either they or the older animals will die so that the population will return to the carrying capacity. These relationships are found, for example, in the ideal model of the annual cycle of big game populations at carrying capacity. The peak of the population at carrying capacity will occur immediately after the fawning period in the spring, after which there will be a slow decline during the summer and then a more rapid decline in population in the late fall and winter as the most restrictive period of the environment occurs. By the following spring pre-fawning period the population will have returned to the same pre-peak level it was at during this same period the previous spring. Thus the surplus of animals is lost each year. A part of this yield may be killed by human hunting, without decreasing the level of populations that will be maintained in that habitat. If those animals in the surplus which are not necessarily killed by natural factors, predation, starvation, accident, disease, or some combination thereof, are harvested by hunting the population will remain stable. Each year therefore there is a production of animals a portion of which is potentially available to hunters to harvest without reducing the population.

Not all animal populations do, or are allowed, to stay at the density set by the limits of their habitat, that is, at the carrying capacity. If a population is at a lower density, it would normally be subjected to a lower impact of environmental decimating factors, and a number of the young born each year would survive to adulthood and join the productive population. The population will then not be stable but growing, if it is not regulated by social mechanisms. Under these conditions, it is possible to harvest each year a number of animals from the population equal to the number of new animals surviving that year to reach the age when they join the reproducing group. This is called the hunting yield, and harvests of this size will not reduce the size of the population as a whole.

If a population is regulated below the limits set by the limits of the habitat by various social mechanisms that regulate densities, then the population will not increase further, and the number of young born each year which would survive to adulthood and reproduce will be removed by some environmental decimating factors. Again, some or all of this increment can be removed by hunting without reducing the size of the population as a whole.

The growth of an animal population in a new habitat, or in an area in which populations have been depleted will normally continue until one or another factor limits the growth. The growth of many animal populations when expanding in a new unfilled niche will approximate an "s" or sigmoid shaped curve. Initially there is an increasing rate of growth and an increasing population. However, the growth begins to decline at one point, while population size continues to rise, although less rapidly. Finally, the rate of growth reaches a low level and the population size reaches an asymptotic high level. An established population may, for a variety of reasons, exist at a density anywhere along such a curve. Dasmann has defined four characteristic types of densities that occur and their features, and these are relevant in the present context.

Subsistence density is the upper limit a population can reach in a given habitat, it is the density limited by environmental variables, the carrying capacity. It represents a point at the upper asymptote of the curve where environmental factors limit growth of the population, and productivity is low. Dasmann describes the characteristic general features of populations at subsistence density:

> "A population living at or near the subsistence level obtains enough food for bare survival, but not enough to maintain good health, optimum growth, optimum body size, vigor or fecundity. It is essentially a disaster

> level, fluctuating with small changes in weather or with the seasonal cycle of growth and dormancy in plants. Any unfavorable change in weather, the appearance of a disease, or an influx of predators can cause widespread decimation. In the absence of such disasters, however, populations can hang on for a long time at a subsistence density" (Dasmann, 1964:183).

In contrast, Dasmann defines the density where productivity was highest but density was normally well below carrying capacity, as the optimum density:

> "A population at this level has adequate food, water, and shelter to meet its needs. Mortality as a result of shortages of these elements will not occur, except where disastrous changes in the environment are brought by unusual weather or other catastrophes.
>
> "At an optimum level a population is not immune to predation, although the abundance of necessities will prevent excessive loss to predators. Body size, health, growth, and fecundity will approach the maximum for the species. Productivity will be near the maximum. Relative to the logistic curve, this level resembles the inflection point, or point of highest yield, beyond which productivity declines as the subsistence level is approached. Since essentially no factor is limiting at optimum density, it is consequently not a level at which a population would remain except where it is controlled by predators or by human hunting, or where the behavior of the animals, through the operation of territoriality, prevents further increase" (Dasmann, 1964:184).

Security density is the level of population density at which, at a certain level of hunting or predation, the amount and distribution of escape cover is such that the population cannot be depressed further under normal conditions. While hunting and predation are the factors most critical to both optimum and security densities, there is no necessary relationship, and the security density may actually fall anywhere along the growth curve. However it is often considered likely that security density will be lower than optimum density, and it is patently so where hunters are able to decimate a game population, as is the case for moose, beaver and many fish.

Finally, tolerance density is a level of population density maintained by intraspecific tolerances, most commonly territorial, whereby crowding is prevented by dispersal brought about by territorial antagonism (1964:187). In general, territorial species are expected to have tolerance densities that are close to optimum densities, although they need not be closely related.

These types of population densities are each compatible with some level of hunting intensity and each can be considered as a possible goal or alternative density at which a game population could be regulated by means of hunting. Each density may therefore be considered a goal that can be achieved by the regulation of hunting activity itself, and each can be seen as an alternative strategy for regulating game populations.

The logic of the types of densities suggests that hunters would find that maintaining an animal population at or near optimum density would simultaneously: maximize the productivity of the population, and hence the potential hunting yield; stabilize the population at a level secure from at least some environmental variations in critical parameters; and, maximize the size and health of each animal. Subsistence density would maximize the number of animals present, but not the yield, individual animals would not be in the best condition, and populations might be easily destabilized by environmental perturbations. Comparing optimum density conditions to subsistence density conditions, at optimum densities: animals would be less dense and hence probably harder to locate; in better health and possibly more difficult to kill; but more could be killed over the long-term at optimum density; and, the populations would be relatively more stable than at subsistence densities.

Comparing optimum and security densities, more animals can be killed at optimum density and there would be more animals present. But at the optimum density the possibility of over-kill must be regulated by the hunter because, assuming the security density for intensive hunting is lower, if the hunter hunts too intensively he will reduce the population to a security density. At security density the kill is limited primarily by the intensity of the hunting and by a combination of habitat conditions and hunting technology, such that escape cover, or some other environmental factor limits further hunting a success. Hunting at optimum hunting density therefore affords more efficient hunting and more animals than hunting at security density would, but to maintain the benefits of hunting a population at optimum density hunters must regulate the number of animals they kill.

In summary then, optimum conditions would theoretically maximize the possible numbers of animals harvested, the size of animals, the total biomass harvested, and long-run stability. But because hunting at optimum density does not maximize the size of the population itself, locating the animals may be less efficient than at subsistence densities, but more efficient than at security densities. From the point of view of the hunter, however, optimum density is an intermediate density at which careful regulation of his own hunting activity is the most important factor. Optimum density then maximizes the critical productivity and yields of the hunted population while leaving the locating of animals and regulation of the numbers killed as potential problems to be resolved by the knowledge and skill of the hunter.

<u>C - Moose Yields, Harvests and Management</u>

i) General Review of Moose Reproduction and Productivity in Relation to Hunting

Only since 1959 has biological knowledge of the reproduction and productivity of moose been adequate to assess the general population dynamics of the species. Prior to that time, moose were generally considered to have a low rate of reproduction. One of the important types of support of this view was the high percentage of "barren-cows" presumed to exist in most moose populations because of the frequency of summer and fall observations of cow moose who were not accompanied by calves (Peterson, 1955:58-60). Later analyses have not supported this view of the reproduction and productivity of moose, and have indicated systematic biases against observation of calves due to behavioral and other factors (Simkin, 1974:518).[4]

Recent studies have revised thinking on three aspects of moose reproduction that are basic to productivity: pregnancy rates of adults, pregnancy rates of yearlings, and occurrence of twin births (Pimlott, 1961:250-251). In addition, they have revised biological knowledge of the responses of moose hunting pressures.

Rutting takes place from early September until mid- or late October, although some breeding activity may also occur in November (Peterson, 1974a:10). Nevertheless, it is estimated that 80 to 90 percent of conceptions take place within a two-week period, usually peaking in late September and early October (Lent, 1974:309). During the rut males mate with more than one cow, but usually stay with one for several days or a week at a time (Peterson, 1974a: 11).

There is considerable variation from population to population with respect to the frequency of early and late conception. Swedish studies show this is related to several factors including physiological condition of the animals, population densities, nutrition and other habitat factors (Markgren, referred to in Peterson, 1974a:10; and Lent, 1974:310). Females who do not mate early in the rut apparently continue to have several additional oestrus cycles, so that mating can continue for sometime after the peak. Conception in moose therefore seems generally adaptive to environmental conditions, and responds with increased opportunities to offset basic conditions which are not favorable.

During the rut both males and females vocalize, the latter partly at least to attract males. Activity patterns vary from day to day depending on weather conditions. The greatest number of male calls is generally observed on cold clear days (Lent, 1974:320). Males generally do not eat during the rut, and lose up to 20 percent of body weight, females lose less than five percent (Lent, 1974:320). Gestation takes 240 to 246 days (Peterson, 1974a), the young being born in the spring.

In Ontario it was formerly thought that less than 50 percent of adult cows produce young (Peterson, 1955:60), but recent studies indicate that over 90 percent of adult cows may bear young in a year (Cumming, 1974b:680-1). Nevertheless, differences in pregnancy rates in different areas are considerable. Variations in the twinning rates and in percentage of yearlings breeding are even larger, and it has been suggested that variations in these frequencies may be particularly responsive to, and indicators of, environmental conditions (Edwards and Ritcey, 1958:266; Pimlott, 1961:251).[5] Twinning occurs in less than half of the births, and is generally said to occur in from 10 to 25 percent of all females (Peterson, 1955:56). The rate of twinning has varied from 41 percent of cows which conceived, in an area of low moose density in Newfoundland (Pimlott, 1961:251), to 25 percent of adult females over 30 months of age, in an Ontario study (Simkin, 1965). A small sample of cow moose from Laurentide Park in Quebec indicated 40 percent twins (DesMeules, 1963:69).

The pregnancy rate among yearlings is also highly variable. Studies in Newfoundland have shown that as many as 37 percent of yearling cows, on average, may become pregnant (Pimlott, 1959a:390), although values of 17 percent have been reported for Ontario (Simkin, 1965:745), and no pregnancies were reported in fifteen British Columbia cases (Edwards and Ritcey, 1958). In the Newfoundland study, the percentage varied from 29 percent in an area of high moose density, to 67 percent in an area of lower density (Pimlott, 1961:251).

The variability of these dimensions of moose reproduction and their relationship to environmental and population variables suggest that moose productivity is not so much low as it is plastic and adaptive. As I have indicated, moose populations are often in circumstances where significant population expansion is possible because fires or other disturbances have created newly suitable habitat. It has been suggested that moose have developed a mechanism that ties ovulation rates to the nutritional regime of the female (Geist, 1974:533).

Thus, with moderate densities and/or abundant nutritional resources, females may have more young, and more females may become pregnant than when densities are higher and/or nutritional resources are less abundant.

Moose productivity, measured as the annual increment to the population, was formerly believed to range from 12 to 25 percent with an average of 16 percent; and a safe kill of bulls only was thought to be 6 to 12 percent of the adult population (Peterson, 1955:70, 216). Rates of increase are now known to be as high as 34 percent (Cumming, 1974b:680-681), and the annual net productivity is 20 to 25 percent in some moose populations (Pimlott, 1959a:397). Net productivity, the percentage of animals that can be removed by hunting annually, taking account of other mortality, has ranged from 17 to 23 percent in Alaska, from 20 to 25 percent in Newfoundland, and has been found to be 24 percent in Ontario, and 25 percent in Sweden (summarized by Simkin, 1974:524, Table VII). The implication of these figures was that "moose on good range can be heavily exploited, a fact not generally appreciated in North America" (Pimlott, 1959b: 443).

The first general review of the biological literature on moose populations was undertaken in the late 1940's because of severe declines in moose populations, which were thought to be caused by over-hunting and as a result hunting was banned in many areas. The data now available indicate not only that moose porductivity is much higher than previously thought, but also that hunting, while potentially dangerous, may also be important for the maintenance of relatively stable and healthy populations, when it is carefully regulated.

Under optimal conditions, or in insular situations, it appears that moose populations have a sufficient rate of reproduction to out produce losses to predators and illnesses and to increase their density until they reach or exceed subsistence density and over-populate an area. On Isle Royale in Lake Superior moose have twice increased to over the apparent carrying capacity of the land, severely over-browsed the vegetation and suffered a high mortality that resulted in a sharp population decline (Adolph Murie, 1934; Shaler E. Aldous and

Laurits W. Krefting, 1946, 1951). Wolves were not common on the island. On the British Columbia mainland, however, moose populations increased in areas that had been destroyed by forest fires, reached peaks in the 1930's and 1940's and experienced heavy winter mortality on both occasions, in the presence of timber wolves (Hatter, 1950)

Moose are apparently able to fill the carrying capacity of their habitats and, when they have done so, exhibit a considerable instability of population. The situation in Ontario, for example, had changed so much from the 1940's to the 1960's that Pimlott was able to write, "It now appears that, unless hunting pressure can be greatly increased, the limiting factor on moose in many parts of this province will be the limit of the carrying capacity of the range" (1961:254).

Hunting then is an important mechanism that can control moose populations and a number of critical dimensions of the productivity of those populations. The impact of hunting on moose populations and productivity can be demonstrated by the changes brought about by the commencement of hunting in Quebec provincial parks during the 1960's. Since 1962, when Quebec began to allow controlled moose hunting in a series of provincial parks, the Department of Tourism, Fish and Game has monitored the effects of the hunt on several parameters of the moose populations.

It was found, in general, that older moose formed a lower percentage of the animals in the later years of the hunt than in earlier years, as hunting had a progressive impact on the populations (DesMeules, 1966:5). In Laurentide Park animals over 15 years of age dropped from 11 percent of the harvest in 1962 to 3 percent in 1968 (Simard, n.d.). The average age of the moose dropped from 7 to 5 years (DesMeules, 1966:12, Table 7).[6] The proportion of yearlings in the harvested population changed dramatically, tripling in Laurentide Park from seven percent in 1962 to 24 percent in 1968 (Simard, n.d.). This indicates that there was a signifiant increase in the number of births and/or in recruitment following the introduction of hunting

(Simard, n.d.; Bouchard et Moisan, 1974:701), and it further indicates a significant increase in the net productivity of the populations. The effects on total population numbers are not entirely clear, but it seems that populations may have declined somewhat in the hunted areas (DesMeules, 1966: 5 and 13, Table 10), but were steady over each of the parks as a whole (Simard, n.d.). In general then, the trends which occurred following the introduction of controlled hunts in Quebec parks were consistent with the expected results of hunting on populations, and demonstrated the beneficial effects of regulated hunting, and that hunting can be a tool of management of moose populations.[7]

But, while the effect of various types of controlled hunts are potentially beneficial, care to avoid over-hunting is a potential problem, because moose populations have been decimated in the past by over-hunting; that is, hunting can keep moose populations at or near optimum densities, but over-hunting can depress populations to security densities that are well below optimum densities. Because hunting harvests probably cannot be precisely balanced in practice with optimum yields, the impacts of over-hunting and the responses of moose populations are important questions for managers. The ability of a moose population to recover from heavy hunting harvests have been analyzed in several recent studies in Ontario. One study of mobility indicated that moose populations do not respond to hunting in a given area by any significant directional dispersal of animals from areas not hunted into the ecological niches created by the heavy hunting (Goddard, 1970:444). This indicates that reproduction in a hunted local population will probably depend more on increased productivity than on repopulation by moose from adjacent unhunted areas.

A second study indicated the response of a local population to over-hunting. A district was intentionally over-hunted for a period of several years. The season was then closed and the response of the population monitored. Results indicated that after two years of closed seasons the moose population was able to support harvests comparable to pre-intensive hunt levels (Cumming, 1974a:543). The moose responded relatively quickly to the closed season with substantial increases in herd size (Cumming, 1974a:546). This suggests again that the variable and, potentially significant, reproductive potential of moose respond not only to habitat changes, but to changes in the harvesting regime, and it also indicates that the results of over-hunting are not as disastrous as was previously feared (1974a:555).

By definition, over-hunting occurs when "an optimum yield is no longer sustained because too many animals have been removed by hunters", but the optimum yield must be determined by the manager on the basis of the purposes for which the population is being managed (Cumming, 1974a:552).

In the recent review of the ecology of moose it has been suggested that there are a number of easily observable indicators by which managers may judge if maximum yields are being approximated and when over-hunting is occurring. If there is a maximum yield being obtained it would be expected that three conditions would exist: 1- the harvests will show small yearly fluctuations; 2- the sex ratio of the kill will approach 1:1; and, 3- the proportion of calves and yearlings in the harvest will be high in relation to the potential productivity of the species (Ritcey, 1974:635). The indicators of over-hunting are: first and best, decreasing annual harvest per unit area, in the absence of other explanations for the decline; secondly, a shift in the sex ratios of the harvest to one favoring cows (Cumming, 1974a:546). An increasing percentage of yearlings in the kill was not an indicator of over-hunting, but it is an early indicator of increasing harvests and the possibility of over-hunting in the future (Cumming, 1974a:546). These reviews therefore indicate that it may be possible to assess whether maximum yields are being achieved and to anticipate over-hunting before it occurs, or in the early stages of its occurrence, by monitoring a number of easily observable parameters of the hunted population.

In summary the studies of moose behavior and populations over the past two decades have repeatedly found moose reproductive behavior to be more adaptive and more capable of higher rates of net productivity than had previously been thought. And, they have found that hunting is an important tool for the management of moose population densities, reproduction and population dynamics. Moreover, they have found that reproductive capacities of moose can apparently respond effectively and quickly to human hunting pressures and changes, as well as to some changes in environmental conditions.[8] While moose can be over-hunted, the population is relatively easy to monitor and, at least when over-hunting is not too extensive and continuous, a local moose population can increase rapidly after cessation of hunting. Thus, moose are capable of being carefully managed by man, hunting is itself a major tool for such management, and alternative management strategies can affect productivity of the species and the size of the harvest.

ii) Moose Population Densities in the Waswanipi Region

The first aerial survey of the moose to include part of the area of the Waswanipi region was undertaken in January, 1968 (Brassard and Bouchard, n.d.), ten months prior to the commencement of the present research. It included coverage of that portion of the Waswanipi hunting territories south of 50° latitude, and extended between 48°N and 50°N and 74°00'W and 79°30'W longitude. The survey was made by airplane and was based on observations from equidistant parallel transects 10 miles apart in a nort-south direction at altitudes of 800 to 1000 feet. The surface area observed on each transect was approximately one-half mile wide, so that approximately 5 percent of the total area was surveyed. The method used is considered to give a minimum estimation of the moose populations.

The results of the survey indicated that moose distributions were sporadic, but that the area surveyed could be divided into zones of light and dense moose populations. Areas of light moose distributions had extremely low densities, less than one twentieth of the densities that were found in the zones of high densities. Over the entire area surveyed, zones of high densities comprised twenty-six percent of the total area. However, the distribution of dense areas in the area of the Waswanipi hunting territories was somewhat different.

In order to estimate the number of moose in the area of Waswanipi hunting territories I have recalculated from transect lines the observations of moose yards within this area. Approximately 535 miles of transects were flown over the Waswanipi hunting territories south of 50°N latitude, covering 267.5 square miles of the area. Eleven moose yards were sighted in the surveyed area, and with the estimated 2.5 moose per yard which the survey assumed, there were 27.5 moose in the surveyed area. This gives a density of 0.1028 moose per square mile.

The entire area within the outer limits of the hunting territory boundaries of the hunters who were interviewed in this study totals 9,759 square miles. If this same density of moose occurred over that portion of the Waswanipi hunting territories that are to the north of 50°N latitude, then the estimated moose population of the entire area of the hunting territories would be 1003 moose.

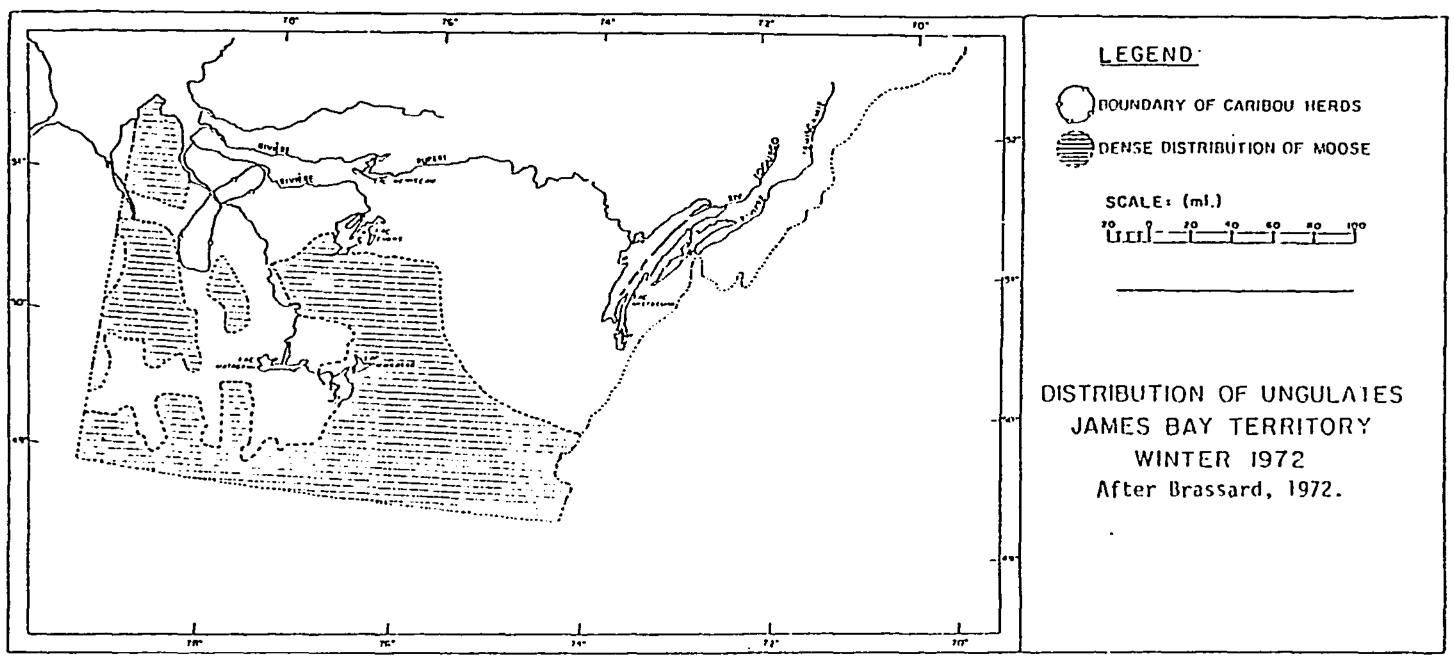
In the winter of 1971-72, slightly over one year after completion of the quantitative data for the present study and four years after the first survey, an aerial survey was conducted in the James Bay area north of 49°N latitude (Brassard, 1972). This study used 10 mile equidistant transects similar to the previous survey, and covered most of the area of the Waswanipi hunting territories, both north and south of 50°N latitude. Because of the distribution of flying patterns part of the Waswanipi area was not surveyed, however, the results were countoured by the authors to fill in missing areas. On the basis of the survey a number of distinct sectors of dense and sparse densities of moose were defined for the James Bay area, and the densities of the moose population in each sector was calculated. The number of moose assumed per moose yard observed is not reported in the study, but on the basis of mapped observations and reported estimates I calculate that 1.8 moose were assumed per winter yard observed, and this is confirmed in a later report (Morasse, 1975:9). The densities estimated per sector varied from under 0.01

moose per square mile in the north of the James Bay territory to over 0.5 moose per square mile in specific sectors of high densities (Map 10-1).

Most of the area covered by Waswanipi hunting territories was in a sector classed as a dense moose area, but with actual densities at the lower end of those found in dense sectors. I have calculated that 6,810 square miles of Waswanipi hunting territories, seventy percent, fell within a high density sector (1-A), and the remaining 30 percent, 2,949 square miles, fell into low density sectors (type 3) (based on Brassard, 1972, Figure 4A). High density sector 1-A, which comprised a total of 9,450 square miles (Brassard, 1972, Figure 4) had an average estimated density of 0.125 moose per square mile. All the low density sectors together averaged 0.009 moose per square mile (Brassard, 1972: Tableau I, page 5). In total then, I estimate that the portion of the Waswanipi area with high densities, the area in sector 1-A, had a total of 851 moose, and the portion of the Waswanipi area with low densities had a total of 24 moose, for a total estimated moose population of the Waswanipi hunting territory area of 875 moose.

This represents 129 moose less than resulted from the survey in 1968, or 13 percent less. The two studies, however, assumed a different number of moose per yard. Observations from the aerial surveys include both sightings of winter yards and of animals *per se* but, in general, the observations of yards are considered more accurate because some moose will be difficult to locate under the trees and in the brief time for observation. The number of moose in an area is calculated using an estimated number of moose per yard. When these studies were conducted there were no intensive surveys of moose yards in Quebec to establish empirically an average number of moose per yard. The 1968 study assumed 2.5 moose per yard, the 1971-72 study assumed 1.8 moose per yard. This 28 percent difference more than compensates for the difference in the estimates of the moose populations in the two studies. If 2.0 moose per yard is assumed then there were an estimated 803 moose in the Waswanipi area in 1968. The density of moose of sector 1-A in 1971-72 would then have been 1.138 moose per square mile and in sector 3, 0.009 moose per square mile, for an estimated 940 plus 27 moose in those sectors within the Waswanipi area, or

Map 10-1. Relative Density of Moose in the Southern Portions of the James Bay Area, 1972.



967 moose in total. By standardizing assumptions, the 1971-72 estimate is 164 moose or 20 percent higher than the 1968 estimate.

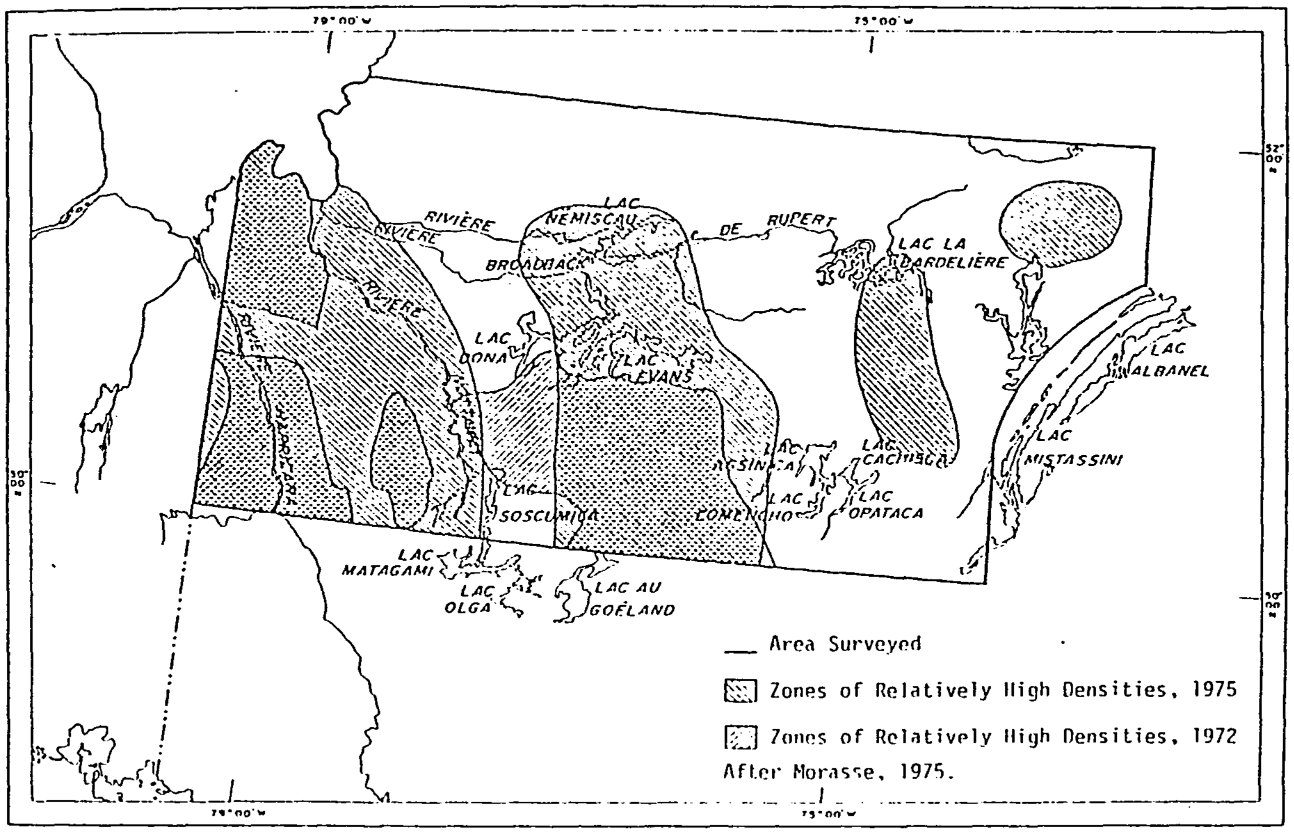
Since these two surveys the results of two more intensive aerial surveys of moose populations have become available, and these help to confirm the picture provided by the earlier studies.

In February and March, 1975 sample plots uniformly distributed north from $50^{o}30'$N north to 52^{o}N were surveyed intensively by airplane (Morasse, 1975). Forty-seven plots were chosen, each with an area of 24 square miles, giving a sample coverage of about three percent of the total area. Within each sampled plot transect lines were spaced 2,000 feet apart, and the flights were made at 650 foot altitudes. The number of moose yards was reported per plot and an estimate of the total population made. In addition, four zones of high densities of moose were identified on the basis of differences between groupings of sample plots. One of these zones corresponds roughly to the northern portions of sector 1-A identified in 1971-72. The redrawn boundaries of this zone of dense moose populations (Morasse, 1975:10) cover 73 percent of the area of the Waswanipi hunting territories north of the 50^{o}N latitude (Map 10-2).

These data therefore confirm the approximate geographical distribution and the approximate extent of the sectors of dense moose distributions in the Waswanipi hunting territories. The data also suggested the possibility that a more accurate and intensive method of sampling the region indicates higher overall populations of moose than were estimated on the basis of the earlier studies, however later surveys have indicated that the population projections from the 1975 survey were probably over-estimates.[9]

In 1976 a follow-up inventory was made of the region north of $50^{o}30'$N latitude, using the same inventory procedure as had been used in 1975. The estimates of moose populations from this survey were however made by stratifying the observed areas, and the territory as a whole, by forestry types (Audet, 1976: 10). The density of moose yards observed in areas with each of seven classes

Map 10-2. Relative Density of Moose in the Southern Portions of the James Bay Area, 1972-1975.



of vegetation was calculated and then extrapolated on the basis of the total area covered by each of those seven classes in the territory. The number of moose per yard was based on a series of three intensive surveys of moose yards from helicopters in Parc des Laurentides and Parc de la Vérendrye in southern Quebec. These studies indicated the mean number of moose per yard in the different regions was 1.92, 2.11, 2.35 (Audet, 1976: Tableau II, page 15), with a mean for all 185 yards observed of 2.12 moose. Because moose densities were lower in James Bay than in the area where the yards were surveyed Audet adopted a value of 2.0 moose per yard.[10]

The density of moose was found to vary significantly by forestry type. When the stratified estimation was made for the entire region the mean density of of moose was estimated to be 0.052 moose per square mile (converted from metric units in Audet, 1976:19). The 1975 survey estimate was 0.09 moose per square mile, is probably too high because the overall 1976 survey results were comparable to the values estimated in the 1971-72 survey (Audet, 1976:23). The general distribution of zones of higher densities of moose in 1976 corresponded well with the distributions determined in 1971-72 and confirmed in 1975.

Thus the studies since 1972 have confirmed that, at least in those parts of the Waswanipi region that have been covered, the distribution and density of moose have been relatively stable. The difference between the 1968 figure and that for 1971-72 may therefore be due to a real increase in densities, or to random variations in sampling procedures. For the nine years from 1968 to 1976 the moose population has been either stable, or it has experienced a modest increase during the first four years and has been stable since.

The fact that moose populations were stable or rising during the period from January 1968 until the winter of 1971-72 is the best indication that the Waswanipi were not harvesting more than the sustainable yield of the moose populations of their area during the period covered by the present study. However, the relationship between harvests and yields may be examined also from the perspective of the level and trends in the harvests.

iii) Waswanipi Harvests

The total Waswanipi harvest of moose is comprised of fall, winter and summer kills. The fall and winter kills for 107 Waswanipi hunters determined on the basis of interviews with 101 hunters totalled 107 animals in 1968-69 and 81 in 1969-70 (Table 10-1). To this must be added summer harvests. My records of summer moose kills are incomplete and must be estimated. The men who lived in the bush for large parts of the summer harvested significantly more summer moose than those living in the settlements, because Quebec game wardens had intermittently given summons to people who had killed moose while living in the settlements. The regulations were that moose could be killed by hunters living on their hunting territories and this was explained by the game wardens as meaning that no moose could be killed within ten miles of the settlements or the main highways, and none could be brought back to the settlements. Surveillance however was spotty and my observations and informants' reports indicate that about one moose a month was killed and brought to each settlement in the months of June, July and August. Including those Waswanipi living at a summer camp cluster along the road between Waswanipi River and Miquelon, there were effectively four settlements during this period, for a total of twelve moose a summer. In addition, a total of approximately fifteen men lived in commercial and subsistence fishing camps in the bush during the summer of 1969 and ten in 1970. Interviews with half these men indicated an average harvest of 0.8 moose each. Projecting this for all men in fish camps, a total of 12 summer moose would have been harvested in 1969 and 8 in 1970. The total annual Waswanipi harvest of moose for 1968-69 was therefore 131 moose, and for 1969-70, 101 moose. The two-year average would be 116 moose per year.

These totals do not include the moose harvested in summer by Waswanipi hunters who were working outside the area of the Waswanipi hunting territories, and such harvests are not considered here. However, not all the moose harvested in the above totals were taken within the area of the Waswanipi hunting territories. Each winter a few hunters were hunting on the hunting territories of Indian people from the Abitibi Dominion band who live at the reserve at

Table 10-1 Harvests of Moose by Hunter, Fall, Winter and Spring, of 1968-69 and 1969-70.

Hunter Number	Fully Active Hunter	Moose 1968-69	Moose 1969-70	Hunter Number	Fully Active Hunter	Moose 1968-69	Moose 1969-70
1		0	0	29		0	0
2		0	0	30		1	0
3		0	0	31	A	1	0
4		0	0	32		2	0
5		2[1]	2[1]	33	A	0	2
6		0	0	34	A	3	2
7		0	0	35		0	1
8		0	0	36[3]	A	2	3
9		0	0	37	A	2	1
10		0	0	38		0	0
11[2]	A	2	1	39[4]		1	0
12		0	0	40		2	0
13	A	0	2	41		0	0
14	A	0	0	42[5]	A	2	5
15	A	3	2	43	A	0	0
16		0	1	44	A	2	2
17		0	0	45	A	1	3
18		0	0	46		0	0
19		0	0	47		0	0
20		0	0	48		0	0
21	A	3	1	49		0	0
22	A	0	0	50	A	2	1
23	A	0	0	51		0	0
24		0	0	52		2	0
25	A	2	3	53		2	2
26		0	0	54		0	0
27	A	4	2	55	A	1	2
28	A	4	2	56	A	0	0

(CONTINUED)

Table 10-1 Harvests of Moose by Hunter, Fall, Winter and Spring, of 1968-69 and 1969-70 (Continued)

Hunter Number	Fully Active Hunter	Moose 1968-69	Moose 1969-70
57	A	4	3
58	A	1	0
59[6]		0	2
60		0	1
61	A	3	0
62		0	0
63		0	0
64		0	0
65	A	2	2
66[5]		0	0
67		0	0
68	A	0	0
69	A	0	1
70		0	0
71		1	0
72	A	4	3
73	A	4	3
74	A	4	0
75	A	0	2
76[3]	A	3	6
77		0	0
78		0	0
79		0	0
80		0	0
81[8]		0	0
82		0	0
83	A	3	3
84	A	6	4
85	A	0	0
86		0	0
87		1	0
88		2	1
89		0	0
90		0	0
91		1	0
92		0	0
93	A	1	2
94	A	2	0
95	A	2	2
96		2	0
97	A	8	1
98		2	1
99	A	1	0
100[7]		2	1
101		0	0
102		0	0
103	A	2	3
104		0	0
105		0	0
106		0	0
107		0	0
Total		107	81
Average		1.00	0.76

(CONTINUED)

Table 10-1 Harvests of Moose by Hunter, Fall, Winter and Spring, 1968-69 and 1969-70 (Continued)

Footnotes:

1. Estimated.
2. Reported by #50.
3. Reported by #99.
4. Reported by #95.
5. Reported by #65.
6. Reported by #97.
7. Reported by #21.
8. Sick after Christmas.

Amos, Quebec. These territories extend up along the western side of the hunting territories of Waswanipi band members. Four hunting territories in this group have been included in the present Waswanipi hunting territory area because the tallymen in charge of those traplines lived at Matagami during the period of this study and have been included in the population under study. As indicated previously, these men and their families are closely related with the Waswanipi and have lived at Waswanipi post for long periods before it was closed. However, theirs were not the only Abitibi Dominion hunting territories the Waswanipi hunters used. On the basis of these and other relationships of kinship and friendship with Abitibi Dominion band members, some Waswanipi men hunted on other Abitibi Dominion hunting territories which were easily accessible from the Amos-Matagami road south of Matagami. Because these territories were not used by the Waswanipi for many years continuously, because they were usually used intermittently during any one year and because they were not under the control of hunters in the population under study, such hunting territories were not included in the regular Waswanipi hunting territory area. Thus, five moose were killed on these hunting territories and outside the Waswanipi hunting territory area in 1968-69 and two in 1969-70. The total Waswanipi harvests within the area were therefore 126 and 99 moose respectively in 1968-69 and 1969-70 for an average of 113.

The reasons for the lower harvest of moose in 1969-70 than in 1968-69 was explained by various hunters as having been caused by unusual winter climatic conditions during 1969-70. Freeze-up was exceptionally late, as has been reported previously, the lakes froze over then thawed and finally froze over a month later. This disrupted fall beaver hunting and forced a more intensive hunt during the mid-winter periods. Snow conditions were said to be erratic and snow depth on the ground at Chapais exceeded 30 inches for only six days in December and January, but then rose continually throughout Frebruary to 52 inches. January was also exceptionally cold. Break-up was said to be extremely rapid. The former two conditions appear to have led to more intensive beaver hunting in early winter, when low snow conditions would facilitate beaver hunting, especially by waking the beaver. And, the same conditions, low snow and extreme cold may have hindered moose hunting, and led to the foregoing of part of the winter moose harvest because of the relatively late arrival of high snow accumulations. It was, in short, an unusual and poor winter in the view of Waswanipi hunters.

The level of moose harvests recorded in 1968-69 and 1969-70 appear to have been generally maintained during the years that have followed. The results of the James Bay and Northern Quebec Native Harvesting Research Committee's studies have provided estimates of the harvests on Waswanipi hunting territories. The estimates were 154 moose in 1972-73, 123 moose in 1973-74, 129 in 1974-75 and 153 in 1975-76 (JBNQNHRC, 1976a, Vol. 1: Table B-3, page 279; and 1978: Table F-4, page 147). These estimates were based on projections made for the entire Waswanipi adult male population of 151 men for the first three years and 166 men in 1975-76 (JBNQNHRC, 1976a, Vol. 1: Table M-1, page 64; and 1978: Table B-1, page 51). The sample coverage was 26.5 percent for the 1975 study which covered the first three years and 96 percent for 1975-76. In addition, some harvests on Waswanipi hunting territories were made by Mistassini hunters. In most years the Mistassini harvest on Waswanipi territories did not exceed 15 percent of the harvest by Waswanipi hunters, but in 1974-75 it was 83 percent. These harvests by Mistassini hunters occurred on the eastern portion of the official Waswanipi hunting territory area, and not in the areas under direct investigation in the present study.

The figures reported above for 1968-69 and 1969-70 are based on 107 men resident in three of the five Waswanipi communities. Of these men 10 were not officially Waswanipi band members. There were in addition 26 men over sixteen years of age living in Chapais and Senneterre who were officially Waswanipi band members. I will assume that these 26 men harvested the same average number of moose per hunter as did the 107 men included in the interviews in this study. I therefore project the total moose harvest for all Waswanipi hunters on Waswanipi hunting territories as: (number of moose harvested/107) x (107-10+26). The projected harvest of moose by Waswanipi band members in 1968-69 was therefore 157 moose and in 1969-70, 123 moose, for an average of 140 moose per year.

Comparison of these figures indicates that the 1969-70 harvest was comparable to the low, and the 1968-69 harvest was comparable to the high moose harvests made from 1972-73 to 1975-76. There does not appear to have been a change in the harvest between 1968-69 and the period after 1972-73. In the four years from 1972-73 to 1975-76 the moose harvest averaged 140 animals. The data on harvests indicate that a relatively stable level of harvesting has been maintained over a period of eight years without declines. The stability of both moose harvests and moose densities is consistent with the view that Waswanipi harvests are below the sustained yields of the moose populations.

iv) Management of Harvests in Relation to the Sustainable Yields

That the relative stability of harvests and densities of moose in the Waswanipi region between 1968 and 1975/76 may be the product of management of the moose populations by Waswanipi hunters can now be examined in detail. However, because the specific parameters of the productivity of the moose population are not known, the analysis must be based on comparisons of the situation at Waswanipi to that reported in other areas, and it can only suggest interpretation of the available data rather than decisively demonstrate relationships.

Not all of the moose harvested in the area of the Waswanipi hunting territories are taken by Waswanipi hunters; in addition to the Waswanipi, non-Native hunters harvest moose in the area during the fall sport hunting season in September and October, and a number of moose are killed each year in accidents with trains and cars.[11] I would estimate on the basis of discussions with local game wardens, railway engineers and outfitters that four moose are killed per year in accidents. The sport harvest is recorded by the Quebec Department of Tourism, Fish and Game on the basis of the data the sportsmen must report as a condition of their hunting licenses. The Department considers that its figures are minimum totals, because they receive a number of sports hunters' reports each year which contain insufficient information for the kill to be mapped. Within the area of the Waswanipi hunting territories the Department has kindly provided me with the maps of sport hunters' kills for the fall hunts of 1969 and

1970. Hunting season licensed hunters killed 36 moose in this area in 1969 and 40 moose in 1970. It is possible that a few Waswanipi men who were employed and who bought licenses to prevent trouble with game wardens may have their harvests included in these totals, but I believe this would not amount to more than one or two cases, if it occurs at all. The non-Natives therefore killed a total of 40 and 44 moose per year for sport or by accident; or about 37 percent of a usual Waswanipi harvest during this period.

Therefore the total annual harvest of moose in the Waswanipi hunting territory area would be 166 and 143 moose for the two-year period. The population of moose in 1968 was estimated at 803 moose. The total harvest of 1968-69 would therefore be 21 percent of the 1968 population, and the 1969-70 harvest would be 18 percent This falls within the ranges of net productivity, i.e., harvestable yields of moose populations reported in the studies reviewed previously: 17 to 23 percent in Alaska, 20 to 25 percent in Newfoundland, and 23.3 to 24.6 percent in Ontario (summarized by Simkin, 1974:524, Table VII; and Simkin, 1965). The harvests reported here are therefore consistent with known rates of net productivity in other moose populations.

Furthermore, it appears that the Waswanipi not only are harvesting at a level that is below the sustained yields of the moose populations, they are harvesting a high percentage of the maximum possible sustainable yield. Thus, on the basis of the 1968 population, and a net productivity of 25 percent, 201 animals, might have been available, and the total harvest in 1968-69 was 86 percent of that number. If the net productivity was 21 percent then 100 percent of the yield was harvested in 1968-69.

This finding provides some basis for a further interpretation. Since the populations and harvests were relatively stable following 1968-69, this may indicate that the sustainable yields of the moose populations of the area are on the order of 21 to 25 percent.[12] And this, it will be recalled, is in the upper range of possible net productivity reported in biological studies of moose populations. This implies that the moose populations of the area are at, or near a level of maximum reproductive capability. And it suggests that the Waswanipi may be maintaining the moose populations of the area at approximately an optimum density, with high reproductive rates, moderate densities, a young population age structure, and relatively large and healthy animals.[13] All available data are consistent with such an interpretation.

D - Beaver Yields, Harvests and Management

i) General Review of Beaver Reproduction and Productivity in Relation to Hunting

When beaver are inhabiting a new or under-populated habitat, the potential rate of population increase is initially high. Where beaver populations have been reduced and then allowed to increase or where transplants have been made to re-establish a population, it has been found that beaver undergo an exponential rate of growth for several years, after which the population levels off to an aymptote, assumed to be approximately the saturation density of the area. A graph of the population increase over time conforms to a sigmoid curve. In a series of studies of trapping areas in northern Manitoba on which trapping had been stopped, Nash found growth conformed to the sigmoid curve on nearly 80 percent of the areas (1951:47-48). In a study in northern Ontario, deVos et al. trapped out the beaver as completely as possible from two small areas, and within four years the beaver catch in both areas was virtually the same as it had been before experimental trapping (1959:41). There was a sigmoid growth in lodge numbers in the two areas. In northern Alberta, Novakowski found a similar growth curve in the area of his study (1965:61, Figure 6)

Comparison of studies shows that beaver may increase from two-fold to five-fold or more during the exponential growth phase (Novakowski, 1965:62; deVos et al., 1959). Fuller reports increases of seven and eight-fold in the amount of beaver "sign" observed during aerial surveys in the Northwest Territories during four or five years (Fuller, 1953:334). In the U.S.S.R. an increase of 3.8 fold occured in the first four years of a beaver population increase

(Semyonoff, 1957a:7). The exponential phase took four years in Ontario, six in Manitoba and seven in Alberta, suggesting, according to Novakowski (1965: 62), that its length may be related to increasing severity of the climates.

Information on the beaver populations of the Waswanipi region is available from the records of the beaver reserves of the area. The hunting territories in approximately the north west one-third of the Waswanipi region were initially made part of the Nottaway Beaver Reserve, along with the more southern Rupert House hunting territories. The hunting territories in the remainder of the Waswanipi area were originally part of the Mistassini Beaver Reserve. In the 1960's the Waswanipi hunting territories were merged as the Waswanipi Division of the Abitibi Beaver Reserve.

The history of these reserves gives some indication of the occurrence of rapid growth phase in the Waswanipi area. Beaver populations in the region were virtually completely depleted during the 1920's and 1930's. Following the success of an experimental test Beaver Reserve on part of the Rupert House area, and the recovery of the beaver populations in that area in the 1930's, other reserves were set up across the northern portions of Quebec. The Nottaway Reserve was formed in 1938 and opened to trapping in 1946. The Mistassini Reserve was set up in 1948 and in 1954 trapping was begun. In the latter case, some beaver were trapped alive in the Nottaway Reserve and released on hunting territories in the Mistassini Reserve to seed areas, and to speed the process of repopulation.

The history of the beaver populations of the Nottaway reserve is therefore the best record of the natural growth potential of beaver populations in the Waswanipi area. The Nottaway Reserve covered 11,300 square miles. From 1938 to 1945, a seven-year period, the number of beaver colonies increased 24 fold, from 51 to 1256 (Table 10-2). During this period annual percentage increases varied between 40 and 61 percent or more. The resulting population curve was exponential. The data however do not show a process of natural levelling off, because harvesting of the population was begun in 1946 and the annual rate of increase declined significantly thereafter as a result of hunting. The data

Table 10-2 Annual Growth of Beaver Colonies on the Nottaway Beaver Reserve, 1938 to 1951[1]

Year	Census of Beaver Colonies[1]	Percentage Increase	Beaver Harvest
1938	51	-	0
1939	98	92	0
1940	146	49	0
1941	225	54	0
1942	315	40	0
1943	494	57	0
1944	778	58	0
1945	1256	61	0
1946	1579	26	850
1947	1687	7	1009
1948	1915	14	1291
1949	2171	13	1781
1950	2413	11	2395
1951	2727	13	3467

Footnote:

1. From report of the: "Indian Affairs Branch" in Canada Department of Citizenship and Immigration, Report for the Fiscal Year Ended March 31, 1952. Page 62. Total census estimate divided by five to get colony census.

for the period from 1938 to 1946 therefore demonstrate the exponential growth potential of the populations; within any three-year period, populations increased three-fold or more.

Following the exponential growth phase in a beaver population, a relatively steady population level may be maintained. This stability is unusual among sub-arctic and arctic animals and some of the possible reasons for it have already been suggested: the territorial organization of the colonies; the effects of ice and flooding in keeping early successional vegetation along the shorelines; and, the extensive habitat modification practiced by beaver which protect it from variations in water supply and temperature (see Appendix 9-5). Other reasons are related to the food habits of beaver, the limited impact of predation and disease on beaver populations and the territorial limitation of beaver densities.

Charles Elton has suggested that the beaver are particularly protected against the short-term climatic variations that appear to be so important for other animal populations because in areas where it is possible beavers use the barks of trees for food, especially in winter, and thus live off the "capital" and not the "income" of annual plant growth (Elton, 1927:138).

In addition, beaver have few effective predators because of their aquatic habits and strong lodges and the isolated breeding colony organization of the population tends to reduce the effects of disease outbreaks on the population as a whole (Elton, 1927:139; Bradt, 1947:42).

Beaver are slow and somewhat awkward on land and are easy prey to large carnivores. It has been suggested that when large predators are common, beaver will not travel as far from the shore for food. And in the fall well beaten paths often develop between the cutting area and the shoreline. Bears, wolves, wolverines, fishers, otters and lynxes can predate on beaver, but only bears and otters may capture beaver in the water (Banfield, 1974:160). In water beaver can swim at only 2-3 miles per hour (Banfield, 1974:159), but can dive for relatively long periods of fifteen minutes or more. While a few predators follow them in water, other predators only occasionally take beaver on land (Banfield, 1974:160; Seton, 1925-1928, Vol. 4:491 and 493). Otters may kill young beaver, but colonies appear to be able to defend themselves against attack (Banfield, 1974:160).

One disease known to affect beaver populations over relatively extensive areas, forexample over a drainage basin or several adjacent drainage basins, is tularemia (Longley and Moyle, 1963:39; Lalzaffsky and Sprint, 1952). Outbreaks appear to be related to periods of high population densities and low water levels (Longley and Moyle, 1963:381; Fowle et al. 1954:32).

Aleksiuk has proposed that the system of territoriality maintained by scent-mounds operates so as to limit the formation of new colonies (1968b:761). When two-year old beaver migrate from a colony, they form new colonies until all the utilizable territorial areas are occupied, and then they form a floating population of transients (1968b) inhabiting marginal areas. These beaver do not form colonies, do not mate and are subject to relatively higher predation and mortality. Alesiuk proposes that, in general, the system is self-regulating so that population is limited before food becomes a limiting factor (1968b:761).

In the stable period of population development therefore the population is at what has been called a saturation density and this may correspond to its tolerance density. The sigmoid growth pattern of beaver populations would indicate that the asymptote corresponds to a tolerance density and that this density is not the same as the optimum density, but rather above the point of optimum productivity.

Beaver populations are therefore characterized by two growth phases, an exponential growth phase, and a relatively stable tolerance density phase, the latter being greater than the optimum density.

Reproductive rates and beaver colony composition are related to the growth phase of the population. Pearson compared reproduction of populations in Elk Island National Park and Prince Albert National Park, the first undergoing expansion and the latter stable at a presumed tolerance density. There was an average of 6.125 embryos per female in the former population and 3.76 (2.6 to 4.2) per female in the latter (1960:83). A similar rate of 3.1 embryos per female was found by Novakowski in Wood Buffalo National Park during the stable population period, and similar rates have been found in many other studies. In Alaska, 2.8 to 3.1 placental marks per female have been reported (Hakala, 1952; and Boyce cited in Traversy and McNicoll, 1976) and in the Northwest Territories 2.7 (Aleksiuk, 1968). In a recent study in the La Grande region of Quebec of a trapline which had not been hunted intensively over the previous several years and which was in a region with beaver populations with relatively old age structures (Bovet, 1974:39, 26) 2.13 young were found per female (Traversy and McNicoll, 1976:22).

Pearson reported that the stable beaver population had used more of the available food in the area than the growing population and he suggested that reduced reproductive rates might be related to nutritional factors (Pearson, 1960:98). He noted that the ovulation and gestation periods occur during winter, the period of limited availability of food, and suggested that the conditions of the animal may significantly affect reproductive success (Pearson, 1960:78).

There was a significant correlation between size and presumably age of the female and number of young produced at Elk Island (Pearson, 1960:98). And, Bailey reported that younger females produce from one to two young, while older ones produce from four to six young (1927). Novakowski has suggested that at tolerance densities, this difference may be reduced and the litter size of older females may be lowered to the level of sub-adults (1965:77). The study in the La Grande region of Quebec, where the population presumably was at near tolerance density indicated that the number of placental marks varied little with the age of the beaver (Traversy and McNicoll, 1976:26 and Tableau 8, page 27). Under these conditions recruitment would be expected to be two to three young per colony per year (Novakowski, 1965:77-78). Novakowski suggests that if population numbers were significantly reduced in an area, then litter sizes and consequently recruitment world increase (1965:78).

The typical composition reported for a beaver lodge is: two adults, kits of the year and yearlings. Novakowski found however that in the Wood Buffalo Park population, which had a stable population, two-year olds and adults were both taken from the same colony in 7 out of 9 lodge sites (Novakowski, 1965: 67, 68 and 69). He has suggested, on the basis of scattered earlier reports of two-year olds in the population, that the two-year olds may not migrate and may be common in colonies at tolerance population densities (Novakowski, 1965:124).

It is the two-year olds who normally leave the colony to establish new colonies. Two-year olds frequently travel downstream from the dam sites, although they may also travel cross country. Most travel less than six miles, but individuals have been known to travel 150 miles (Banfield, 1974:160). It is the two-year olds which colonize new areas, and have to find unused suitable sites. Beaver prevent other beaver from establishing within the territory already occupied by a colony. Fighting is common in areas with tolerance level densities and/or poor food supplies, as there are many animals constantly searching for locations to establish a colony (Novak, 1972:13). Male beaver may bear the marks of other beavers' bites on their rumps and tails at such times (Buckley, 1950:88).

Colony size is therefore determined by the net reproductive rate and by emigration of the two-year olds. By means of intensive trapping Novakowski attempted to determine the composition of colonies at tolerance population density. He trapped an average of 2.7 kits, 2.0 yearlings, 2.0 two-year olds and 1.8 adults from the colonies, but estimated that on an average an additional 3.8 animals remained per lodge (1965:84, Table 10). His estimated average size and composition of a lodge was therefore 12 animals, with a minimum of three kits, two yearlings, two two-year olds and two adults or nine in total (1965:86-87).

These figures are higher than the average size of colonies reported in other studies. Bradt trapped out 42 colonies in Michigan and reported 5.1 beaver per colony on the average (1947:19, 23), but noted also the number of animals per colony was highly variable, and that a single average value was of doubtful value if applied to populations over extensive areas (1947:19). Many similar values in the range of 4 to 6 beaver per colony have been reported in Newfoundland, Alaska and Maine (Northcott, 1964:100, Hakala, 1952; Boyce cited in Traversy and McNicoll, 1976:10; Hodgdon and Hunt, 1955:75).

The recent study of colonies in the La Grande area of Quebec resulted in the capture of 3.26 beaver per colony (Traversy and McNicoll, 1976:7 to 10), but no estimate was provided of untrapped beaver.[14] In the present study Waswanipi hunters harvested between 2.3 and 4.0 beaver per colony on nine different traplines, and averaged 3.16 beaver per colony (Table 9-14). However, this trapping was considered by the hunters to have left a considerable number of beaver unharvested in the same colonies. A recent program in the La Grande basin to trap out the beaver populations from a sector of the area to be flooded by the LG-2 reservoir, conducted by Cree hunters, resulted in a harvest of 1491 beaver in 437 lodges. In addition, the hunters estimated there were 219 beavers remaining which they did not trap in the same lodges (Grand Council of the Crees (of Quebec), 1978). This program therefore resulted in a harvest of 3.41 beaver per colony and an estimated total population of 3.91 beavers per colony.

It has been suggested that the number of individuals in a colony depends on the level of the population in relation to the environment, as well as on the age and history of the colony (Novakowski, 1965:59; Traversy and McNicoll, 1976).

Under saturation conditions the average size of colonies would be expected to be larger. There are two reasons for this. First, the ratio of older to younger colonies would be higher than with an expanding population. Second, because two-year olds may be tolerated in colonies under saturation conditions.

To summarize the characteristics of the two population phases: stable populations would have a higher density of colonies, lower productivity per colony, more beaver per colony, and more non-colony and non-reproducing beaver. In populations undergoing exponential growth, the density of colonies would be relatively lower, but the reproductive rate of females would be higher, the number of beaver per colony lower, and the number of non-colony beaver lower.

Trapping in stable populations would be facilitated by the relatively high density of colonies, and the larger mean number of beaver per colony.
The number of beaver taken per colony and the number of lodges broken would have to be kept low however if the number of colonies at tolerance density was to be kept stable. In populations undergoing exponential growth there may be a closer to optimum productivity, but there will be fewer colonies and fewer beaver per colony and a higher percentage of young beaver.

Trapping activity may directly affect the density of a population, and presumably the growth pattern of the population. This has been indicated by an aerial survey in the area of the Mackenzie Delta Beaver Sanctuary. The sanctuary had not been trapped for ten years at the time of the survey, whereas trapping was being done on adjacent lands outside the sanctuary. There were 0.6 colonies per transect mile in the sanctuary and 0.3 colonies per transect mile outside where trapping had continued, despite similarity in environmental conditions (Fuller, 1953:335).

The effect of trapping probably depends on the growth phase of the population. When populations are undergoing exponential growth, and therefore many colonies are newly established and contain but a single pair of adults capable of breeding, trapping can rapidly remove the breeding population from colonies where they cannot be immediately replaced from within the colony, or from a "floating" population of adults, and this may adversely affect the survival of these colonies (Novakowski, 1965:149). Thus, trapping during the expanding phase would easily create population instabilities.

In colonies with yearlings or with two-year olds, the yearlings or two-year olds often replace any adult of the breeding pair that is lost to trapping (Novakowski, 1965 71 and 83). If there is a large "floating" population of adults that have not been able to mate they can join colonies where a breeding adult has been lost and there is no replacement from within the colony. Trapping intensively at tolerance population densities may therefore change the population density, but it is more likely that the population would quickly return to its former density. Such moderately intensive hunting at tolerance density would therefore be capable, at least potentially, of creating a relatively stable situation. Thus, even though productivity is below optimum levels, sustained yield harvesting is probably easier to achieve in tolerance density populations than in expanding populations, but the effects of harvesting must be carefully regulated.

A third possibility exists, however, namely that a population at tolerance density be trapped intensively, and then allowed to receover before being trapped again. This would use the inherent resilience of a tolerance density population to recover quickly from short-term depletion, while taking advantage of the likely increase in the rate of the productivity that would occur during the years of growth. The optimum therefore would be a rotational intensive trapping, with the period of rotation equal to the period for exponential growth to return the population to tolerance densities. This would result in a controlled population cycling, at and just below tolerance densities. Novakowski has in fact proposed something like this rotational scheme of management for Wood Buffalo Park (1965:153). He proposes a five-year rotation with five areas per trapper, each being trapped to its limits one year in a five-year cycle.

In summary then, the value of such a system would appear to be that it limits the trapping to the saturation population phase or the upper end of the exponential phase, when large harvests can be taken per lodge and per unit of area, because of large and dense colonies, and it reduces the problem of the possible instabilities caused by continued intensive hunting of populations by taking advantage of the ability of saturation density populations to replace lost adult beaver, at least in the short run, as long as adequate time is left for recovery. Rotational use therefore combines the qualities of both phases of the population cycle. It uses the relative efficiency and stability of hunting at tolerance densities, while also benefitting from several years of high levels of reproduction during the recovery.

It is therefore important for the manager to be able to readily determine the growth phase of the population being trapped, and several variables have been suggested as "keys" for evaluating the state of a given population. One is the density of active lodges. Novakowski suggests that a rule of thumb for favorable habitats at northern latitudes would be that densities at or over 0.7 to 1.0 active lodge per mile of stream indicate a population probably near saturation density and densities less than 0.7 to 1.0 lodge per mile of stream probably represent populations that are still increasing (1965: 66, 151). Another proposed indicator is the proportion of active to inactive lodges. Northcott proposes that a population with one or less inactive lodges per active lodge is young, increasing and presumably below saturation. One to three inactive lodges per active lodge is an indicator of a stable population and more than three active lodges per active lodge, a declining population (1964:120-121). A third method may be to examine the age structure of the population, particularly for two-year olds in the presence of adults. While these indicators are only rough rules of thumb, they are potentially important as management techniques.

Because of the considerable impact trapping has on beaver populations, and because most trapping tends to be concentrated at seasons when its biological impact on the populations may be high, most jurisdictions with significant beaver trapping areas have introduced programs for the regulation of beaver harvests.

The most influential system of regulation was proposed by Bradt (1947). He suggested that beaver has low natural mortality rates due to limited incidence of disease, accidents, predation (1947:42). Infant mortality was considered to be low because the number of embryos per pregnant female was nearly the same as the number of kits per trapped colony (1947:25) and nearly the same as the average number of young per litter (1938:151). Many studies since have supported this conclusion and it has been suggested that mortality of the newborn is very low in general because maternal care extends for at least a year and the young stay close to the lodge (Novakowski, 1965:77; Bradt, 1947: 25; Buckley, 1950:89-90).[15]

Therefore, Bradt proposed it was reasonable to multiply the number of colonies by 5 to estimate the size of the population, and assume that: a theoretical loss of 50 percent would be the maximum that might not reduce the population; a 33 1/3 percent loss would allow a steady increase or at least maintain the population; and, a 25 percent loss would allow an increase (Bradt, 1947:43). This comes to annual harvests of 2.5, 1.65 and 1.25 beavers per colony, assuming 5 per colony.

Although Bradt's ideas have been influential in establishing the quotas used on some Canadian beaver reserves and traplines, modifications to the harvest rates he proposed have proved to be necessary in some areas. Nash has reported on the considerations that led to the establishment of quotas on Manitoba traplines. It was assumed that the average litter size was four per breeding female and hence per colony, and that the natural survival rate was about fifty percent. This low natural survival rate was based on Bradt's findings that the average colony size was 5.1 in Michigan whereas the theoretical colony composition for colonies of adults (2), plus yearlings (4) and kits (4) would have been ten beaver (Nash, 1951:32-34), that is, actual colony size appeared to be 50 percent of expected size. This calculation did not take account of the percentage of new colonies in the study area. The quota was set at one beaver per colony to allow half the annual increase, after other losses, for maintaining population growth and half for harvesting. As the populations increase and stabilize, the quota was increased up to just under two beaver per lodge which was intended to remove most of the annual increase (Nash, 1951:33).

A similar range of quotas has been in use in Ontario. In Ontario one beaver per colony was allowed while the population was increasing and 1.5 to 3 beavers per colony at high population levels (deVos, Cringan, 1957).

In Quebec, after the beaver reserves were opened to trapping one beaver per active lodge was the permitted harvest. Each year the trappers took an inventory of the number of active lodges on their hunting territory and reported this to government officials. The trends in both the lodge inventory of the harvests were monitored, as well as any trend in the sizes of beaver pelts. When populations continued to increase the harvest quota would be raised from 1.0 to 1.5 or 2.0 per lodge. By means of this experience a number of harvest intensity criteria were arrived at for each Beaver Reserve. North of Waswanipi 1.0 beaver per lodge is the general maximum harvest. South of Waswanipi 2.0 per lodge are permitted in some areas. At Waswanipi, the head of the Quebec Fur Service, Mr. Marcel Beaudet, estimates that 1.0 beaver per lodge can be harvested over the whole area, and 1.5 per lodge in parts of the Waswanipi Reserve (Beaudet, personal communication).

Regulation of beaver harvests, then, has generally taken the form of limiting the harvest per lodge. However, it has not been expected that the limit would be taken from each lodge every year, but only that the total catch in a given area correspond to the quota for all the colonies in that area.

In summary then, several strategies for managing the densities and reproductive characteristics of beaver populations can be identified and the advantages and disadvantages of each formulated. Harvest size is managed mainly by regulating the number of beaver taken per active lodge, and by continual monitoring of the trends in the harvests and in the inventories of the number of active lodges. These trends, plus a number of specific indicators permit a gross assessment of the current condition and status of a beaver population.

ii) Beaver Population Densities in the Waswanipi Region

The first aerial survey of beaver colonies in the James Bay area was made in 1964 on the hunting territories of the Rupert House Cree. Part of the area surveyed was immediately to the north of the Waswanipi hunting territories, extending from the Rupert River north in the area of Lac Nemiscau. From the reports of this survey I have tabulated the number of active beaver colonies observed, the distances covered and the area surveyed. Seven transect lines traversed the area immediately north of Waswanipi, with a total length of 164 miles, and a surveyed area of 100 square miles. Twenty-nine active beaver colonies were observed for a density of 0.29 colony per square mile (Charles A. Drolet, 1965: Tableau 2, page 38). The density of active colonies in the forest region which included this area was 0.34 colony per square mile (tabulated from data in Drolet, 1965:40). These figures are probably minimum estimates of beaver colony densities on the more southerly Waswanipi hunting territories.

In October 1966, two years prior to commencement of the present study, an aerial survey of the beaver in the Waswanipi region was made under the combined auspices of the Canada, Department of Indian Affairs and Northern Development and the Quebec, Department of Tourism, Fish and Game, Fur Service (Emond, 1967). The survey covered most of the beaver reserves in the Province of Quebec. Transect lines were arranged irregularly so as to sample as many of the hunting territories as possible so that overall estimates of the beaver populations of an area could be estimated. The sample was not sufficient to provide specific estimates for individual hunting territories.

The hunting territories of the Waswanipi as defined in the present study are grouped into two beaver reserve divisions: The Waswanipi Division of the Abitibi Reserve, which includes all the hunting territories originally registered as belonging to the hunters registered as members of the Waswanipi band; and the Abitibi Reserve proper, which includes the hunting territories of those hunters who are officially registered as members of the Abitibi-Dominion band at Amos, but who live at Matagami, which also includes one trapline inherited by a hunter who has transferred into the Waswanipi band.

One aerial survey plot was laid out to sample the Waswanipi Division. It consisted of 184 miles of transects flown in six lines which crossed once each of sixteen out of the total of forty hunting territories. A second aerial survey plot traversed 29 transect miles of one territory in the Abitibi Reserve proper, and a third plot traversed 44 transect miles of two territories in the Abitibi Reserve proper.[16]

Transects were flown at 500 feet, and observers were estimated to be recording lodges and other signs of beaver colonies for up to one-half mile on either side of the flight line, so that each transect mile equalled a coverage of one square mile. A total of 257 square miles were surveyed, or 3 percent of the area of the hunting territories covered in this study. The density of lodges of the Waswanipi division was .43 lodge per square mile and on the hunting territories in the Abitibi Reserve proper .44 and .43 lodge per square mile.

No aerial surveys of the beaver of the Waswanipi region were conducted from 1966 to 1977. However, some estimates can be made on the basis of the ground surveys by the hunters themselves. Maps were marked by hunters in the summer of 1970 indicating the locations of the beaver colonies in the areas where the hunters were harvesting the previous winter, see Chapter 9. The number of colonies can be converted to density estimates because most of the maps included the outline of the areas which were harvested during the season of record. From this I have calculated the area surveyed. In some cases however this outline included within it portions of the hunting territory which were used for some hunting activity, but which were not used or surveyed for beaver colonies because, for example, they were too far from the camps used that winter. In these cases, I have estimated the area surveyed for beaver by defining the approximate limits of the drainage basins of the streams on which colonies were marked. Where most of the full length of the stream was used the full drainage was included, where the colonies on the upper reaches of a stream were not recorded I have included the stream for a distance beyond the last colony equal to one-half the distance between that colony and the next to the last colony on the stream.

On this basis, 829 square miles were surveyed in the reports I collected or eight percent of the hunting territory area. The average density of colonies in this area is 0.36 per square mile (Table 10-3). The actual estimated number of colonies in 1966 was therefore 4196 and in 1969-70, 3513 beaver colonies. Thus, in 1969-70, the number of beaver colonies was 16 percent lower than in 1966. But, the 1964 density was also lower than was the 1966 density. The data indicate that there may have been rise in the number of beaver colonies from 1964 to 1966, and then a small decline between 1966 and 1969, although the changes were small. The 1977 survey found a density of 0.36 beaver per square mile, the same density as in 1964 and 1970 (Banville, 1978).[17]

iii) Waswanipi Harvests

In 1968-69 and 1969-70, 99 Waswanipi hunters interviewed reported that they plus the eight other men considered in this study had harvested 2778 and 2614 beaver in each of the two winter hunting seasons (Table 10-4). Effectively, all beaver were harvested in the winter hunting season; less than ten are caught in summer according to informants; so no correction is made here for summer harvests. No non-Native harvesting was permitted in the areas covered by Waswanipi hunting territories, although a few scattered illegal harvests by non-Natives were reported by Waswanipi hunters around Matagami, east of Lebel-sur-Québillon and near Miquelon-Desmaraisville. I have no estimates of these harvests, but hunters comments suggest that only the non-Native trapping from Lebel-sur-Quévillon, which was on the southern-most of the Waswanipi hunting territories, involved significant numbers of animals.

If the beaver caught by the 107 hunters resident in the three settlements studied are projected to the Waswanipi male population over 16 years of age

Table 10-3 Density of Beaver Colonies in 1969-70, Based on Maps of Beaver Lodges Prepared by Waswanipi Hunters

Hunting Territory Number	Number of Beaver Colonies Located on Map	Area Used or Drainage Basin of Streams with Colonies[1]	Beaver Colonies	
			Per Square Mile	Per Stream Mile
I	36	99	0.36	0.62
IIA + B	48	174	0.28	0.52
VII	37	105	0.35	0.66
XII	14	58	0.24	0.50
XIII	33	91	0.36	0.78
XV	58	84	0.69	1.10
XVIA	28	92	0.30	0.59
XVIII	13	28	0.46	1.00
XIX	31	98	0.32	0.60
All	298	829	0.36	0.78

Footnote:

1. See text for discussion.

Table 10-4 Harvest of Beaver by Hunter, Fall, Winter and Spring, of 1968-69 and 1969-70

Hunter Number	Fully Active Hunter	Beaver 1968-69/1969-70		Hunter Number	Fully Active Hunter	Beaver 1968-69/1969-70	
1		0	0	29		0	0
2		25	30	30		25	0
3		100	30	31	A	28	23
4		0	0	32		44	0
5		15[1]	10[1]	33	A	11	10
6		0	0	34	A	100	99
7		10	25	35		0	30
8		0	0	36[3]	A	35	40
9		0	2	37	A	90	89
10		0	3	38		0	20
11[2]	A	30	20	39[4]		35	5
12		20	22	40		36	26
13	A	25	0	41		20	10
14	A	37	0	42[5]	A	70	122
15	A	30	70	43	A	48	60
16		20	30	44	A	25	52
17		0	0	45	A	50	42
18		0	6	46		15	25
19		0	0	47		0	0
20		0	0	48		0	0
21	A	70	80	49		0	0
22	A	35	20	50	A	42	36
23	A	25	30	51		16[1]	28[1]
24		10	15	52		29	20
25	A	70	75	53		23	60
26		8	14	54		0	0
27	A	90	46	55	A	53	49
28	A	50	54	56	A	60	48

Table 10-4 Harvest of Beaver by Hunter, Fall, Winter and Spring, of 1968-69 and 1969-70 (Continued)

Hunter Number	Fully Active Hunter	Beaver 1968-69	/1969-70	Hunter Number	Fully Active Hunter	1968-69	/1969-70
57	A	36	40	85	A	50	60
58	A	45	15	86		0	0
59		15	35	87		35	28
60[6]		20	35	88		87	41
61	A	40	30	89		0	0
62		0	0	90		0	0
63		0	0	91		30	20
64		0	16	92		0	20
65	A	70	40	93	A	56	35
66[5]		30	0	94	A	67	35
67		0	0	95	A	30	23
68	A	25	32	96		20	25
69	A	0	50	97	A	100	40
70		0	10	98		44	9
71		1	2	99	A	25	37
72	A	19	30	100[7]		50	22
73	A	50	134	101		0	20
74	A	75	35	102		0	18
75	A	25	15	103	A	20	30
76[3]	A	15	20	104		0	0
77		0	0	105		0	0
78		5	21	106		0	0
79		0	0	107		0	0
80		0	0				
81[8]		8	0	Total		2778	2614
82		0	0	Average		25.96	24.43
83	A	100	70				
84	A	60	35				

(CONTINUED)

Table 10-4 Harvest of Beaver by Hunter, Fall, Winter and Spring of 1968-69 and 1969-70 (Continued)

Footnotes:

1. From official statistics of Fur Division, Quebec Department of Tourism, Fish and Game.
2. Reported by #50.
3. Reported by #99.
4. Reported by #95.
5. Reported by #65.
6. Reported by #97.
7. Reported by #21.
8. Sick after Christmas.

in the five Waswanipi settlements in 1968, or 123 men, then the total projected harvest of beaver by all Waswanipi band members in 1968-69 is 3193 and in 1969-70 it is 3005 beaver.

These harvests may be compared to harvest estimates for more recent years made by the James Bay and Northern Quebec Native Harvesting Research Committee. For the hunting years 1972-73 to 1975-76 the JBNQNHRC estimates beaver harvests to 3451, 2242, 2681 and 2481 beaver, for an anerage of 2713 beaver per year. These harvest estimates were based on interviewing a sample of the hunters. The harvest in 1972-73 that was similar to that taken in 1968-69 and 1969-70, but there was a generally lower average harvest over the latter period, indicating about a 12 percent decline from the average of 1968-69 and 1969-70. This pattern may be consistent with the finding that the number of beaver colonies inventoried was especially high in 1966.

iv) Management of Harvests in Relation to the Sustainable Yields

The data on beaver colony densities and beaver harvests indicate that the number of active colonies may have declined by about 16 percent between 1966 and 1970, and the harvests of beaver declined about 13 percent between 1968-70 and 1972-76. What is the significance of these changes?

The 1968-69 and 1969-70 harvests of 2778 and 2614 beaver recorded directly in this study. Of these 82 beaver in 1968-69 and 133 in 1969-70 were not taken on the hunting territories included in the Waswanipi hunting territory area as defined in this study. Thus a total of 2696 and 2481 beaver were taken on the 9759 square miles of hunting territories whose tallymen were part of the population under study here. At an average density of 0.36 colony per square mile in 1969 and 1970, I estimate that there were 3513 colonies within the area of these hunting territories. The harvest of 1968-69 and 1969-70 therefore average 0.77 and 0.71 beaver per colony, which is below the probable sustained yields of the populations. The minimum harvest permissible would be 1.0 beaver per colony, and this level would normally permit some increase in the populations in part of the region. The actual harvests during the 1968-69 were therefore below the recommended sustainable yield of between 1 and 1.5 beavers per lodge.

Furthermore, in 1968-69 and 1969-70, the beaver population was characterized by indicators of high relatively stable populations. Thus, as reported previously, there were colonies hunted which included more than two large sized beaver, i.e., that included two-year olds, see Chapter 9. And, the density of 0.78 colonies per stream mile (Table 10-3) was in the range reported above for stable populations in northern Canada. These indicators are however only suggestive, but in the absence of more extensive data on biologically relevant parameters, they indicate that the beaver population may have been at high density.

It should be noted, however, that whereas harvests were well below sustained yield levels on a region-wide basis, this was not the case within the areas being actively hunted in any one year. Considering only the beaver colonies in the areas that were hunted, it will be recalled that the harvests per colony ranged from 2.41 to 4.00 and averaged 3.16 (Table 9-14). Thus, the colonies actually hunted were being harvested at a level that could not be sustained annually. As I will show in the next chapter, in fact, on most hunting territories the same areas were not being hunted annually, but on a rotating basis. Therefore, the data not only indicate a high and relatively stable beaver population, the data suggest that the beaver population was being hunted on an intensive, but rotating basis. This will be described in more detail in Chapter 11.

Finally, the data available are suggestive with respect to some short-term trends in the populations. From the data I would infer that the relatively higher harvests of beaver in 1968-69 and 1969-70 may have been a response to the under-utilization of beaver between 1964-65 and 1967-68. When hunting was reduced during these four years for the economic reasons, as previously indicated, the number of colonies would have increased as would the number of beaver. When hunting again intensified in 1967-68 and especially in 1968-69 and 1969-70 a relatively higher harvest would be taken, and the overall density of beaver colonies would be returned to its original level. In the successive years beaver harvests would return to normal annual harvests. While this is inferential, it is worth noting that the indicators of beaver population density and trends in 1966 are generally consistent with this interpretation. In the 1966 survey only 9 percent of the colonies observed were inactive. The low ratio of inactive to active lodges (.1/1) is an indicator of an increasing population. The author of the survey report considered the data for Waswanipi, all considered, established that there was "an abundance of beaver and /an/ increase in population" (Gimmer, 1967).

In review, the data available indicate that harvests have been relatively stable over the eight year period for which there are data, and that the actual population is at relatively high density and relatively stable. Small changes in harvest levels occurred and may respond to changes in availability of beaver occasioned by a period of under-utilization due to economic reorganazation. The actual harvest, considered in relation to the normal standard for sustained yields of the beaver populations of this region, was approximately 74 percent of the minimum permissible sustained yield harvest, and was compatible with sustained yield harvests. Harvesting patterns indicate that beaver are being harvested at high densities and generally at intense levels which are associated with intermittent harvests.

E - Fish Yields, Harvests and Management

i) Comments on Fishery Management

Many fishing enterprises have resulted in the depletion of the fisheries, especially in northern Canada (Healy, 1975) and it has recently been recognized by fisheries biologists that northern fisheries may require new or revised management strategies. Among the concepts being proposed in the biological literature are: rotational fishing out of lakes; reduction in net sizes used in order to sample more of the total population and provoke compensatory responses in growth and productivity; and careful restriction of fishing intensity (for a review, see Berkes, 1977b).[18] Several changes in the fish resource have been noted whenever over-fishing was known to have occurred without doubt: a decrease in the mean size of fish; a decrease in the catch per unit effort; and, eventually, a decrease in the total yield, despite increases in fishing effort. Berkes proposes that these criteria can serve as an operational definition of over-fishing for fish populations which are being harvested on a continuing basis (1977b:49-50).

While the biological studies of northern fishery practices have been made primarily on commercial fishing operations, Berkes has pointed out that many of the management practices now being proposed are in fact found in northern Native subsistence fisheries and some of the measures of the condition of the populations are used by subsistence fishermen.

His studies of coastal James Bay Cree fishing practices have indicated rotational use of fishing sites, selective use of nets of different sizes, and limitations on fishing intensity (Berkes, 1977a). In addition, he has identified several other management techniques. There is selectivity of species harvested and dependence on relatively few of the species actually present (Berkes, n.d.a). Fishing effort responds to increases and decreases in success and efficiency, so that when catches per unit of effort fall off, for example, nets are relocated and/or participation in fishing declines. A limited number of traditional sites are used, on an annual or seasonal basis, and only shallow water sites are used, so that only a small part of the total species range is fished which helps prevent depletion of an entire stock (Berkes, 1977a:299-304). The sum total of these practices, Berkes claims, is that fish harvests are managed by fishermen, a conclusion comparable to that found for the harvests of moose and beaver reported above. The best single indicator of the success of this management is the lack of evidence of depletion of fish since the first fisheries study on the James Bay coast about fifty years ago, and the continuing high levels of catches.

The data available in the present study on fish harvesting are more limited and permit a test of the use of only some of these strategies and only a limited test of their effectiveness at Waswanipi.

ii) Fish Yields

The fish yield of the Waswanipi region was estimated to be at least 1,000 pounds per square mile of productive water (Appendix 9-6). The major lakes of the region have been estimated to cover surface area of 808 square miles (Table A9.3-1). A recent detailed planimeter study of 7440 square miles of the 9759 square mile Waswanipi hunting territory area indicated that 10.9 percent of the area surface is lakes, rivers and other water bodies, or 1064 square miles. Assuming 1000 square miles of water surface, then the annual fish yield of the territory would be approximately 1,000,000 pounds of fish.

iii) Fish Harvests

Winter fish harvests can be estimated from the data in the diary records. Prior to the New Year's holiday 11 hunters caught 801 fish or 73 per hunter. After New Year's 9 hunters caught 864 fish or 96 per hunter. The average per hunter winter fish harvest is therefore 169 fish. The winter average harvest for the 63 hunters in bush camps in 1968-69 is 10,647 fish and for the 66 hunters in bush camps in 1969-70 the estimated harvest is 11,154 fish.[19]

The diary records do not continue into the summer period proper for reasons that have been indicated previously. Gathering data on summer fish harvests by interview proved difficult because many people expressed concern that they did not count or remember all the fish they caught and could not therefore give accurate reports of their harvests. Extensive interviewing was not therefore conducted. The summer harvests of fish were approximated by means of a settlement by settlement estimate.

During the latter part of the fieldwork, I inquired about how many people had fish nets set at each community and the number of fish nets set by community members. The number of observations for these data is limited and I do not have data from each settlement for each part of the summer. Nevertheless, the numbers are reasonably consistent throughout the summer period, the main variation occurring when spawning runs occur. My data, however, are sufficient to adjust for the most general of such variations. Overall there were approximately four nets set regularly at Waswanipi River settlement in summer, two from summer camps along the road from Waswanipi River to Miquelon, two set in Miquelon and three at Matagami in summer. For several weeks during the early summer and late summer when spawning runs of several species occur, the number of nets increased significantly. Seven nets were set at Waswanipi River, four at Miquelon and six at Matagami. These periods lasted in total about eight weeks. Nets were checked an average of about five times a week in summer in most settlements except Matagami, where the distance that had to be travelled to suitable sites away from the town led to a decreased in the frequency of checks to about three a week. From observation and reports of some three dozen net checks I calculate that just over 15 fish were harvested per check in spring and fall, and about 9 per check in June, July, August and September. The 15 per check is close to the late fall and early spring diary record averages of 16.8 and 17.0 fish per check reported in Chapter 9. For the entire period this amounts to 15,816 fish. This scale of harvest is consistent with the estimated harvests of summer fish given to me by individual fishermen, but the number of such reports is too small to warrant separate estimates.

One additional source of fish harvests are the catches taken by the men who worked for the commercial fishery in the summer of 1969 and 1970. While the great majority of their harvests were sold to the fishery, some of the fish caught while commercial fishing were used for domestic consumption. Ten men were fishing commercially in 1969 for a short seven-week season and seven in 1970 for a thirteen-week season. If they used three fish a day for domestic consumption then 1470 were used in 1969 and 1911 in 1970.

The total annual subsistence fish harvest for 1968-69 is therefore estimated to be 27,933 fish and for 1969-70 it is estimated to be 28,881 fish. Assuming a live weight of 3.2 pounds per fish harvested, these harvests amount to an estimated 89,386 pounds in 1968-69 and 92,419 pounds in 1969-70.

In addition, the commercial fishing operation supported by Indian Affairs harvested 4,651 pounds of strugeon in the summer of 1969 and 25,185 pounds of sturgeon plus "small fish" in the summer of 1970.[20] Because most fish in 1970 were gutted, 10 percent must be added to the recorded weights to estimate live weights, for a total of 27,704 pounds.

The Waswanipi subsistence plus commercial harvests therefore totalled about 94,037 pounds in 1968-69 and 120,123 pounds in 1969-70.

Non-Native sports fishing was common in the southern parts of the Waswanipi area in both summers, and at least five outfitters were operating in the area at the time. There are however no official records of the number of fish taken or of the number of fishermen and the duration of their stays. Considering data that are available on the number of sports fishermen visiting the region in the mid-1970's it is likely that the total sports harvest was less than the subsistence harvest. It is not clear, however, how much lower it was than subsistence harvests, and no estimate can be made here. In some calculations made below I will simply assume that it was equal to or less than the subsistence fish harvest.

iv) Management of Fish Harvests in Relation to Fish Yields

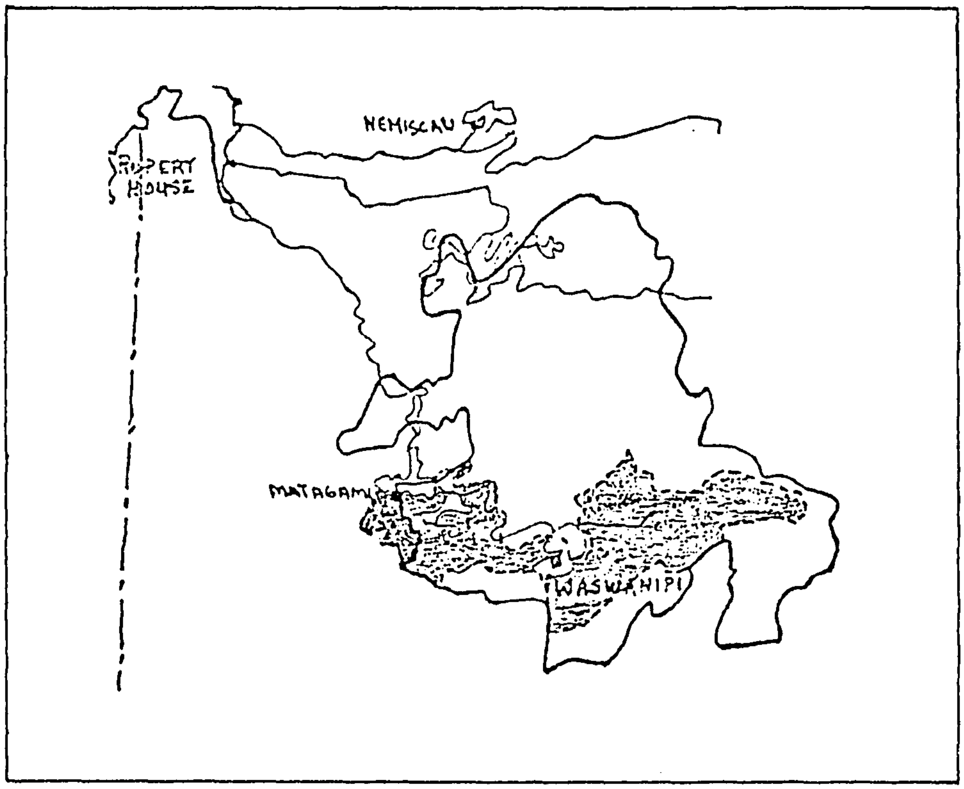
Assessment of fish harvests in relation to fish yields is complicated by significant differences in the geographical distribution of the harvests and important variations in yields and resilience of the different species of fish. Furthermore, the data available from the present research are of limited value because they provide little information on the geographical distribution and species composition of the fish harvests. The present data are therefore briefly examined to establish the general relationship between fish harvests and yields. Then, historical data on the commercial fisheries harvests and more recent data on subsistence fish harvests are examined to define the nature of the fish management problems that confront the Waswanipi. How these problems are solved is suggested on the basis of the data available.

The estimated subsistence fish harvests of 1968-69 and 1969-70 are between 9 and 10 percent of the estimated sustainable fish yields in the Waswanipi area. The subsistence plus commercial harvests represent between 9 and 12 percent of the potential yield, and if the sport fishing harvest were included the total would probably not exceed 20 percent of the available total sustainable yield. The use of the fish resource is therefore well below sustainable yields on a regional basis.

However, while this is true for the Waswanipi area as a whole, it should be noted that the most heavy fishing was concentrated in the southern portions of the area. In winter the subsistence fishing activity is widely dispersed on the hunting territories. In summer, however, the subsistence fishing activity is centered on waters that are accessible within a daily return trip of the summer settlements, and this is the same region used by the commercial fishery and by most sports fishermen who use the southern lake network to reach fishing areas. The southern portion of the Waswanipi area adjacent to the settlements and roads is therefore subjected to a more intensive use of fish resources than is the area as a whole.

The data from the present study does not permit an evaluation of the geographical distribution of the fish harvests, however, the more recent by the James Bay and Northern Quebec Native Harvesting Research Committee provides some data on this question. The JBNQNHRC defined a strip of territory running from Matagami Lake east, and including all the major lakes in the southern portion of the Waswanipi territory, Olga, Gull, Waswanipi, Pusticamica and Opawica, and the Waswanipi and Chibougamau Rivers as the "near" harvest area, because it was close to the Waswanipi settlements and to the road network (Map 10-3). Based on the sample interviews it conducted, the JBNQNHRC

Map 10-3. Waswanipi Hunting Territories and the "Near" Area as Defined in JBNQNHRC Studies[1]



____ = Boundary of Hunting Territories with Tallymen who are Members of the Waswanipi Band

[shaded box] = "Near" area

1. Redrawn from: JBNQNHRC, 1978: Figure B-3, Page 48.

estimated that the "near" area, which includes approximately 25 percent of the total Waswanipi area and approximately 50 percent of the water area of the region, provided 82 percent of the total estimated fish harvests of the Waswanipi people, by food weight (calculated from JBNQNHRC, 1976a:Vol. 1, Table H-4, page 336).

In 1968-69 and 1969-70 virtually the entire summer subsistence fish harvest occurred in this same area and a portion of the winter harvest as well. The summer subsistence harvest was 62 percent of the annual subsistence harvest in 1968-69 and 61 percent in 1969-70. In the winter of 1968-69, 8 of the 18 hunting groups hunted in this area, and in 1969-70, 10 of 21 hunting groups. Thus 40 to 50 percent of winter fish harvests may also have been made in this "near" area. If fifty percent of winter harvests were made in the near zone, then in 1968-69 and 1969-70 approximately 80 percent of the subsistence fish harvests may have occurred in the limited area. This area also included the sites of the commercial fishery.

In the "near" area then, the sustainable yield would be approximately 500,000 pounds of fish, and the subsistence and commercial harvests would be 76,160 pounds in 1968-69 and 101,640 pounds in 1969-70, or 15 and 21 percent of sustainable yields respectively. These levels of use however do not take into account the sport fishing harvests, which occurred predominantly in the same "near" area, and may increase the intensity up to 30 to 40 percent of yields.

The intensity of fish harvests in relation to yields is therefore unevenly distributed. Over the Waswanipi region as a whole the harvest of fish is a small percentage of sustainable yields, and in the areas "near" the main summer settlements, the road network, and the sport fishing outfitters fish harvests may account for up to forty percent of sustainable yields. In more limited areas, such as particular lakes or rivers near settlements, utilization levels could easily be close to sustainable yields. This can be demonstrated in a number of particular instances.

Some Waswanipi reported that the fish harvests taken from a few particular lakes were sufficiently large that they resulted in a reduction of successive harvests and in the efficiency of harvesting. Two small lakes, Billy and Bachelor lakes, were reported to have been fished out several years before this study when a summer encampment of Waswanipi working in woodcutting operation was established nearby. This was however a temporary situation and problem in the Waswanipi view.

More serious than these cases, the fish resources of Gull, Olga and possibly Matagami Lakes were considered to be showing signs of over-fishing by the Waswanipi. These were the lakes which were subjected to the major commercial fishing operations and the Waswanipi considered the commercial fisheries to be responsible for the depletion. While in 1969-70 the commercial harvests were only 20 percent of the total subsistence harvest, the commercial fishery harvests had declined significantly from the levels of harvests that were attained five years earlier in the summer of 1965. It was continuing intensive harvests of the commercial fishing operation that were considered responsible for the depletion of the fish stocks of these lakes.[21] A brief review of the history of the commercial fishery and of its annual harvests confirms the Waswanipi view that these lakes were being over-fished.

The Indian Affairs Branch commercial fishing operations at Waswanipi were begun in 1958 with fishing commencing on Waswanipi Lake.[22] As reported previously fishing was stopped on Waswanipi Lake itself, at the request of the Waswanipi, because the Waswanipi feared a depletion of important subsistence fishing near the post (Williamson, 1964:33; and Samson, 1966:30). Fishing was expanded to other lakes, Gull, Olga and Matagami, and northward to Evans Lake by 1961.[23] During the early years of the fishery sturgeon, the most valuable commercial species in the region, was the only fish harvested and it remained the most important economically when other species were fished as well.

By 1963, the sturgeon of the region were clearly being over-harvested and depleted. Biological studies were undertaken on the lakes being harvested.

On the basis of the testimony of Indian people and on the basis of an examination of the distribution of the sturgeons sampled during his survey, Etienne Magnin concluded that the large sturgeon were rare and the species was in retreat (Magnin, 1964:279, 296).

The fishing of other fish species started to take on greater importance.[24] Harvests of fish other than sturgeon increased for several years, 1965 being the peak harvest according to the fisheries employees. The first year for which detailed data are available to me is also 1965 (Table 10-5). From 1965 on however the total harvest declined with a three-fold decrease occurring between 1965 and 1970. A decline in both harvests and harvest per man-week fishing occurred in 1966. The delcine was first reported in 1967 in Gull Lake, and it was reported to fieldworkers of the McGill-Cree Project both by Waswanipi hunters (Fieldnotes, Ignatius E. LaRusic, 10/1/67) and by Indian Affairs personnel (Fieldnotes, Adrian Tanner, 6/20/67), but not by those personnel directly responsible for the fishery operation.

The response to the declining harvests of fish and to operating deficits was to reduce the number of fishermen and increase the intensity of the fishery by using more fishing gear and checking them more intensively. This was begun in 1968, and in 1969 each fisherman was to set 10 to 13 nets and check half each day on alternative days. In 1970, 10 to 15 nets were set per fisherman and each was to check all his nets everyday.

The effects of this intensification in the total number of nets and net checks was to stabilize the total fish harvest between 1968 and 1970, to stabilize the sturgeon harvest per man-week and to increase the harvest of other species per man-week (Table 10-5). However, on a per net check basis, the harvest efficiency was probably still declining. The total harvest was only being kept stable by increasing the numbers of nets and the number of checks of the nets, and the harvest per fisherman was only being increased by reducing the number of fishermen and itensifying the work of all those who remained.

Table 10-5 Waswanipi Commercial Fishing Harvests, Intensities and Efficiencies, 1965 to 1970

Summer	Lakes Fished[1]	Number of Fishermen	Man-Weeks Fishing	Harvest Weight (Pounds)		Harvest Per Man-Week	
				"Small Fish"[2]	Sturgeon	"Small Fish"	Sturgeon
1965[3]	Gull, Olga, Matagami	22[4]	314	55,234	19,334	176	62
1966[5]	Gull, Olga, Matagami	25[4]	309	31,889	13,975	103	45
1967[6]	Gull, Olga, Matagami	14					-[7]
1968	Gull, Olga, Matagami	18	117	15,492	8,027	132	69
1969	Gull, Olga	10	69	-[8]	4,651	-	67
1970	Gull, Olga, Waswanipi	7	91[9]	——25,185——		——277——	

Footnotes:

1. Lake Evans was also fished in some years, but primarily by people from Nemiscau and Rupert House. It is not considered here.
2. "Small fish" includes: pike, walleye, whitefish, cisco, goldeye.
3. Samson, 1966: Table V, page 31.
4. Maximum number of fishermen.
5. From fieldnotes provided by Ignatius LaRusic.
6. McGill Cree Project fieldnotes, by Adrian Tanner, 6/21/67, 6/26/67, 7/4/67.
7. Not available.
8. Not fished.
9. Based on starting and finishing dates of season.

In the summer of 1970, mercury levels in the fish sold by the fishery were found to exceed the limit set for commercially sold fish, 0.5 p.p.m. Tests indicated that the mercury levels in the fish of the region generally exceeded the permissible limit and the fishery was closed down in September, 1970.

This experience confirms the view that where intensive fishing occurs it is possible that harvests may be sufficiently large that indications of over-harvesting will occur. The critical feature of the commercial fishery, however, was that it was being conducted under the supervision and "instruction" of non-Native commercial fishing "experts" and the Waswanipi fishermen were not using traditional fishing techniques.

Would traditional techniques limit the impact of subsistence fishing on the stocks? I have only limited data on this point. The Waswanipi did fish out at least two small lakes, Bachelor and Billy Lakes, as mentioned above. These were lakes that were not harvested on a regular basis, however, so that depleting the stocks and then moving to other areas and allowing the fish stocks to recover was consistent with the Waswanipi long-term use of these fish resources.

The most critical problem the Waswanipi faced for fish resource management was the harvesting of the water bodies immediately adjacent to their permanent communities. The Waswanipi River and its tributaries at Waswanipi River settlement, Pusticamica and Waswanipi Lakes and the O'Sullivan River at Miquelon and the Bell River and Lake Matagami at Matagami. Unfortunately, geographically localized subsistence fishing harvest data for these specific areas are not available from my study or from later studies.

Some indication that there is a response to these potential problems can however be indicated by noting that the Waswanipi are selecting for particular species of fish in their harvests.

The one indicator of possible management strategies available is data on the distribution of the harvest among various species of fish. In Appendix 9-6 I pointed out that the available biological data indicate that some species of fish are better adapted to northern conditions than others, and that these species are better able to respond to more intensive harvesting without a decline in the reproductive potential of the population, indeed they have strong compensatory mechanisms that respond initially to harvests by increasing productivity. The species identified as relatively resilient to exploitation in the north were the whitefish, pike and burbot. Those that were identified as probably being less resilient were sturgeon, walleye and suckers. Of the former species whitefish and pike accounted for an estimated 10.3, and 14.1 percent of the total biomass of fish. Of the latter, sturgeon and walleye accounted for 16.7 and 33.2 percent (Table A9.6-4). Thus while the former are more resilient to exploitation they account for only an estimated 24.4 percent of biomass, whereas the latter species are less resilient to intense fishing but the sturgeon and walleye alone account for an estimated 49.9 percent of biomass.

Fishery activities do not usually harvest fish simply on the basis of their presence, they harvest on the basis of selective strategies which ultimately depend on the values of the fishermen. The commercial fishery at Waswanipi for example was based on the commercial sale prices of the fish at the markets in Montreal and/or New York, and the fishermen were encouraged to harvest in the species with the highest commercial value. The major commercially salable species were the sturgeon and walleye. The 1968 price at the market was \$0.90 per pound for sturgeon and \$0.35 per pound for walleye. The prices paid to fishermen were \$0.40 per pound for sturgeon, \$0.12 per pound for walleye, \$0.09 for whitefish, \$0.05 for pike and \$0.02 for goldeye. The commercial fish harvest in 1968 reflected the commercial values of sturgeon, walleye and whitefish. While sturgeon comprised 16.7 percent of the biomass sturgeon comprised 37 percent of the commercial harvest by weight (Table 10-6). Walleye and whitefish both also comprised higher percentages of the commercial harvest than of the estimated biomass.

Table 10-6 Percentage of Biomass of Fish by Species, and Percentage of Commercial and Subsistence Fish Harvest Weights by Species

Species	Percentage of Total Biomass Number[1]	Percentage of Harvests by Weight		
		Commercial Fishery	Subsistence Fishery	
		1968	1974-75	1974-75 adjusted[2]
Lake Sturgeon	16.7	37	6.2	8.6
Walleye	33.2	39	18.0	25.2
White Sucker	13.7	-[4]	) 28.5	0
Longnose Sucker	5.1	-[4]	)	
Lake Whitefish[3]	12.7	22	28.6	40.0
Northern Pike	14.1	-[5]	15.9	22.2
Other		2		

Footnotes:

1. From Table A9-6.4.
2. Proportion of all harvests excluding suckers.
3. Includes "Cisco".
4. Unknown.
5. Unknown, but reported to be small.

This is in sharp contrast with the species selection indicated by the JBNQNHR data on the 1974-75 subsistence fish harvest. In Chapter 4, I have indicated that sturgeon was the most highly rated fish flesh food, and that walleye and whitefish and pike were less highly valued although positively valued as well (Table 4-17). If the Waswanipi were simply following their food preferences, they would select sturgeon, walleye and whitefishes in the subsistence harvests. However, as I have noted above, the Waswanipi considered the sturgeon populations to be depleted. Furthermore, since some of the sites of intensive subsistence fishing were sites that were used on a continuing basis, it may be expected that walleye populations as well as sturgeon populations could easily be subjected to difficult conditions were the fishing selective for that species.

In fact, the harvest of the subsistence fishery indicates a selection against sturgeon and walleye. The percentage distributions have been adjusted to exclude the harvest of suckers, which were caught in large numbers, but which were not sought but rather caught in the process of seeking other fish species. On this basis, sturgeon accounted for 8.6 percent of the subsistence harvest by weight whereas it was estimated to comprise 16.7 percent of the fish biomass. (Table 10-6). Similarly, walleye accounts for a smaller percentage of the subsistence harvest than it does of the biomass and of the commercial harvest (Table 10-6). The subsistence fishery selects against those species that were most easily depleted by intensive fishing.

On the other hand, the subsistence fish harvests were comprised of a much higher percentage of whitefish than the percentage they are estimated to comprise of the fish biomass (Table 10-6). Similarly pike comprise a higher percentage of subsistence harvests than of fish biomass. Thus, those fish species which are most resilient and most likely to respond successfully to intensive fishing comprise most of the subsistence fish catch, and appear to be selected for.[25]

That the Waswanipi have the knowledge to be selective is amply demonstrated by the data presented in Chapter 6 on the places suitable for selective harvesting of each of the major fish species, and on the times when spawning and other concentrations of particular species occur. Unfortunately, the issues involved in this assessment were not clear to me at the time fieldwork was underway, and I failed to inquire about the selectivity of fishing activities in relation to perceived indicators of increases or decreases in resource yields. The data indicate a value on conservation of the fish resources.

In conclusion then, the data indicate that the Waswanipi selectively harvest fish so that more intensive use is made of those species that can best withstand intensive harvesting, and so that species which are most easily depleted by fishing are subjected to relatively less intensive harvests.

The success of this, and of other practices which have not been documented in detail, is indicated by the fact that the most heavily fished areas show no signs of depletion of fish stocks and harvest levels increased following the period of study. Between the subsistence fish harvests of 1968-69, 1969-70 and 1974-75, a significant increase in harvests occurred in the "near" area. I estimated earlier that subsistence harvests plus the commercial harvests from the "near" area totalled 76,160 pounds of fish in 1968-69 and 101,640 pounds in 1969-70. In 1974-75, an estimated total of 64,518 fish were caught in the "near" area, or 206,458 pounds of live weight of fish. This increase occurred without any major change in equipment or in techniques of fishing, of which I am aware.

F - Yields and Harvests of Waterfowl

No surveys of the waterfowl of the Waswanipi region have been made to date. An extensive survey of waterfowl populations inland from the James Bay coast has been conducted in the La Grande River basin, including the Sakami and Boyd Lake areas in late September of 1972 (Curtis, 1973b; Bourget, 1973). The survey indicated that waterfowl densities were many times lower than waterfowl densities on the James Bay coast, averaging 1.20 individuals per square mile in the randomly surveyed portions of the inland area, as compared with 121.8 individuals per square mile on the coast (Curtis, 1973b). Densities varied significantly with type of habitat, and were two to ten times higher on lakes, rivers and streams, and small rivers and beaver ponds than they were on muskeg, low relief, high hills and valleys. The former areas had densities of 1.40 to 3.80 individuals per square mile, the latter 0.36 to 0.76 individuals per square mile (Curtis, 1973b).

Of the waterfowl observed 65 percent were ducks of various species, mainly black, common goldeneye, mergansers and lesser scaup, and 34 percent were Canada geese (Curtis, 1973b).

A much smaller survey was conducted during early July, 1972, on short transects inland from Rupert House, Eastmain, Paint Hills and the Rivière-au-Castor and Roggan Rivers. The survey indicated densities of about 0.82 waterfowl per square mile (calculated from data in Bourget, 1973: Tableau 2, page 16). Densities were five times higher on rivers than over interior lands. Ducks comprised 58 percent, mainly black and mallards. These results generally confirm those of the more intensive study in the La Grande basin and indicate the results may be roughly characteristic of a much wider area of the James Bay interior. The differences in the observed densities may reflect real seasonal differences in densities of waterfowl due to the birth of young birds during the summer and increased migration of birds through the territory in the fall.

In the Waswanipi region, which is further inland from the coast, the densities of geese may be somewhat lower than indicated in these surveys, and those of ducks might be similar or higher. A mid-summer density of 0.82 waterfowl per square mile would mean approximately 8,000 waterfowl in the Waswanipi hunting territory area. And a fall density of 1.20 waterfowl per square mile would mean approximately 11,700 waterfowl. According to the Waswanipi spring densities would probably be highest, but no inland surveys are available for this period.

A small sample of eight interviews indicated harvests of 25.9 ducks per hunter in one year and 32.7 in the next, harvests of 6.5 and 5.9 geese per hunter and 1.1 and 1.7 loons per hunter. These averages, projected for the 107 hunters in the population, give estimates of 2,771 and 3,499 ducks, 696 and 631 geese and 118 and 182 loons per year. The estimated total waterfowl harvests were 3,585 and 4,312 per year for the two years.

These figures may be compared to the figures for the entire Waswanipi band estimated by the JBNQNHRC. If the estimates per hunter from this study are projected for 126 registered Waswanipi male hunters they give total estimates of 3,186 and 4,120 ducks, 819 and 743 geese and 139 and 214 loons.

The JBNQNHRC estimates of duck harvests by all Waswanipi hunters were 3,256 ducks in 1974-75 and 4,096 in 1975-76 (JBNQNHR, 1976a: Vol. 1, Table W-1, page 126; and 1978: Table D-12, page 100). For geese the estimates were available for three years; 1,254 geese in 1973-74, 671 in 1974-75 and 592 in 1975-76 (1976a: Vol 1., Table W-4, page 129 and Table W-1, page 126; 1978: Table D-2 page 90, Table D-4, page 92, Table D-8, page 96). For loons the estimated harvests were 88 in 1974-75 and 141 in 1975-76 (1976a: Vol. 1, Table W-1, page 126; and 1978, Table D-10, page 98).

These data therefore indicate that the waterfowl harvests fluctuate somewhat from year to year, but that the harvests have been of a similar order of magnitude during the present study and the years following.

The total harvest of waterfowl is a relatively high percentage of the estimated mid-summer and fall populations, 31 to 37 percent of the latter, but the spring populations are unknown and the actual systainable yields unknown. The only test of the sustainability of the waterfowl harvest levels reported in this study is that they have been maintained in succeeding years.

G - Yields and Harvests of Hare and Grouse

There are no studies of hare or grouse densities in the Waswanipi region, and the highly variable populations of these species make it impossible to predict typical densities. Furthermore, partly because of the cyclical variations in populations, and partly because of the high reproductive potential of these species, hunting harvests have little impact on the course of the cycles, and therefore on the long-term population sizes and densities. A gross study of the crude survival rate of hare, for example, suggested that only 14 percent survive from one breeding season to the next and 86 percent die (Banfield, 1974:83). To the extent that hunting removes animals that would otherwise be lost to other causes of mortality, the hunting harvest could take the great majority of the standing crop without affecting the long-term potential of the populations. But, management of the population by hunting would be impossible.

Despite the impossibility of arriving at a single representative value for hare and grouse densities in the Waswanipi region, even a speculative assessment of the likely range of densities of hare and grouse may be instructive for comparative purposes. I therefore will provide a gross estimate of possible hare and grouse populations based on a number of simple, but largely unconfirmed assumptions. First, I will assume that at peak densities the hare and grouse populations of the Waswanipi region attain densities in the middle of the ranges of densities that have been reported in census studies of good habitats in other northern regions. I will assume hare densities peak at 150 to 250 hare per square mile of suitable habitat, and grouse densities peak at 50 to 150 grouse per square mile of suitable habitat (selected from figures presented in Keith, 1963: Table 16, page 135). I will assume that the densities at the low points in the cycles vary from high densities as a fraction of the peak densities. I chose a fraction that was associated with the peak densities I had chosen. I will assume low point densities of hare are about 1/15 of the peak densities, or approximately 10-15 hare per square mile of suitable habitat. I will assume that grouse densities at the low points are about 1/5 to 1/10 of the peak density or 5 to 30 grouse per square mile of suitable habitat. Then, I will assume that at low points in the cycles grouse and hare are restricted to young vegetation regenerating after burns and disturbances. On the basis of forestry maps of the Waswanipi area I roughly estimate that approximately 10 percent of the area may be suitable habitat. At peaks of the cycles, I will assume hare and grouse populations occur in all young forests, or about 30 percent of the Waswanipi region.

Based on these assumptions hare populations at the low point of the cycles would be between 9,750 and 14,500 animals and grouse populations would be between 4,900 and 29,000 animals. At peaks of the cycles hare populations would total between 439,000 and 732,000 and grouse between 146,500 and 439,000 animals. These figures will be used below to compare the possible sustained yield productivity of these species to those of other species.

The actual Waswanipi harvests of hare and grouse may be estimated with greater accuracy. In 1968-69, 25 hunters averaged 20 hare each during the winter hunting period, and 37 grouse each (Table 9-36). Data from eight interviews in which summer and winter harvests of hare and grouse were reported for two summers indicate that summer harvests of hare averaged 65 percent of winter harvests, and summer harvests of grouse averaged 86 percent of winter harvests. The per hunter annual harvest is therefore estimated to be 33 hare and 69 grouse. While hare and grouse were hunted by both people who were in bush camps and those who lived in the settlements, interviews indicate that approximately 59 percent of the families actually hunted these species. Thus I estimate that there were 63 hunters and hunting families. The total estimated harvest is therefore 2,277 hare and 4,761 grouse.

To compare these estimates with those of the JBNQNHRC, they would be increased by 15 percent to cover the entire population of registered Waswanipi band members, or 2,619 hare and 5,475 grouses. The JBNQNHRC estimates of harvests by Waswanipi band members were 2,132 hare in 1974-75 and 2,188 in 1975-76 and 2,136 grouse plus ptarmigan in 1974-75 and 2,789 in 1975-76 (1976a: Vol. 1, Table G-1, page 308; 1978: Table H-1, page 166). These differences presumably reflect changes in populations of these species, weather conditions and variations in hunting intensity.

H - Fur-bearer Harvests

There are no adequate surveys of fur-bearer populations or densities in the Waswanipi region or in the James Bay region as a whole, with the exception of the studies of beaver cited previously. Data on the Waswanipi harvests of fur-bearers in 1968-69 and 1969-70 were collected for all hunters by means of interviews. These data are summarized on Table 10-7 and compared to the JBNQNHRC results on Table 10-8. The full data appear in Appendix 10-1. There are no general trends apparent in the results.

There are no data with which to test whether these fur-bearer harvests are in fact close to the sustainable yields of the fur-bearing animal populations of the territory. It may however be worth noting that for highly valued species and species with high prices in recent years, the levels of fur-bearer harvests reported in the period from 1968-69 to 1975-76 compare well to the periods of high harvests of the same species that have occurred over the last fifty years. That is, the highest number of otter, marten, lynx and black bear taken in recent years generally is higher than or within the upper one-third of the highest record of yearly sales of the pelts of that species to the Hudson's Bay Company post at Waswanipi between 1925 and 1965 (Table 10-9). That roughly similar levels of peak catches have been maintained for species of continuing value over a fifty-year period is striking, even given the large year to year variation (full data in Appendix 10-2).[26] Over this period the number of active hunters has approximately doubled.

The one anomalous figure among those collected in the present study is the single black bear reported killed in 1969-70. This may be a low harvest, but it is based on an almost complete set of interviews with Waswanipi hunters. That the harvests can vary significantly from year to year is also indicated by the JBNQNHRC data in which only five black bears are estimated to have been killed in 1973-74 (Table 10-8).

Table 10-7 Harvests of Fur-Bearing Animals, 1968-69 and 1969-70

Species	Year	
	1968-69	1969-70
Otter	103	55
Marten	259	213
Mink	120	170
Weasel	289	244
Muskrat	1326	1067
Lynx	52	40
Bear	8	1

Table 10-8 Estimated Harvests of Fur-Bearing Animals Taken by All Waswanipi Band Members, Available Years, 1968-69 to 1975-76

Species	Harvest Year					
	1968-69[1]	1969-70[1]	1972-73[2]	1973-74[2]	1974-75[2]	1975-76[3]
Otter	118	63	71	60	63	93
Marten	298	245	307	405	215	494
Mink	138	196	155	101	81	222
Weasel	332	281	-[6]	-	-	-
Muskrat	1525	1227	292	469	608	1270
Lynx	60	46	134	109	67	70
Fox, Red	-[6]	-	13	18	22	40
Bear	9	1	44[4]	5[4]	31[4]	23[5]

Footnotes:

1. Table 10-5 multiplied by 1.15, see text.
2. JBNQNHRC, 1976a:Vol. 1, Table F-5, page 200, unless otherwise noted.
3. JBNQNHRC, 1978: Table E-1, page 113, unless otherwise noted.
4. JBNQNHRC, 1976a:Vol.1, Table B-9, page 285.
5. JBNQNHRC, 1978: Table F-11, page 154.
6. Hyphen (-) means no estimate was made.

Table 10-9 Comparison of Highest Recent Harvests of Fur-Bearer Species with Highest Purchases of Fur Pelts of That Species at Waswanipi 1925-1965.

Species	Maximum Number of Pelts Purchased in One Year Between 1925 and 1965[1]	Maximum Estimated Harvest, 1968-69 to 1975-76
Otter	84	118
Marten	371	494
Lynx	207	134
Black Bear	53	44
Mink	539	222
Weasel - "Ermine"	1559	332
Muskrat	5127	1525

Footnote:

1. From Appendix 10-2.

This variation and the relatively low harvest are striking in the light of reports that densities may be in the order of one bear to every 5.56 miles (Banfield, 1974:305). On this basis there would be 1755 black bears in the Waswanipi region. Even if this estimate were two or three times too high, and even if sustained yields were low, i.e., 5 to 10 percent of the population estimates, the harvest would be quite low in at least one-half of the years surveyed.

I - Overview of Annual Hunting Harvests and Their Relation to the Sustained Yields of the Resource Populations

On the basis of the data presented it is now possible to summarize the estimated total annual harvests of wildlife (Table 10-10). The percentage contribution of each species and group of species in the total annual diet may be compared to the estimates made earlier of winter food harvests (Table 8-19). Beaver and moose remain the predominant sources of food, although the importance of beaver declines marginally on an annual basis. Fish is the prime summer source of food, and is a significant component of the total food production on an annual basis, but remains less important than moose or beaver on an annual basis. All other sources account for two percent or less of the food harvests as in the winter estimates. On an annual basis the food produced is still predominantly beaver, moose and fish, in that order.

The sustainable yields for each of the major resource populations which the Waswanipi hunters harvest can now be compared with each other, and with the relative importance of that species in the food harvests. From data collected during aerial surveys of the moose populations of Waswanipi region it is estimated that the moose population of the region was 803 moose in 1968. And, on the basis of continuing harvests of about 20 percent of that population and slight increases in estimated populations, I have estimated that 20 to 25 percent of the population is a sustainable yield. On this basis 161 to 201 moose could be harvested in the region on a sustained yield basis during the period of this study. This amounts to an annual sustained harvest of between 6.37×10^7 and 7.95×10^7 Calories of food (Table 10-11).

Table 10-10 Total Annual Harvest of Animals and Calories of Food Produced, 1968-69 and 1969-70

Species or Species Group	1968-69 Number Harvested	1968-69 Calories of Food[1]	1968-69 Percentage of Calories of Food	1969-70 Number Harvested	1969-70 Calories of Food[1]	1969-70 Percentage of Calories of Food
Moose	131	51,808,797	30	101	39,944,187	26
Beaver	2,778	74,505,960	43	2,614	70,107,480	45
Fish	27,933	33,240,270	19	28,881	34,368,390	22
Ducks	2,771	1,629,348	1	3,499	2,057,412	1
Geese	696	2,091,480	1	631	1,896,155	1
Loons	131	259,642	0	182	360,724	0
Hare	2,277	2,306,601	1	2,277	2,306,601	1
Grouse	4,761	3,385,071	2	4,761	3,385,071	2
Otter	103	420,343	0	55	224,455	0
Marten	259	140,896	0	213	115,872	0
Mink	120	48,960	0	170	69,360	0
Weasel	289	39,304	0	244	33,184	0
Muskrat	1,326	721,344	0	1,067	580,448	0
Lynx	52	189,436	0	40	145,720	0
Bear	8	750,520	0	1	93,815	0
All		171,537,972	97		155,688,874	98

Footnote:

1. Based on Table 8-12.
2. No separate estimates were made by year for hare, grouse and summer fish harvests.

Table 10-11 Sustained Yield Harvests of Various Resource Species in the Waswanipi Region

Species or Species Group	Sustained Yield Harvests		
	Numbers	Pounds	Calories of Food $(x10^7)$[1]
Moose	161-201		6.37 - 7.95
Beaver	3,513-4,391		9.42 - 11.78
Fish[2]		1,000,000	37.19
Waterfowl[3]	(3585)		(0.40)
Hare[4]			
Low point	9,750-14,500		0.99 - 1.47
High point	439,000-732,000		44.47
Grouse[4]			
Low Point	4,900-29,000		0.39 - 2.06
High Point	146,500-439,000		10.42 - 31.21

Footnotes:

1. Based on Table 8-12.
2. Conversion from pounds to calories is based on an average live weight of 3.2 pounds per fish (Table 8-9).
3. No sustained yield harvest estimates were made for waterfowl. The number cited here is the estimated harvest. The calorie calculation assumes 77 percent ducks, 19 percent geese and 4 percent loons.
4. These are technically estimated densities, not yields, but as was indicated in the text potential yields could well exceed four-fifths of the actual populations without damaging the reproductive potential of the populations.

On the basis of an aerial survey and on the basis of the locations of beaver colonies mapped by hunters a minimum estimate of the number of colonies in the Waswanipi region was 3,513. Based on a sustained yield harvest of 1.0 to 1.25 beaver per colony, the total annual sustained yield harvest is estimated to be between 3,513 and 4,391 beaver, or between 9.42×10^7 and 11.78×10^7 Calories of food.

The yield of fish in the Waswanipi region has been estimated at 1,000,000 pounds per year, or 37.19×10^7 Calories of food. The populations of hare and grouse have been estimated within wide ranges. As indicated above the harvest might account for up to 85 percent of the population, although such a harvest is unlikely. Since the range of estimated populations is much greater than the difference between the population estimates and sustainable yield estimates no adjustment is made to the population estimates. At low points the populations would provide up to 0.99 to 10^7 to 1.47×10^7 Calories of food from hare, and 0.39×10^7 to 2.06×10^7 Calories from grouse. At high points they would provide up to 44.47×10^7 to 74.15×10^7 Calories from hare and 10.42×10^7 to 31.21×10^7 Calories from grouse.

No estimates were made of the sustainable yields of waterfowl. However, for comparative purposes I propose to note the food provided from the present harvest, 0.40×10^7. This appears to be sustainable, but it may not be the full sustainable yield.

A comparison of these various estimates of the sustained yield harvests (Table 10-11) indicates that: among the main food resources moose is the least productive; beaver is about fifty percent more productive than moose; and fish are three to four times more productive than beaver. Waterfowl probably have the lowest overall yields. Hare and grouse productivity varies enormously. At low points in the population cycles they may be 1/3 to 1/12 as productive as moose, although probably more productive than waterfowl. At the high points in their cycles, hare is probably as productive or significantly more productive than fish and grouse is at least as productive as beaver and possibly as productive as fish (Table 10-11).

The main point here is to indicate the relationship between the three main subsistence resources, moose, beaver and fish. As has been indicated in the previous chapter, moose is the most efficiently harvestable resource, beaver is the second most efficiently harvestable resource, and fish is generally the least efficiently usable. Parallel with this beaver provides the major source of subsistence food production, moose is second and fish is the least important of the three. The critical point here is that the estimated sustained yields of these three resources are the reverse of the efficiencies and nearly of relative importance, fish is clearly the most productive resource, beaver is the next most productive and moose is the least productive. The importance of a resource in the harvest does not therefore correspond to the total quantity of that resource available in the environment.

Thus, while many resources are used to a very limited degree and some resources are not used at all, for example mice, voles, lemmings, crustacea, small forage fish, this is not the case for all resources. The resources which are the main sources of harvests are used at a significant intensity, either over the entire area, or over smaller areas in which relatively isolated populations occur. The fact that, in this case at least, the more efficiently harvestable resources and the resources that are most intensively used (Table 10-12), are among the less productive resources, leads to a situation where efficiently harvestable resources are being harvested at a high level of intensity.

It follows from this that some regulation and management of both hunting and of the resource populations would be expected. I have attempted to show that this is possible and it is in fact done in the detailed discussions above, which I will summarize here.

The total moose harvest in the Waswanipi hunting territory area is a high percentage of the estimated populations[27] and, since the populations and harvests are stable or slightly increasing, the assumption is that the net productivity,

Table 10-12 Intensity of Use of Major Wildlife Resources in the Waswanipi Region

Species or Species Group	Percentage of Sustained Yield Harvested[1]			
	Waswanipi Subsistence Harvest		Total Harvest	
	1968-69	1969-70	1968-69	1969-70
Moose	63-78	50-63	83-100	71-89
Beaver	61-77	57-71	61-77	57-71
Fish[2]	9[3]	9[3]	20[4]	20[4]

Footnotes:

1. Harvests occurring in Waswanipi hunting territory area.
2. Assumes 3.2 pounds live weight per fish.
3. No separate estimates were made by year for the summer subsistence fish harvest.
4. No precise data on sports fishing harvest available.

yield, of the moose population is high. Since Waswanipi hunters claim that they could kill more moose than they do, the moose populations appear to be at a density above the security densities. Given that they are yielding harvests, over a period of about eight years, that are in the upper range of sustained yields reported in other studies, it is assumed that the moose populations of the region are near optimum densities. Optimum densities provide maximum yields and stable populations. The conclusion is that the Waswanipi are regulating their own harvests, so as to manage to keep the moose at near optimum density and productivity and this is why more moose are not overharvested, despite the efficiency of moose hunting.

Beaver are harvested at a relatively high intensity over the entire area, varying between about 60 to 75 percent of yields. Decreasing hunting activity during the years immediately preceding the present study appears to have increased the density of colonies above the levels characteristic of the years when hunting activity was renewed. This indicates that the hunting is keeping colonies below tolerance levels, and studies from other areas indicate that productivity of beaver populations is higher when the population is below tolerance levels. It has been indicated however that beaver harvests are unevenly distributed geographically and in the areas subject to hunting, harvests appear to exceed sustainable yields. The rotation of these harvests will be considered in the next chapter, but it should be noted here that the general pattern of populations of beaver in small areas appears to be one of cyclical densities just below and at tolerance levels. This increases productivity of the population while retaining the resilience of the population against severe depletion. No serious evidence of depletion has occurred in the last twenty-five years and the typical annual harvest level is therefore related to the harvest management strategies chosen.

Fish yields are relatively high in those areas near the settlements where more intensive harvests are made on a continuing basis. That harvests are not too high a percentage of yields was indicated by the data available and by the increases in harvests in some later years. The main regulation of harvests identified with respect to fish harvesting was the selection for particular species.

The management significance of this selectivity was suggested by the fact that: the species most heavily selected against were the sturgeon which although highly valued as food is easily subject to depletion, and the walleye which is probably a species with relatively low resilience to harvesting; and the species selected for, particularly whitefish, were those which biological data suggest to have relatively good resistence to moderate or intensive levels of harvesting. The fish data therefore also indicate a management of the distribution and reproduction of selected species and a conservation of the resources.

What is common then to all of these three cases is that: the Waswanipi hunters are managing these populations so as to provide long-term population resilience and/or stability; they are optimizing yields in so far as this is compatible with long-term stability of yields; and the actual harvests and intensity of harvests of the most efficiently harvestable resources in the short run are at the levels compatible with long-term stability and optimization of yields.

Footnotes for Chapter 10

1. See also Yehudi Cohen, 1968c:282; and Leo Smith, 1972:52; and, for a recent critique of these assumptions see Henry T. Lewis, 1977.

2. If the most efficiently usable resource is also available in great abundance, relative to the needs of the people, then presumably they would still have an interest in trying to control the distributions of the resource, although not necessarily the reproduction.

3. This presentation is based on the textbook reviews in two works by Raymond F. Dasmann (1964, Chapters 8 and 9; and 1968, Chapter 9), although I remain responsible for the presentation and interpretation of the ideas. The review is highly generalized and is intended as background to the specific species reviews included in the sections that follow. Many of the concepts used here may have to be revised in the future in the light of new advances in ecological theory. Nevertheless, however theoretically imprecise some of these concepts may now appear to be, they are tried and useful tools for the task of managing wildlife populations and harvests in practice.

4. Calves, yearlings and adults can be distinguished by observation relatively well on the basis of size and antler development in the males, although hoof imprints can also be used to some extent. Male yearlings usually develop their first spikes, two-and-a-half-year olds develop long-forked spikes or small palms, and full large shovels develop at four or five years of age (Banfield, 1974:395). Antler growth begins in April, the velvet is cleaned off in late August or early September and antlers are dropped during the winter. Hoof prints can distinguish calves and yearlings relatively well, and mature bulls can be distinguished from yearlings and adult cows, however yearlings cannot be systematically distinguished from adult cows (deVos, 1956:623). For scientific purposes these observables have not proved adequate, and age class determinations are now made on the basis of examination of the teeth of the animals.

5. Tripling is very infrequent but does occur.

6. The reduction in the age of animals was accompanied by a significant reduction in the frequency of parasitism (Simard, n.d.; Bouchard and Moisan, 1974:696 and 697), and overall there was an improvement in the physical condition of the populations, although not all the parks showed clear trends (Bouchard and Moisan, 1974:696 and 697). The sex ratios of the kill also shifted with time. Bulls were more common in most years in the hunt harvest, but the sex ratio of males to females tended to move toward a more even balance over the years (DesMeules, 1966:5 and 6, Table 4).

7. It has been generally thought that the shift in age structure and productivity of a population by harvesting may be best accomplished through an annual harvest. Recently however, a periodic harvest occurring only once

every few years has been suggested as an alternative means of managing big game populations (Walters and Bandy, 1972). These authors have suggested that, under some conditions, the harvest calculated on a per year basis may be higher for periodic harvests than for annual harvests. Their view, in short, is that the intermediate age classes which have the highest productivity in the population are also abundant in the population and have relatively low natural mortality rates; but harvesting, as long as it is not age specific, tends to remove intermediate age animals in proportion to their numbers. Thus, if the hunting is stopped for one year, more of the mid-age animals survive because natural mortality takes a proportionally higher toll from other age classes than does hunting, and the population has a higher reproductive potential at the next breeding period. In addition, there is a reinvestment of the young that survive (1972:129). There are, however, several limiting conditions on the hypothesis, particularly concerning the differences between natural and harvesting mortality and the age structure of reproductive potential. Further, the authors suggest that the difference between annual and periodic harvesting would be greatest for low population densities. These authors have modelled the hypothesis by computer, using as one test a hypothetical elk-type population based on data from studies on elk and moose populations. The results indicated that an optimum periodic harvest was every three years, and that the harvest obtained was about ten percent higher than would have been obtained from an annual harvest of the same population for three consecutive years (1972:133). There are not yet any field tests of the hypothesis. In some ways, as will be indicated in this study, the native harvest could serve as an example of such periodic harvesting.

8. In recent years moose populations have been increasingly affected by human disturbances of the habitat, especially forest cutting. The cutting of forests for wood and pulp production is now widespread in much of the Canadian north. The effects of such cutting on moose populations are potentially positive, but the actual effects are usually negative. The effects depend on the cutting pattern adopted. The regeneration that generally follows cutting clearly produces food that can be highly beneficial to moose. The critical factor after cutting, however, is not food, but cover, and especially cover required in the areas of winter concentration of moose. Clear-cutting of large areas eliminates the mixed mosaic pattern moose require and it eliminates the mature stands moose often need access to during their winter concentration. Because only a portion of the area is used in winter concentrations, limited cutting leaving some of the mature forests in the area can create highly suitable conditions for moose population (Telfer, 1970b; Peterson, 1955:219).

9. The estimates were said to be extremely hazardous by the author for two reasons: the lack of objective data on the number of moose per yard and the difficulties deciding on the number of separate yards during winter of low snowfall and very extensive complexes of moose trails and habitation areas. The method of intensive surveys of sample plots was however reported to be generally more accurate than the method of surveying long

transect lines because it allows a more precise estimate of the proportion of the territory that has been inventoried and therefore a more accurate extrapolation of the results.

10. It was reported in Chapter 9 that Waswanipi average between 1.6 and 1.7 moose per harvest day or per harvest site. I would assume that most successful hunts would result in the killing of all moose in a yard, but I do not have data on how frequently one or more moose escape from a yard at which a successful hunt has been conducted. In two descriptions given to me of moose hunts, the moose in a yard consisted of a female and two young, and one of these young escaped on each occasion and could not be or was not pursued. Because I do not know how frequently one or more moose at a yard were not killed I am unable to add to the kills per site a correction for animals that escape.

11. I have also heard on some illegal harvests by non-Natives, but I cannot confirm or estimate the extent of illegal hunts. From discussions, the number of moose involved appears to be small.

12. Three indicators of possible optimum yields have been cited previously: small yearly fluctuations in the harvest; sex ratios in the harvest of 1:1; and a proportion of calves to yearlings that is high in relation to potential productivity. The first condition has been demonstrated. I failed to gather the data necessary to test the second. But, I do have some data on the third. Choosing from the accounts of moose hunts those that give assessments of ages of animals killed and, if appropriate, the animals seen but not killed in the yard, I have tabulated the age structure of the harvests. Some uncertainty exists in the data between the yearling and adult age classes. This is expectable as Waswanipi hunting goes on during the winter so men are often killing animals as late as March and April when the yearlings are nearly two year olds, and not as distinct as they are in the fall populations. Therefore only the percentage of calves in the population has been calculated. Of a sample of twenty-four moose, seven animals were calves or 29 percent. Unfortunately, this cannot be taken with confidence as a direct measure of the age structure of the population because hunting harvests have been shown often to be selective with respect to young animals (Pimlott, 1959a:393-394). On one hand sport hunters select against calves, on the other hand yearlings are known to be more vulnerable than adults to hunting. Because it is not known whether Waswanipi hunts and observations are also skewed there is no basis for comparing the percent of calves in the Waswanipi kill to other data from sport hunts. Presumably the Waswanipi kills are less skewed than sport hunters' because: there is little emphasis on trophy animals; and there is a detailed interest in, and examination of the signs in yard after the hunt to determine and confirm whether any animals took flight without being hunted. If it is assumed that there is no skewing and also that calf mortality is highest in the first summer, varying from 30 to 70 percent (Rausch, 1959:60; LeResche, 1968:953, 954; Pimlott, 1959a), then a fall-winter population with 29 percent calves is probably indicative of 35 percent gross productivity or more

and is probably consistent with 20-25 percent net productivity. But, detailed independent data on the age and sex structure of the populations would be necessary to make an assessment of the actual recruitment of young of the population.

13. Waswanipi are very concerned when they find animals sick or dead without apparent predation. One moose which was found dead near a highway without apparent cause in 1969 was the subject of some speculation until the leaves on the shrubs along road all died and it became clear that the brush had been sprayed. Presumably the young moose ate the leaves and was poisoned, as the Waswanipi noted with concern. A similar pattern of finding animals dead without apparent cause occurred on other occasions, and it always provoked discussion in the community, and worried interest among the hunters. The Waswanipi expect the animals they hunt to be in good health and condition.

14. As was reported in Appendix 9-5 when the adult beaver are trapped out at a colony the young appear to become disoriented and inactive and may be very difficult to trap.

15. Prenatal mortality has been reported at 27 percent in Wyoming (Osborn, 1953), 12 percent in Ohio (Dale and Bookhout, 1967) and between 7 and 21 in Saskatchewan (Gunson cited in Traversy and McNicoll, 1976:31). The post-natal mortality rates are less clear. The recent study in the La Grande region appears to indicate very high mortality rates on the basis of a 46 percent difference between placental marks per female and number of kits per female and 51 percent difference between the number of kits per female and the number of yearlings per female (Traversy and McNicoll, 1976: Tableau 7, page 23). The authors attribute this to predation by wolves and the particularly severe conditions in the La Grande region. Because of extremely cold temperatures and light snowfall, the ice is particularly thick and may freeze part of the food pile, diminishing the amount of available food in mid-winter. With relatively little fat accumulation in young beaver, these conditions may reduce post-natal survival rates in regions such as this. On the other hand, as has been noted above, no correction was made in this study for young animals that remained untrapped.

16. The traplines actually covered by the surveys were numbers: I, IIA, III, IV, V, VI, VII, VIII, XC, XE, SD, XII, XIX, XX, XXI, XXV, XXX, XXXI. Maps locating these hunting territories will be found in Chapter 11.

17. The 1977 survey was conducted in October, 1977 and covered five hunting territories in the Waswanipi area (Nos. W-4, W-4A, part of W-5, A-52 and A-54), all in the western most portion of the hunting area. Three of the territories were in the northern portion of the hunting area, two in the middle portion and none were from the southern most hunting territories. The hunting territories surveyed in 1977 were treated as two geographical blocks by the surveyors, and the average

density of the two blocks was 0.36 beaver colonies per square mile (calculated from Banville, 1978a: Tableau 1, page 14). The mean density for the 22 hunting territories surveyed in 1977 between the 49°N and 52°N latitudes and 74°W and 78°30'W longitudes was 0.34 colonies per square mile. The density of beaver colonies in the Waswanipi area in 1977 was therefore nearly the same as in 1964 and 1969-70. However, the data being compared are not identical, the 1964, 1966 and 1977 estimates are based on aerial surveys, the 1969-70 on a ground survey. The methodological difference however would be expected to result in a higher density from the ground survey than from the aerial surveys, and the actual difference reported here is not consistent with this expectation. This leads me to believe the difference in the figures reflects a real change in the density of the colonies.

18. Much of this discussion is based on the work of Berkes on fisheries management in the James Bay Region, although I remain responsible for the adaptation and use of his material.

19. This method may over-estimate winter harvests, because diaries with no fish harvests have been excluded. Some of these are cases where a fish harvest was taken but not recorded. Others were cases where no harvest of fish was made. The number of such cases is small and I have assumed that all hunters in the bush camps made some harvest. No correction has been made here because a few people did winter fishing from the settlement, and the present estimate does not take these fishermen into direct account.

20. Small fish includes pike, walleye, whitefish and goldeye. Suckers were the only moderately sized fish not sold for commercial purposes in 1970. Commercial fishermen catch large numbers of suckers in their nets while fishing for other species. Most of these are thrown away. Some are used for domestic consumption, both for people and for dogs. The weight of this harvest is not included in the commercial records. The "small fish" caught in the process of catching sturgeon in 1969 are also not included in the commercial records, although those used domestically have been estimated separately. The total reported commercial harvest of fish is therefore somewhat less than the total weight of fish killed in the course of commercial fishing activities.

21. These lakes with the exception of Matagami Lake, were not subject to an intensive subsistence fishery, and it appears that they were chosen for the commercial fishery because they were not sufficiently accessible to the Waswanipi, after they moved away from Waswanipi post, to play a major role in the summer subsistence fishery.

22. Fishing provided small net incomes for most fishermen, less than $5.00 per day on average in 1966 although the work was enjoyed for a variety of reasons, most important that it took place in the bush, in Cree work

groups, and that it provided important summer subsistence (LaRusic, 1977:B-41, ff.). The fishery operation however ran at a significant deficit which Indian Affairs paid.

23. The base camp for operations until 1962 was at Quévillon Lake, and the fish camps were served by airplane and the fish flown out for processing at the base camp before shipment to market. Only the highly priced sturgeon was fished between 1958 and 1963. In 1963, the base camp and fish plant were moved to the new site at Matagami, which made it possible to transport fish to the plant from all the lakes except Evans Lake by boat.

24. The new fish plant location and the resulting cheaper transportation from fish camps to plants made the processing and sale of other fish appear feasible.

25. The diferential in the species composition of the subsistence harvest in 1974-75 and the fish surveyed in 1964 could be the result either of a selection for the most resilient species, or it could be the result of previous depletion of sturgeon and walleye stocks. The possibility that the species composition of the catch is itself a result of over-harvesting is unlikely however because the fish harvests in the "near" area have increased between 1968-79 and 1974-75. Furthermore, a sample of fish made at Lake Matagami and the Bell River in 1973 by biologists from the James Bay Energy Corporation recorded a species distribution similar to that recorded in 1964, taking into account differences in sampling locations. If mooneye and goldeye are excluded because they are found in Matagami Lake, but not at many other locations, sampled in 1964; sturgeon accounted for 7 percent of the number of fish caught in 1964 and 9 percent in 1973; and, walleye accounted for 37 percent in 1964 and 30 percent in 1973; whitefish accounted for 13 percent in 1964 and 20 percent in 1973; and, pike accounted for 14 percent in 1964 and 12 percent in 1973 (Table A9.6-3). These data make it likely that the species composition of the fish harvest is in part a result of selectivity by hunters, and that it is not a simple factor of fish availability resulting from serious depletion of several stocks.

26. It should be noted however that present harvests are being compared to previous fur pelt purchases and purchase records are typically lower than harvest records for two reasons. First, not all the pelts of animals harvested are sold; some are damaged, or lost, or too small or of too low quality to warrant preparation for sale, or are used in domestic production for clothing, etc., or for spiritual purposes. Second, these records only come from the Hudson's Bay Company post at Waswanipi, and some furs were being sold at the towns the Waswanipi visited for/or to itinerant fur traders throughout this century.

transect lines because it allows a more precise estimate of the proportion of the territory that has been inventoried and therefore a more accurate extrapolation of the results.

10. It was reported in Chapter 9 that Waswanipi average between 1.6 and 1.7 moose per harvest day or per harvest site. I would assume that most successful hunts would result in the killing of all moose in a yard, but I do not have data on how frequently one or more moose escape from a yard at which a successful hunt has been conducted. In two descriptions given to me of moose hunts, the moose in a yard consisted of a female and two young, and one of these young escaped on each occasion and could not be or was not pursued. Because I do not know how frequently one or more moose at a yard were not killed I am unable to add to the kills per site a correction for animals that escape.

11. I have also heard on some illegal harvests by non-Natives, but I cannot confirm or estimate the extent of illegal hunts. From discussions, the number of moose involved appears to be small.

12. Three indicators of possible optimum yields have been cited previously: small yearly fluctuations in the harvest; sex ratios in the harvest of 1:1; and a proportion of calves to yearlings that is high in relation to potential productivity. The first condition has been demonstrated. I failed to gather the data necessary to test the second. But, I do have some data on the third. Choosing from the accounts of moose hunts those that give assessments of ages of animals killed and, if appropriate, the animals seen but not killed in the yard, I have tabulated the age structure of the harvests. Some uncertainty exists in the data between the yearling and adult age classes. This is expectable as Waswanipi hunting goes on during the winter so men are often killing animals as late as March and April when the yearlings are nearly two year olds, and not as distinct as they are in the fall populations. Therefore only the percentage of calves in the population has been calculated. Of a sample of twenty-four moose, seven animals were calves or 29 percent. Unfortunately, this cannot be taken with confidence as a direct measure of the age structure of the population because hunting harvests have been shown often to be selective with respect to young animals (Pimlott, 1959a:393-394). On one hand sport hunters select against calves, on the other hand yearlings are known to be more vulnerable than adults to hunting. Because it is not known whether Waswanipi hunts and observations are also skewed there is no basis for comparing the percent of calves in the Waswanipi kill to other data from sport hunts. Presumably the Waswanipi kills are less skewed than sport hunters' because: there is little emphasis on trophy animals; and there is a detailed interest in, and examination of the signs in yard after the hunt to determine and confirm whether any animals took flight without being hunted. If it is assumed that there is no skewing and also that calf mortality is highest in the first summer, varying from 30 to 70 percent (Rausch, 1959:60; LeResche, 1968:953, 954; Pimlott, 1959a), then a fall-winter population with 29 percent calves is probably indicative of 35 percent gross productivity or more

and is probably consistent with 20-25 percent net productivity. But, detailed independent data on the age and sex structure of the populations would be necessary to make an assessment of the actual recruitment of young of the population.

13. Waswanipi are very concerned when they find animals sick or dead without apparent predation. One moose which was found dead near a highway without apparent cause in 1969 was the subject of some speculation until the leaves on the shrubs along road all died and it became clear that the brush had been sprayed. Presumably the young moose ate the leaves and was poisoned, as the Waswanipi noted with concern. A similar pattern of finding animals dead without apparent cause occurred on other occasions, and it always provoked discussion in the community, and worried interest among the hunters. The Waswanipi expect the animals they hunt to be in good health and condition.

14. As was reported in Appendix 9-5 when the adult beaver are trapped out at a colony the young appear to become disoriented and inactive and may be very difficult to trap.

15. Prenatal mortality has been reported at 27 percent in Wyoming (Osborn, 1953), 12 percent in Ohio (Dale and Bookhout, 1967) and between 7 and 21 in Saskatchewan (Gunson cited in Traversy and McNicoll, 1976:31). The post-natal mortality rates are less clear. The recent study in the La Grande region appears to indicate very high mortality rates on the basis of a 46 percent difference between placental marks per female and number of kits per female and 51 percent difference between the number of kits per female and the number of yearlings per female (Traversy and McNicoll, 1976: Tableau 7, page 23). The authors attribute this to predation by wolves and the particularly severe conditions in the La Grande region. Because of extremely cold temperatures and light snowfall, the ice is particularly thick and may freeze part of the food pile, diminishing the amount of available food in mid-winter. With relatively little fat accumulation in young beaver, these conditions may reduce post-natal survival rates in regions such as this. On the other hand, as has been noted above, no correction was made in this study for young animals that remained untrapped.

16. The traplines actually covered by the surveys were numbers: I, IIA, III, IV, V, VI, VII, VIII, XC, XE, SD, XII, XIX, XX, XXI, XXV, XXX, XXXI. Maps locating these hunting territories will be found in Chapter 11.

17. The 1977 survey was conducted in October, 1977 and covered five hunting territories in the Waswanipi area (Nos. W-4, W-4A, part of W-5, A-52 and A-54), all in the western most portion of the hunting area. Three of the territories were in the northern portion of the hunting area, two in the middle portion and none were from the southern most hunting territories. The hunting territories surveyed in 1977 were treated as two geographical blocks by the surveyors, and the average

density of the two blocks was 0.36 beaver colonies per square mile (calculated from Banville, 1978a: Tableau 1, page 14). The mean density for the 22 hunting territories surveyed in 1977 between the $49^{o}N$ and $52^{o}N$ latitudes and $74^{o}W$ and $78^{o}30'W$ longitudes was 0.34 colonies per square mile. The density of beaver colonies in the Waswanipi area in 1977 was therefore nearly the same as in 1964 and 1969-70. However, the data being compared are not identical, the 1964, 1966 and 1977 estimates are based on aerial surveys, the 1969-70 on a ground survey. The methodological difference however would be expected to result in a higher density from the ground survey than from the aerial surveys, and the actual difference reported here is not consistent with this expectation. This leads me to believe the difference in the figures reflects a real change in the density of the colonies.

18. Much of this discussion is based on the work of Berkes on fisheries management in the James Bay Region, although I remain responsible for the adaptation and use of his material.

19. This method may over-estimate winter harvests, because diaries with no fish harvests have been excluded. Some of these are cases where a fish harvest was taken but not recorded. Others were cases where no harvest of fish was made. The number of such cases is small and I have assumed that all hunters in the bush camps made some harvest. No correction has been made here because a few people did winter fishing from the settlement, and the present estimate does not take these fishermen into direct account.

20. Small fish includes pike, walleye, whitefish and goldeye. Suckers were the only moderately sized fish not sold for commercial purposes in 1970. Commercial fishermen catch large numbers of suckers in their nets while fishing for other species. Most of these are thrown away. Some are used for domestic consumption, both for people and for dogs. The weight of this harvest is not included in the commercial records. The "small fish" caught in the process of catching sturgeon in 1969 are also not included in the commercial records, although those used domestically have been estimated separately. The total reported commercial harvest of fish is therefore somewhat less than the total weight of fish killed in the course of commercial fishing activities.

21. These lakes with the exception of Matagami Lake, were not subject to an intensive subsistence fishery, and it appears that they were chosen for the commercial fishery because they were not sufficiently accessible to the Waswanipi, after they moved away from Waswanipi post, to play a major role in the summer subsistence fishery.

22. Fishing provided small net incomes for most fishermen, less than $5.00 per day on average in 1966 although the work was enjoyed for a variety of reasons, most important that it took place in the bush, in Cree work

groups, and that it provided important summer subsistence (LaRusic, 1977:B-41, ff.). The fishery operation however ran at a significant deficit which Indian Affairs paid.

23. The base camp for operations until 1962 was at Quévillon Lake, and the fish camps were served by airplane and the fish flown out for processing at the base camp before shipment to market. Only the highly priced sturgeon was fished between 1958 and 1963. In 1963, the base camp and fish plant were moved to the new site at Matagami, which made it possible to transport fish to the plant from all the lakes except Evans Lake by boat.

24. The new fish plant location and the resulting cheaper transportation from fish camps to plants made the processing and sale of other fish appear feasible.

25. The diferential in the species composition of the subsistence harvest in 1974-75 and the fish surveyed in 1964 could be the result either of a selection for the most resilient species, or it could be the result of previous depletion of sturgeon and walleye stocks. The possibility that the species composition of the catch is itself a result of over-harvesting is unlikely however because the fish harvests in the "near" area have increased between 1968-79 and 1974-75. Furthermore, a sample of fish made at Lake Matagami and the Bell River in 1973 by biologists from the James Bay Energy Corporation recorded a species distribution similar to that recorded in 1964, taking into account differences in sampling locations. If mooneye and goldeye are excluded because they are found in Matagami Lake, but not at many other locations, sampled in 1964; sturgeon accounted for 7 percent of the number of fish caught in 1964 and 9 percent in 1973; and, walleye accounted for 37 percent in 1964 and 30 percent in 1973; whitefish accounted for 13 percent in 1964 and 20 percent in 1973; and, pike accounted for 14 percent in 1964 and 12 percent in 1973 (Table A9.6-3). These data make it likely that the species composition of the fish harvest is in part a result of selectivity by hunters, and that it is not a simple factor of fish availability resulting from serious depletion of several stocks.

26. It should be noted however that present harvests are being compared to previous fur pelt purchases and purchase records are typically lower than harvest records for two reasons. First, not all the pelts of animals harvested are sold; some are damaged, or lost, or too small or of too low quality to warrant preparation for sale, or are used in domestic production for clothing, etc., or for spiritual purposes. Second, these records only come from the Hudson's Bay Company post at Waswanipi, and some furs were being sold at the towns the Waswanipi visited for/or to itinerant fur traders throughout this century.

27. The estimation of yields should technically be corrected for intermittent harvesting, but the requisite data are not available. The range of values presented on Table 10-12 probably covers the error factors involved. The same would be true of beaver yields.

CHAPTER 11 - DECISION-MAKING: STRATEGIES AND TACTICS FOR CONSERVING ANIMAL POPULATIONS

A - The Link Between Belief, Individual Action and Community-wide Outcome

In the previous chapters evidence has been presented in support of the proposition that Waswanipi hunters have strategies for the management of their hunting activities and of those wildlife populations which they hunt most intensively. At the community-wide level it has been shown that slightly more than one half of the adult men hunt actively from bush camps during most of winter hunting season, and although participation varies somewhat from year to year, on average it is the somewhat more skilfull hunters who tend to practice such active hunting. It has been shown that the hunters harvest more animals than are immediately required to meet the subsistence needs of the members of the co-residential group, but that they harvest fewer animals than would be required to meet the subsistence needs of the entire Waswanipi population. The work required to produce these harvests has been shown to be heavy and of long duration, relative to that in most other societies, but it has also been indicated that efficiency of labor inputs relative to outputs is kept as high as is consistent with the long-term management of the wildlife populations. The animal populations which are harvested most intensively have been shown to be managed so as to reduce the long-term variability of the population, and so as to sustain the productive yield of the population, so far as this is consistent with stabilization. At the community-wide level of analysis it has been shown that the populations of moose and beaver have been relatively stable over nearly a decade, and that harvest levels are consistent with sustainable yields.

Such conclusions are consistent with the belief systems models presented in part II of the present study. There it was argued that the Waswanipi conception of 'hunting', nitaonano, implies a long-term alternation of receiving gifts of animals and of then leaving time for animals to 'grow'. Good or exceptional hunters were shown to be those who, while alternating periods of good and bad luck, had relatively more consistent periods of good luck than other hunters, over the long term. Such consistency was shown to be established through personally received power which is exercised and realized in the process of establishing a balance between the acts of a hunter and the personal beings who cause the events of the world. Hunting, as life, is a long-term process of establishing and enhancing future capabilities through management of present activities. The overall structure of the belief system was shown to be closely related to the hunting recipes for harvesting and managing wildlife.

Thus, the analysis of the actual patterns of Waswanipi action has been shown to be generally consistent with the broad structures and goals for action formulated in accordance with the belief system. How is this correspondence created? The belief system outline is drawn from a composite of statements that are expressed by a wide cross-section of hunters. The belief system model is therefore built up of a set of widely shared beliefs, of which each individual has their own personal version. Thus, while the belief system model developed here is a model of shared elements, the actually existing belief systems in the Waswanipi community are the individual systems of belief of each individual Waswanipi person. The correspondence of beliefs with action at the community level therefore depends on the systems of belief of each individual and on the action of individual actors acting in a socially constructed context.

The pattern of individual actions has been shown to generate a community-wide behavioral pattern of resource use that conforms to conservation of the wildlife. That is, the total distribution of actual harvests over time and space is having the general effect of conserving and managing the animals. But how individual belief and individual action can lead to a total community-wide pattern of harvesting that is consistent with shared elements of individual belief systems remains to be specified.

Such community-wide patterns of harvesting could simply be the aggregated result of the decisions of the over 100 Waswanipi hunters. However, for this to be reasonably likely, rather than a chance outcome occurring at only one time it would require one or another assumption to the effect that each hunter had an overview of the community-wide context. This would presumably have to include information on the condition of the wildlife over the nearly 10,000 square mile area, the recent history of harvests throughout the region, and the future plans of all or many of the other 100 hunters. Furthermore, it would assume, or at least not deal with the implausibility of the assumption, that hunters were always successful at foreseeing the consequences of their own decisions. The simple alternative to these assumptions, namely that the community-wide pattern of action and of impacts on wildlife populations is a chance outcome characteristic of the system only at the particular moment when the fieldwork for this study was done is belied by the consistency of the later data up to 1976, and by the data on earlier harvests back to 1954.

If the correspondence between shared but individually held beliefs, and community-wide patterns of hunting and of game populations is to be explained, some alternative mechanisms must be postulated and described for information gathering, for decision-making concerning the times, places and kinds of harvests taken, and for monitoring and responding to the actual consequences of hunting activities.

One obvious mechanism would be the system of individualized ownership of hunting territories that has been widely described among northeastern Algonkian peoples. Originally reported in the professional literature by Frank G. Speck in a series of articles published in 1915, the major debates surrounding the system have focussed on his claim that such territories were aboriginal, i.e., pre-date contact with Europeans and involvement in the fur-trade (Speck, 1915a, 1915b, 1915c; Hallowell, 1949; Leacock, 1954; Rogers, 1963; Knight, 1965 and Bishop, 1970 among others). Whatever the merits of the claim for aboriginality, the point of interest here is that this system was described as actually being practiced, or as recently having been practiced, by numerous groups of northeastern Algonkian peoples in the early decades of the present century (Speck, 1915a:290-291), and since that date numerous other authors have indicated that it has been practiced throughout this century by most of the northeastern Algonkian peoples. Speck explicitly claimed that the family hunting territory system had two substantive aspects, a socio-territorial and an ecologic-conservational. On the latter subject, he wrote that a:

> "feature of economic importance in the institution of the family hunting territory is the conservation of resources practiced by the natives. In their own régime this means the conservation of the game. Let us consult, for example, the native regulations governing the treatment of the hunting territories among the northern Ojibwa and the Montagnais of the province of Quebec.... Accompanied by his family, the Montagnais hunter operates through a certain territory, known as his "hunting ground" (oti'tawin).... Here in the same district as his father hunted before him and here also his children will gain their living. Despite the continued killing in the tract each year the supply is always replenished by the animals allowed to breed there. There is nothing astonishing in this to the mind of the Indian because the killing is definitely regulated so that only the increase is consumed, enough stock being left each season to ensure a supply for the succeeding year. In this manner game is "farmed", so to speak, and the continued killing through centuries does not affect the stock fundamentally. It can readily be seen that the thoughtless slaughter of game in one season would spoil things the next and soon bring the proprietor to famine" (Speck, 1915a:293).

Speck went on to specify two mechanisms for such regulation, rotating use of sub-sections of a territory, and only harvesting one or two beaver from each beaver colony hunted. He did not however specify how the system could respond to changing animal populations and to changing human demographic conditions over time, nor did he provide quantitative evidence in support of his claims. Speck described the system consistent with the general ethnographic traditions of the period and his description of hunting territoriality has significance because the practice was explicitly reported, and its purpose explicitly described by his informants, (Speck, 1915a:294).

The importance of Speck's work for the present study lies in the fact that the hunting territory system provides a plausible mechanism, although Speck did not specify the mechanism in detail, by which individual belief can be related to socially structured action which would generate community-wide patterns of conservation. And, it is a means to explain this link which does not imply that each hunter has information on the whole community-wide condition of wildlife populations, or on the past and future actions of all hunters. The hunting territory system would imply that the owners of such territories have information on the wildlife populations, past harvests, and anticipated harvests only with respect to the limited areas covered by their hunting territories, and only with respect to the group of hunters who actually use the hunting territories. In addition the system implies that owners themselves have some control over the responses to perceived conditions, and therefore over the hunting activities of other hunters who may, or may desire, to use their hunting territories. The present chapter will provide an extended cultural and behavioral analysis of the hunting territory ownership system among the Waswanipi, and its use in resource management. I will provide a brief introduction to the ideology and practice of ownership rights, analyse in detail the organization and history of Waswanipi hunting territories, describe the use of wildlife resources in relation to the hunting territory system, and outline the tactics for management of wildlife in relation to human population distributions and subsistence requirements.

Before turning to an analysis of the Waswanipi system of ownership of hunting territories and of wildlife conservation it is necessary first to note that the debates over the aboriginality of the hunting territory systems, which will not be explicitly addressed in the present study, have included a claim that such systems could not have existed until introduced by government agents because conservation was not possible given the ecological and demographic conditions to be found in the sub-arctic region. This claim runs counter to the evidence presented in the present study and will be considered below. Because this claim is based on the application of functional systems analysis to the problems of resource use among sub-arctic hunters, such an examination not only provides an occasion for consideration of alternative ethnographic and ecological data, it also allows a critical case-study comparison of the methods of functional systems analysis and decision theory. This analysis will therefore be developed and reviewed in the following and concluding chapter of this study (see Knight, 1965 and 1968).

In the present chapter I will complete the analysis of Waswanipi resource use and management by analysing the ownership and use of hunting territories. This will require an outline of the ideology and practice of rights, a history of the territorial system, and an analysis of the strategic and tactical use of resources and territories, and a history of management practices.

B - "Ownership" and Access to Hunting Territories

i) The Rights and Duties of "Owners" of Hunting Territories

Among the Waswanipi, the major decisions concerning the use of animal resources are taken, in the first instance, by a limited number of Waswanipi adult men each of whom is said to be the "owner" of a hunting territory. These men do not act collectively, rather each is individually responsible for taking decisions with respect to a particular, geographically definable area called nitasči or nitaounasči which means 'my land' or 'my hunting land'. There were 40 owners recognized among the study population in 1968-1970. In English, it is now common to call these men, "tallymen", but I will use the term "owner". The term "owner", however, is used in a particular sense because the rights and obligations of these men have more to do with the use of the land, and more particularly with the use of the animal resources on a given area of land, than with the ultimate disposal of the land, and their relationship would more properly be classed as usufructory rather than an ownership title. It is God who created the land, the Waswanipi say, and the land will be there after the people who are alive and using it now are dead. Therefore no human being can claim to dispose of land in a comprehensive sense, men can only make use of it, and allocate the rights of use, and this they should do in a manner consistent with the moral order and responsibilities that God has given to men.

The explicit statements of the Waswanipi concerning these usufructory rights refer specifically to the use of the beaver on a hunting territory. The owner is said to decide who can hunt beaver on a hunting territory, where hunting shall occur, and how many beavers a hunter shall seek to take. At a general level people say that the other animals can be hunted "anywhere", and that other hunting activities are not necessarily decided by the owner. Anyone can hunt moose, small game, fish, waterfowl and birds anywhere, whether the owner has knowledge of it or not.

Nevertheless, while the explicit cultural rules concern the harvesting of beaver, the focus of ownership rights and responsibilities extends well beyond a single resource species in practice. Beaver is the predominant wildlife resource of the region with respect to both subsistence production and the production of marketable furs, as I have indicated previously.

As a result of this critical role of beaver in both subsistence and market production during this period no hunter would be prepared to undertake winter hunting activities in area in which he could not hunt beaver. Thus, control over access to beaver resources in fact gives the owner of a hunting territory control over all intensive uses of animal resources of a hunting territory.

It is still possible for a hunter to harvest any game he wants when traversing or briefly visiting a hunting territory on which he has no permission to hunt beaver, but an extended residence on or use of the hunting territory, and therefore a potentially intensive use of the animal resources would not result from such visits. This right to short-term use is emphasized by saying that people can hunt game, other than beaver, anywhere and that the owner only has an exclusive right to decide on the hunting of beaver.

On the other hand, there is some recognition that his rights extend beyond the beaver alone, when intensive hunting is involved. Thus, while mapping the harvests of big game, hunters sometimes indicated that they would take game beyond the limits of the hunting territory on which they were hunting, and without the permission of the owner of the adjacent hunting territory. While this indicates some consistency with the rule that only beaver is controlled, the point of relevance here is that there was an explicit reluctance to mark the sites of these big game harvests on the map. This occurred not only with respect to beaver harvests, but also with respect to moose harvests, and it occurred in cases where moose were the only animals harvested on an adjacent hunting territory.

This extension of rights to other animal resources also appeared in the case of commercial fishing, although not explicitly in the comments of the Waswanipi. Each commercial fisherman in the summers of 1969 and 1970 was either an owner of a hunting territory or was working with an owner, and each man actually was fishing on his own hunting territory, or that of the man he worked with. Thus, while it is explicitly stated that anyone can fish anywhere, and in fact people do fish quite widely and without special permission, this activity is often not very intensive, except around the settlements where accommodations have been made, see below. The commercial fisheries by contrast, which were the most intensive fishing activities being conducted at that time, were organized by the fishermen on the basis of ownership rights to hunting territories.

The same right of an owner is reflected in the generally supported view that a sport outfitter for non-Native hunters and fishermen should not establish on a hunting territory without the explicit consent, and possibly participation or compensation, of the owner of the hunting territory, even though sport activity mainly concerns fishing and moose hunting, and only indirectly affects the beaver hunting of the Waswanipi.

Finally, the rapid succession of industrial developments exploiting the non-living natural resources of the Waswanipi region, which began to intensify in the late 1950's, has resulted in various protests by the Waswanipi and occasionally in official consultations between developers and the Waswanipi. On such occasions it has been both the official political and administrative structure of the band, namely the chief and band councillors, and the official owners of the affected hunting territories who have been involved in the protest or consultation. The key feature is that positions adopted and decisions taken by the Waswanipi band with respect to the animal resources of an area depend primarily on the participation and agreement of the owner or owners of the hunting territories affected. And, the owners themselves do not restrict their interest or concern to beaver, they express a generalized concern with all animal resources, with the vegetation and the land, and with the spirit beings, in short with the total interrelated environmental system as it is conceived by the Waswanipi. I am not concerned in this context with the positions adopted, nor with the success or lack thereof of the Waswanipi responses. The point is that in practice anything that affects the land and animals of a hunting territory is considered to involve both a general community response and a specific participation by the owner, and the latter's interest is considered to extend to all environmental aspects of the hunting territory and is not limited to a single resource species.

In summary, all community members have rights to the casual and occasional use of all land and resources, but the owner of a hunting territory has effective responsibility and control in practice, for extended and intensive use of all animal resources on a hunting territory. The main problem the Waswanipi perceive is how to effect such responsibility vis-à-vis those outsiders who the Waswanipi cannot control, namely developers, and most sports fishermen and hunters.

In this respect, however, the current emphasis on beaver as the ideological focus of ownership rights has been taking on a new and added dimension of meaning in recent years. The system of Waswanipi hunting territories and owners are officially recognized as part of a governmentally and legislatively established system of beaver reserves which will be described in greater detail below. The beaver reserve legislation establishes that the beaver populations of the hunting territory areas are to be exclusively for the use of Indian people. Non-Native trappers may not trap in the beaver reserves. The legislation and regulations recognize the boundaries of the Waswanipi hunting area, as distinct from that of neighboring Indian communities and thereby implicitly, although not explicitly, the system also limits use of Waswanipi hunting territories by non-Waswanipi Indian hunters, unless they have permission from the owners.

Thus, as the Waswanipi have become increasingly concerned with the harvests of moose and fish by sportsmen over whom the Waswanipi had little control during the 1950's and 1960's, they also find it important to emphasize the role of the owner of a hunting territory with respect to beaver hunting, because this is the aspect of his role that is recognized by non-Natives, and this is the basis for trying to assert wider recognition of Waswanipi rights.

The Waswanipi complaints concerning non-Native hunting activity is articulated, to those who will listen, by or for the owners of hunting territories in their role as tallymen on the beaver reserves. Although the owners were generally not aware of how they could in practice call upon the government to take action against non-Natives who trap, or who hunt illegally, and although they clearly harboured doubts about whether government agents would do anything in fact even if the situation were called to their attention in an appropriate manner, they saw outside recognition of rights to beaver as the focus to use when expressing their wider concerns with non-Native hunting and development.

The point here is that there is a complex interrelationship between the ideology that ownership is concerned with rights to harvest beaver, and the extension of that ideology to cover all concerns that arise from intensive use and extended management of land and of animal resources, and that this extension has the support not only of the owners, but of the Waswanipi as a community.

In practice owners of hunting territories take decisions about the intensive harvesting of animals on their hunting territories by deciding if the territory shall be used and if so what parts, by deciding who shall use the hunting territory and by deciding how many of the animals the hunters shall try to harvest.

ii) Rights and Privileges of Access to the Hunting Territories

Up to this point I have focussed the account of the Waswanipi hunting territory system on the role and rights of the hunting territory owners. At the risk of over formalizing a flexible system I have suggested that the concept of ownership involves what I would define as a claimed and acknowledged right to take long-term decisions respecting the ongoing relationships between human beings and the animals and spirits inhabiting an area. This I have rephrased in a more etic terminology as a right and corresponding obligation to manage the use of the animal resources of an area. By implication this includes a right to make decisions about the use of those resources by people other than the owner himself.

Two rights other than those of an owner have been indicated up to this point. One is the right of any person to short-term access to and use of the animal resources of any area, such as occurs in normal travel or visiting or in emergencies. Such short-term use may be necessary for survival in emergency or for convenience and it is universally recognized among the Waswanipi. A second right rests in the community as a collectivity, and it is a right to participation, along with the owner, in decisions vis-à-vis the contemplated or actual activities of non-Waswanipi people whose actions may affect the overall long-term productive capacity of the land. Such a right is especially clear when external agencies undertake so-called "development" in the region. In these cases, not only the owner of the affected land, but the band members and the elected band representatives, chief and councilors, participate in consultation and decision. It may also be worth recalling that no right to permanent alienation of the land is thought to reside with men, there is no right to sell land.

There are at least two other kinds of rights and privileges that appear to exist with respect to the hunting territories and which relate to the use of hunting territories on a seasonal or annual basis.

Most hunters who do not own a hunting territory appear to have what amounts to a right of use of a hunting territory, although that use will come under the general decision-making authority of the owner. Thus, whether or not a hunting territory is used in a given year, or season, will normally be decided by the owner. But, if an owner decides that indeed the hunting territory will be used there are often one or more hunters, who are not themselves owners of hunting territories, who will by that very decision have the opportunity to use the hunting territory that year or season. I would say that these men have what amounts to a right, because they do not have to seek or receive permission to use the hunting territory. If the hunting territory is to be used in a given period, they have a right to use it in that period, without any further decision by the owner. These hunters are most commonly sons, son-in-laws, foster sons, brothers and occasionally fathers or "friends" of the owners. These men have typically hunted with the owner of a given territory over a period of years. The decision by an owner to use a territory is therefore a decision to use it with the hunters who usually accompany him. However, these men use the hunting territory under the supervision of the owner, who still has the right to determine where and how many animals will be sought, and by whom.

I have called this access to a hunting territory by non-owners a right, a right of long-term access to a hunting territory, although the Waswanipi do not express it in such terms. From the Waswanipi perspective this access is expressed as a relationship to the owner. Asked "Why did you use (go to) X's hunting territory" one group of replies is of the form "I always hunt with X" where X may be "my father","my brother" or the name of a man. Alternatively it may be said "I always hunt on X's hunting territory." The former phrasing usually implies that the hunter is part of the hunting group of the owner, the latter is often used in an equivalent sense, but it may also cover cases where two separate hunting groups are formed and use a single territory.

As both statements indicate, the relationship is one extending over a period of years, one that develops through repeated association and co-use of a hunting territory. It is therefore like the relationship that exists between successive owners of a hunting territory, and in some ways, may be considered an early stage in the development of the relationship between a heir and an owner and between a heir and the animal and spirit beings of a particular hunting territory.

Because of the similarities between a right of long-term access and a right of ownership there is generally, but not always, a clear separation between the two in practice.

The concept of a right of access here can be understood as a right which develops through time in a manner that parallels a right of ownership, and that is socially recognized in the first instance by the owner of a hunting territory himself. In cases where a son grows up hunting with his father on a hunting territory such right hardly needs explicit statements. In cases of son-in-laws and friends, both the owner and the non-owner will explicitly say that the non-owner "does not have to be invited" or, less commonly, "does not have to ask" to use the hunting territory. Nevertheless, on questionning only one man will usually be called the owner of the hunting territory.

However, decisions on whether to use or not to use a hunting territory in a given year, or season, typically taken by the "owner", may not always be taken by him exclusively and may be shared, especially in his old age. In some cases, it appears some of the married sons of the "owner" or several of a group of brothers, one of whom is "owner", may participate in the decisions. This is indicated in statements where hunters will say, for example, "we" decided to use the hunting ground this year, as opposed to statement that "he" decided. The extent of this participation appears to include only those mature hunters with families who regularly use the hunting territory, and it may in fact occur as an intermediate step towards transfer of the hunting territory or a part thereof, see below. The right to decide on the use of a hunting ground therefore resides minimally on the "owner", but may also extend to a small group of mature hunters regularly using the hunting territory.

The right of ownership and the access right are in direct contrast to specific cases of the use of hunting territories in which the question "Why did you use (go to) X's hunting territory?" will result in an answer such as "X invited me" or "X asked me to go" or "X asked me to hunt with him." Where X will be an owner of a hunting territory, or the head of a hunting group which an owner has allowed to use the territory. Nearly all questions on why a man used a hunting territory to which he did not have a long-term right were answered in the form: "because so-and-so wanted me to come with him," and the few instances when a man did not seem to have anyone to go with were explained as occurring because no one had asked that man to join them.

While, formally, such use of a hunting territory by a hunter who has no long-term right of access to that territory is by invitation from the owner, those desiring an invitation will make their needs known. The process of formally requesting a man to join a group, like other reciprocal exchanges, may in fact be part of a chain of information exchanges with the recipient of the offer taking the initiative. As my first field trip had indicated, the final composition of the co-residential groups was not always well predicted in advance by informants although there was definite information circulating in the community about who wanted an invitation, and there was information about who might join whom. In fact any informant seemed well able to state for most of the hunters in the community which group they thought each man would join. The fact that these predictions were not correct in a significant number of cases is an indication that the process of invitations is dynamic, and that it may go on up to the day of departure from the settlement for the hunting territory.

In contrast to the rights of long-term use of a given hunting territory the hunters who are "asked" to use a hunting territory can be said to have been given a temporary privilege to use a hunting territory. Such privileges may be given to hunters with long-term access rights to other territories or to owners of other hunting territories. The privilege is temporary, and may be for a part of the hunting season or a whole hunting season, but it is for a defined or assumed period. A hunter may use a hunting territory for several years consecutively by invitation, although this is not common. More common is the exchange of hunting privileges between men, such that over an extended period of years each will hunt on the others hunting territory in some of the years. Men who receive invitations will often be accompanied by their sons and by others who regularly hunt with them.

The granting of hunting privileges on a hunting territory is widespread and may in some sense, be a part of the obligations on the owners towards the band as a whole. This did not emerge from explicit discussions of hunting territory ownership, but it was implied in a sense of obligation to provide each hunter with access to some hunting territory, which appeared to work in practice. During the fall, as the time of departure for the territories grows near hunters who have made their desire for an invitation known, but who have not yet received a privilege, tend to receive offers, and leave the settlement on rather short notice.

This community-wide responsibility became clear in the responses made to changes in the system of land rights resulting from the James Bay and Northern Quebec Agreement signed in 1975. As a result of the classification under the agreement of tracts of land into different categories governed by different hunting regimes, some hunting territories, or parts thereof, were to be exclusively for Waswanipi use, and on these lands there was to be no non-Native hunting of any kind without the band's permission. The initial response of some people to the creation of an exclusive hunting area was that some hunting territory owners would have their lands better protected by not having non-Native hunting on them, and would thereby derive a personal benefit from the creation of the exclusive area. Several owners however indicated that in their view this new arrangement did not bring personal benefits but rather new obligations, because if their hunting territories were the only ones protected then they would have to respond to the requests of a much wider range of band members if other non-exclusive hunting territories were depleted. What they appear to have feared was that while they recognized an obligation to the band as a whole, this would make careful management more difficult. In the present context, this example brings out the broad social responsibilities felt to be part of the ownership of a hunting territory. Such ownership does not imply only exclusive management, but also extensive sharing.

While it is important not to separate too radically the privileges of use of a hunting territory from what I have called a long-term right of access, the distinction is very important analytically, and is central to clarifying some of the confusion which surrounds the social rights and social organization associated with a hunting territory system.

A distinction must be made between the group of hunters who have long-term rights of access to a hunting territory, and the actual group of hunters who may be using a hunting territory on any given occasion. Each year, many hunters say that they were hunting on a particular hunting territory because they were invited or asked to do so. These same men may have long-term rights of access to other hunting territories. The group of hunters actually using a hunting territory may therefore include men who have no enduring right to that hunting territory, and similarly, it may not include all the men with a long-term right of access to that territory. It is possible that the group using a hunting territory in a given year will not include any hunter with a long-term right to that territory, but the leader of the group will have been asked or invited to use the territory by the owner. Such an invitation should always be given before a hunting territory is used.[1]

This distinction between the group of hunters with long-term rights of access to a hunting territory and the group literally on the ground has not been adequately recognized in previous studies of the eastern Algonkian hunting territory systems and social organization.[2] Confusion of the group actually using a hunting territory at any given time with the group of hunters with long-term access rights has led to an under-estimation of the degree of flexibility and adaptability inherent in the system of rights. Even the use of the term group in these cases is ambiguous. The group on the ground, the hunting group as I have been calling it, is a co-residential group carrying on a hunting activities on one or more hunting territories at any given time. The group of hunters with long-term rights of access to a hunting territory is not necessarily a physical group, and in some cases may never form a physical grouping. Of course, since the rights develop out of use over extended periods, many hunters with long-term access rights to a given hunting territory will have hunted or lived together over those periods of time. Nevertheless, they may have grown up or used a hunting territory at different periods, and it is not necessary that all people with such rights ever have been co-residents at the same time. Such rights of access may not be exercised for long periods of time, but do not appear to completely lapse easily. There were clear cases of men who spoke of a right to use a hunting territory without permission, who had not used the territory in question for over a decade. Some men may therefore have a long-term right of access to more than one hunting territory. More commonly, a hunter will have a long-term right of access to one territory and a long-term series of exchanges of privileges with the owner of one or more other hunting territories. The distinction between those hunters with long-term rights of access to a hunting territory and the hunters actually using a hunting territory at any one time is fundamental to an adequate analysis of the use of hunting territories.

iii) Owners as the Stewards of Hunting Territories for Present and Future Generations

As has already been indicated, the ownership of a hunting territory is inherited from one man to another, at the discretion of the owner, and normally through a period of co-residence and co-use during which the heir develops close personal relationships with both the owner and the animals and spirit beings of the territory. Since all hunting success is given to hunters by the animals and spirit beings, owning a 'hunting land' is in the Waswanipi view a statement about the relationship between a hunter and the other personal powers inhabiting a tract of territory. An owner passes a part of his power, i.e., his relationships to the other powerful beings of the land, to his heir in passing on ownership rights and obligations to the hunting territory.

This obligation to pass on these relationships and powers intact to another generation of hunters is a central part of the Waswanipi conception of hunting, and of hunting territory ownership. It is done over a period of years late in the lifetime of the owner, but it is often anticipated and planned for over many years.

This is brought out most clearly when the Waswanipi express their concerns about the impacts of development projects occurring on their lands. When it was announced that there would be a massive hydroelectric development in the Waswanipi region in the near future, the people responded with a series of public band meetings to express their concerns and convey them to the governments involved. The concerns they expressed most extensively were for the land and the animals and their own livelihoods. But the concern extended beyond immediate needs and livelihood, it was a concern set in a long-term time frame. People spoke of two generations into the future and two generations back in time. They said that the land and the animals were important to the next generation and to the generation after that, to the children of the present generation and to their children's children. People recalled how they had inherited the land from their fathers and ancestors, and how former owners had themselves inherited the land from a previous generation. They recalled how the animals grow and reproduce themselves, and how each generation had survived from those animals and from the land up to the present. And, the Waswanipi asked, how could future generations survive without the land and the animals being passed on to them in healthy and good condition.

It is beyond the scope of this study to assess the impact of the hydro-electric development scheme on the Waswanipi, the critical decisions and assessments are underway as this is being written. But the response of the Waswanipi to the moments of crisis informs an understanding of the underlying system. One example of this is how the Waswanipi response brings out the role of inheritance in the hunting territory system. Present day owners of hunting territories not only have an obligation to pass on their hunting territories to another generation they consciously perceive themselves as the inheritors of the wisdom and careful stewardship exercised by several previous generations and they see themselves as part of a living tradition of resource users and managers. It is not only to themselves and to spirit beings, but to past and to future generations of Waswanipi that they are under obligation. This is part of what the Waswanipi mean when they say that no human being ultimately disposes of land, they only use and look after it.

Ownership and inheritance of a hunting territory is therefore part of a long-term frame of reference, one part of which extends back in time to former owners and to a resource whose existence predates the birth of the present owner, and another part of which extends forward into the future, providing a guide for contemporary management of resource use. I would emphasize that the system of ownership of hunting territories, and the knowledge that ownership of a hunting territory is to be passed on, places current decisions and action in a long-term context that supports and enhances the strategy of placing priority on the long-term sustained yield and maintenance of the animal populations. By placing resource use decisions in the hands of owners who receive and give hunting territories across generations the long-term goals are emphasized. Such long-term responsibility might better be called stewardship rather than ownership or usufruct.

Such a system requires that the analysis of hunting territories be placed in a historical perspective. Below I will describe the location and the history of inheritance and use of hunting territories, and then I will describe the strategies and tactics for conserving the productivity of the land.

C - Hunting Territories, The Waswanipi Tradition

i) The Organization of Land Into Hunting Territories

Waswanipi hunters can usually describe the general location of most of the hunting territories owned by Waswanipi men. People refer to a lake or river on the territory or near the territory, or to its position in relation to an adjacent hunting territory, for example, "north of X's hunting territory." Furthermore, when actually travelling across the land people can almost always say whose hunting territory they are on at any given moment. The general outlines of the geographical location of the hunting territories are therefore widely known.

All owners are also able to draw a line on maps of an appropriate scale indicating the boundaries of their own hunting territory. In general, these boundaries correspond to those drawn by neighboring owners, although some overlapping claims and some unclaimed lands appear when separately drawn maps are super-imposed.

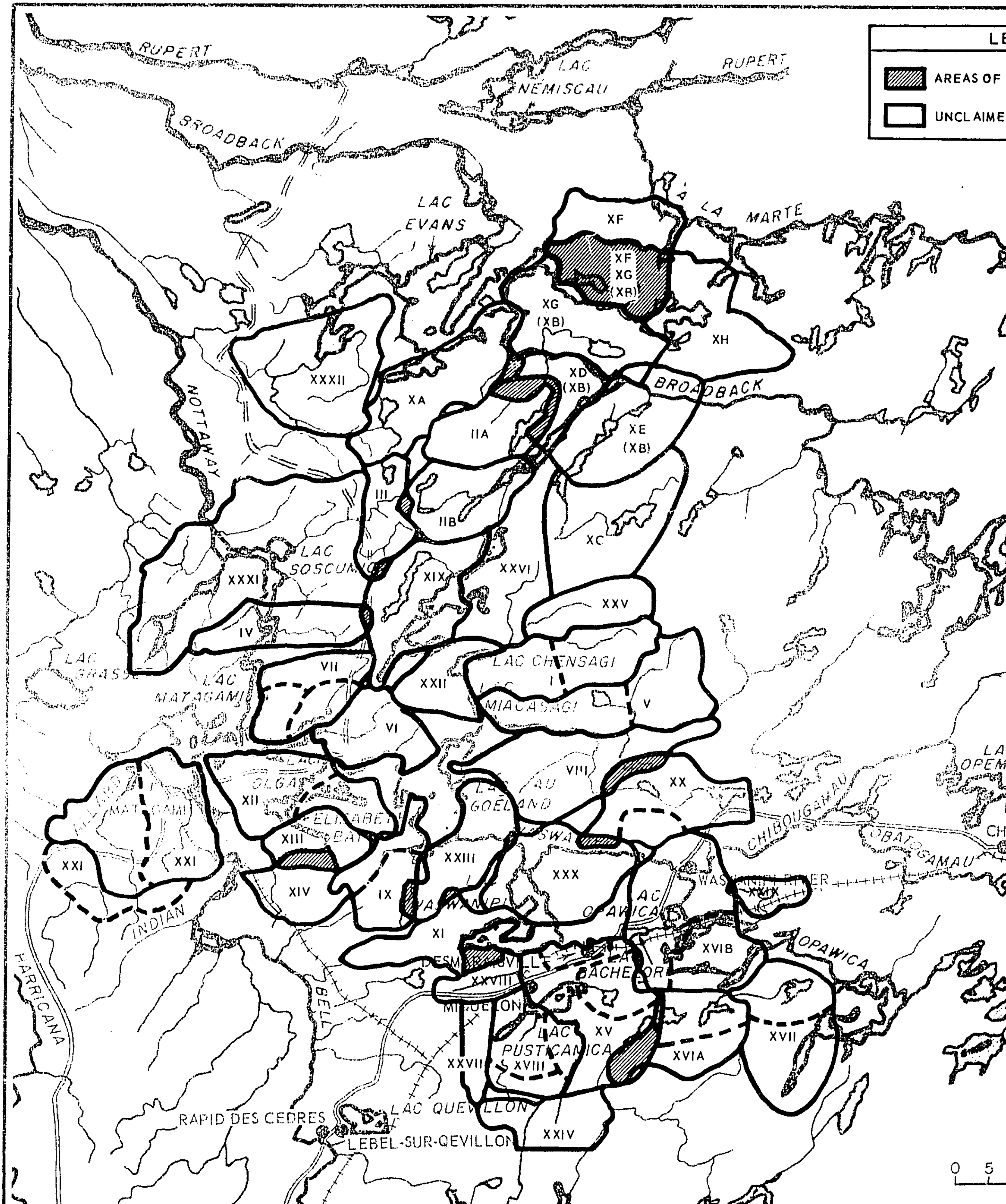
MAP 11-1 Hunting Territories of Waswanipi Tallymen Living in Matagami, Miquelon and Waswanipi River, 1969-1970, Based on Individual Maps

This map is a composite redrawing of the maps drawn by individual owners of hunting territories in 1969-1970. Maps were drawn on 1:250,000 base maps, most without adjacent hunting territories indicated. Areas of overlapping claims are indicated by shading, unclaimed areas are indicated by areas within solid lines that have no numbers. Dashed lines indicate the sub-division of a hunting territory into sectors used as distinct units. In one case, territory XXI, an area of an adjacent hunting territory, owned by the non-resident brother of the owner of territory XXI, has been included with hunting territory XXI because it was regularly used with the latter territory. The area is indicated by dashed lines outside the boundary of hunting territory XXI.

It should be noted that these hunting territories do not correspond exactly with the hunting territories owned by official members of the Waswanipi band. See text for discussion.

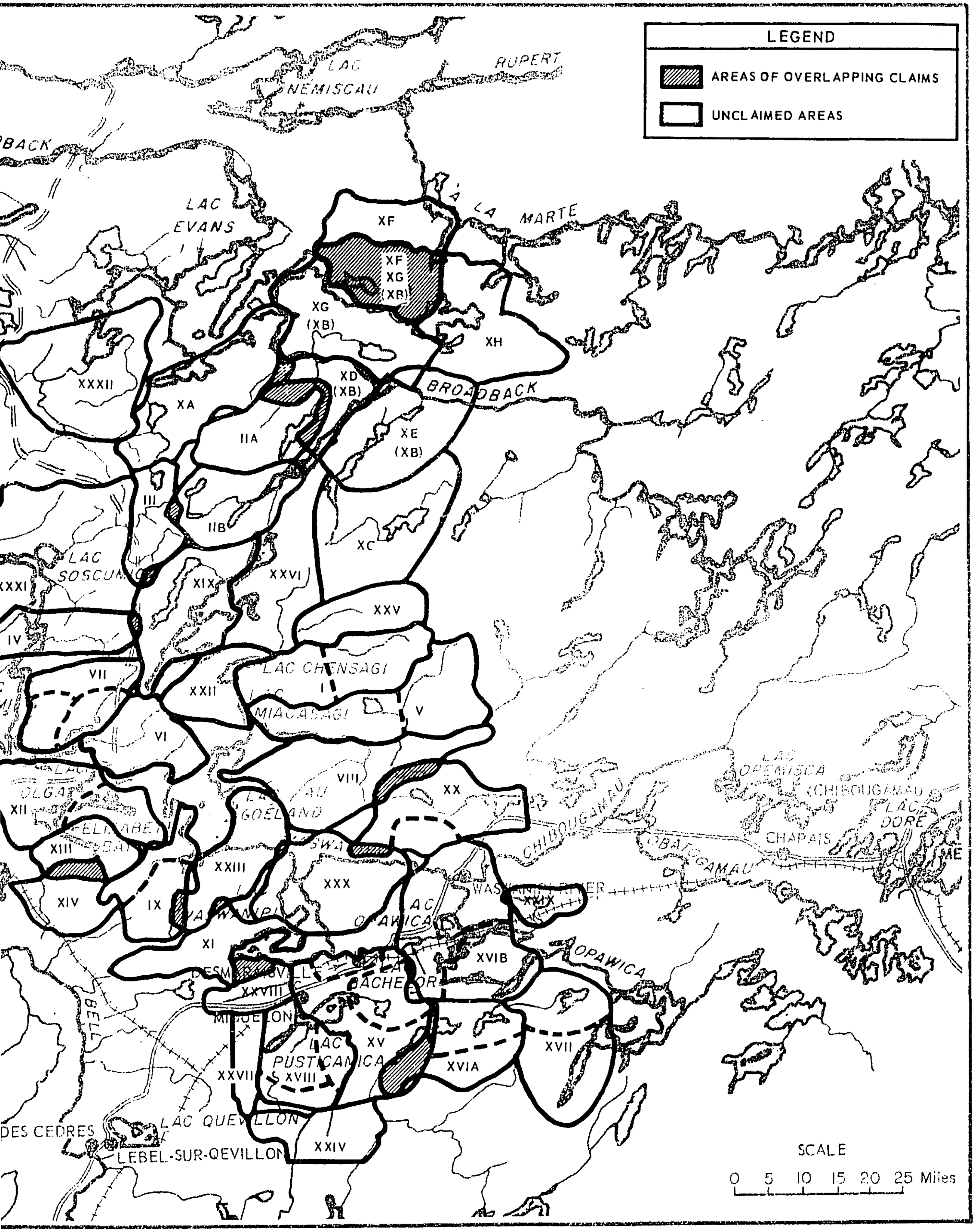
Hunting Territories of Waswanipi Tallymen Living in Matagami, Miquelon and Waswanipi River, 1969

Based on Individual Maps



ritories of Waswanipi Tallymen Living in Matagami, Miquelon and Waswanipi River, 1969-1970,

Based on Individual Maps



Nevertheless, the first principle of Waswanipi land ownership is that all land is owned, and the second is that there should be no competing claims.

In the summers of 1969 and 1970 I asked each of the thirty-nine Waswanipi hunting territory owners to trace the boundary of his hunting territory on topographic maps of the Waswanipi region. Each owner was given a map on which none of the adjacent hunting territories had been drawn, with a few exceptions when I ran short of fresh copies of the maps. The hunting territory boundaries were drawn on 1:250,000 scale maps, and the entire series was then retraced onto a single topographic base map of the same scale. A much reduced redrawing of the composite map appears as Map 11-1. The boundaries of hunting territories are indicated by solid lines with roman numerals inside them.[3] The areas of overlapping claims are indicated as shaded areas. The unclaimed areas appear as areas bounded by solid lines but without numerals inside them.[4]

One feature of this map is that while I was able to interview thirty-nine owners, forty territories appear on the map. Territory XXVI, in the north central portion of the map, is defined on this map by the boundaries of the adjacent hunting territories. The owner of this hunting territory died in an accident a few years before the present research commenced, and no immediate alternative ownership was claimed or recognized. In fact everyone said that was still the deceased owners hunting territory. This situation has continued for over a decade, up to 1978, when a claim to ownership is being asserted, and may soon be recognized. The point I want to make in the present context is that ownership implies a bond between the owner and the animals and other spirit beings, and in this sense all land is owned, and can be owned even after death, and will continue to be owned if inheritance or transfer were not planned for and are delayed. This would appear to be consistent with the view that the spirit of the owner is still present, and continues to have relationships with spirit beings, and with the living.

The unclaimed areas between hunting territories are also not unclaimed in any permanent sense. Since the establishment of the beaver reserve system the governments have periodically asked the Waswanipi to provide maps of their hunting territories. On these occasions meetings are held and owners map their territories in each others presence. This makes clear the unclaimed areas as well as areas of overlapping claims. I have not been present when this has been done, but the discrepancies are said to be discussed and resolved and the results are maps on which the boundaries of each hunting territory are contiguous with those of adjacent territories, and on which there are no unclaimed areas and no over-lapping claims. The map made jointly by owners in 1962 has been redrawn on the same base as the map I collected in 1969-70 and it appears as Map 11-2, and that made in 1977 has been similarly redrawn and it appears as map 11-3. The latter map may not be complete or final.

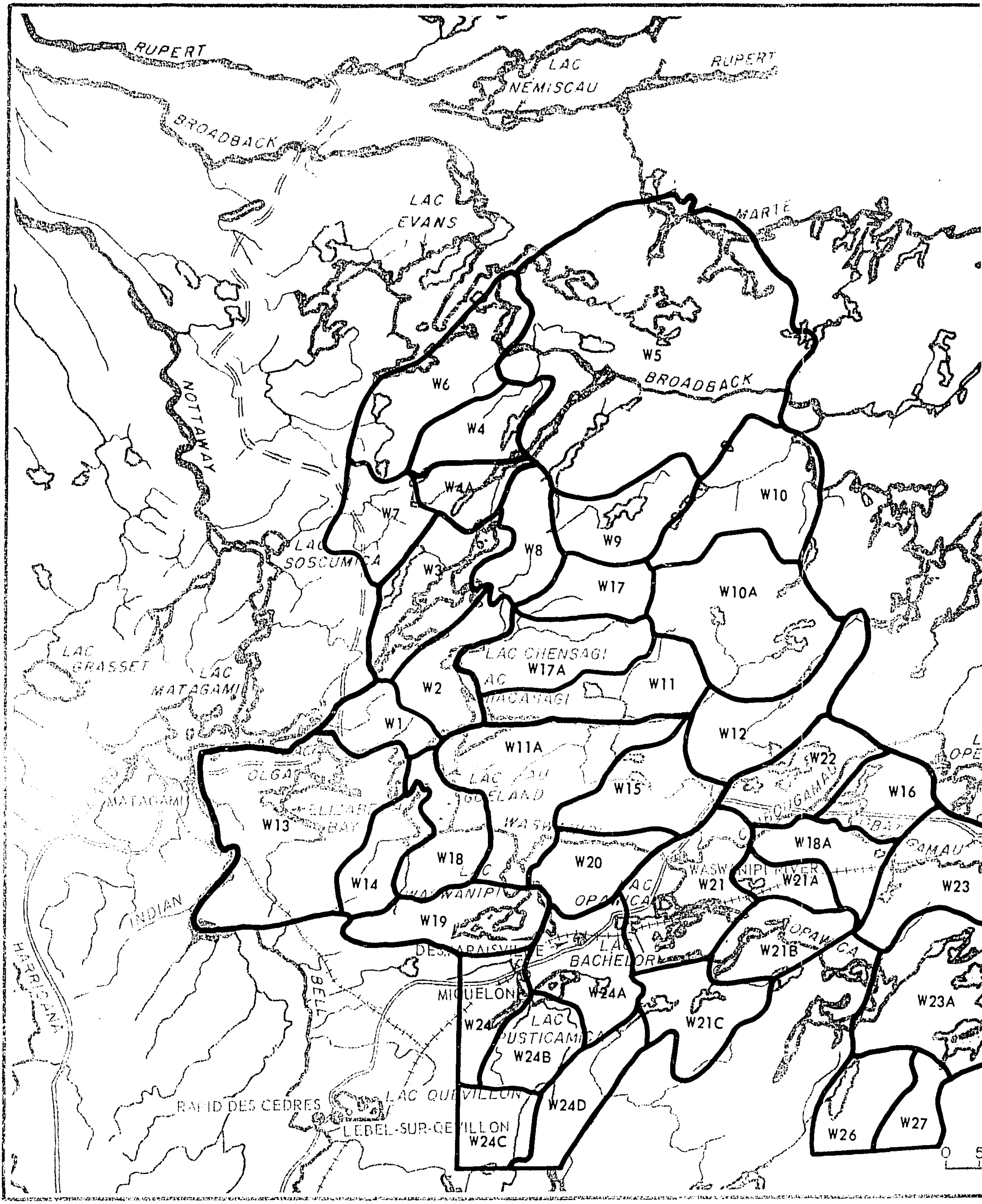
Owners do not generally have trouble reaching a consensus on the boundaries of their hunting territories so that all are continuous and non-overlapping. Thus although there were thirteen cases of overlapping claims among the maps I collected, I was only aware of one of these conflicting claims that was a point of real disagreement among owners, that between territories XG and XF in the northern most portion of the hunting territories (Map 11-1). Interestingly enough, the 1977 map (11-3) appears to split the area of overlapping claims equally between the hunting territories of the two disputing owners. It is also interesting to note that on the maps I collected unclaimed areas were nearly twice as common as areas of overlapping claims, and that they covered more area than was covered by overlapping claims.

The existence of overlapping claims and unclaimed areas indicates that there is some flexibility in the boundaries of the hunting territories over time. This can be seen most readily by comparing the 1962 and 1977 maps (11-2 and 11-3). The most common change is a sub-division of the hunting territories into smaller units. Thus hunting territories W13, W5 and W23 were all subdivided between 1962 and 1977, and the first two of these sub-divisions appeared on the maps I collected in 1969 and 1970. At least one distinct hunting territory, W18A appears to have disappeared as a distinctive unit during the period and to have been annexed to another hunting territory.

MAP 11-2 Traplines of Waswanipi Tallymen, Circa 1962, Based on Consultations Among Tallymen

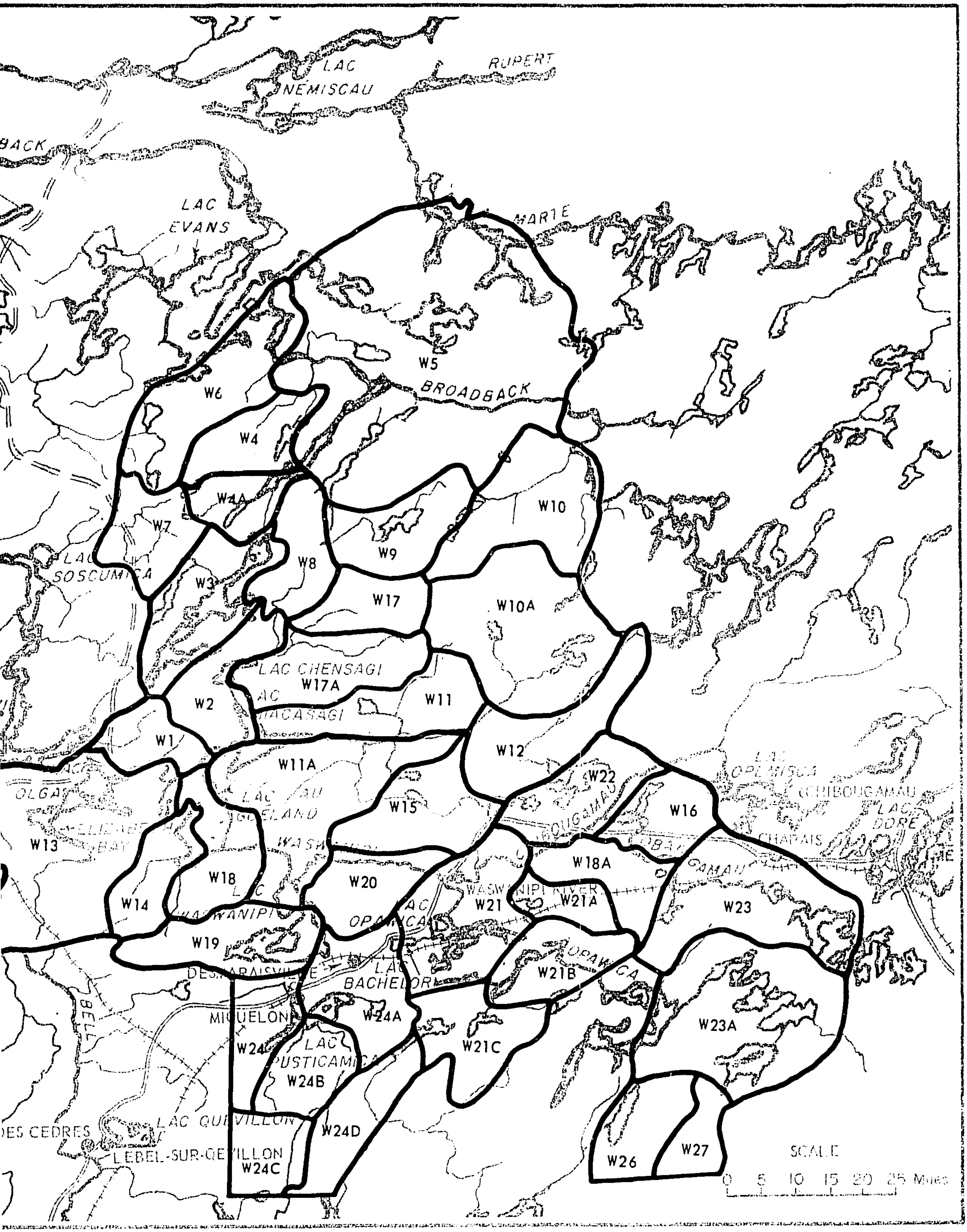
Redrawn from a map provided by the Quebec Fur Service, Department of Tourism, Fish and Game. It includes all, or most, of the traplines of men who are official members of the Waswanipi band.

Registered Traplines of Waswanipi Tallymen, Circa 1962, Based on Consultations Among Ta



Source: Quebec, Department of

stered Traplines of Waswanipi Tallymen, Circa 1962, Based on Consultations Among Tallymen

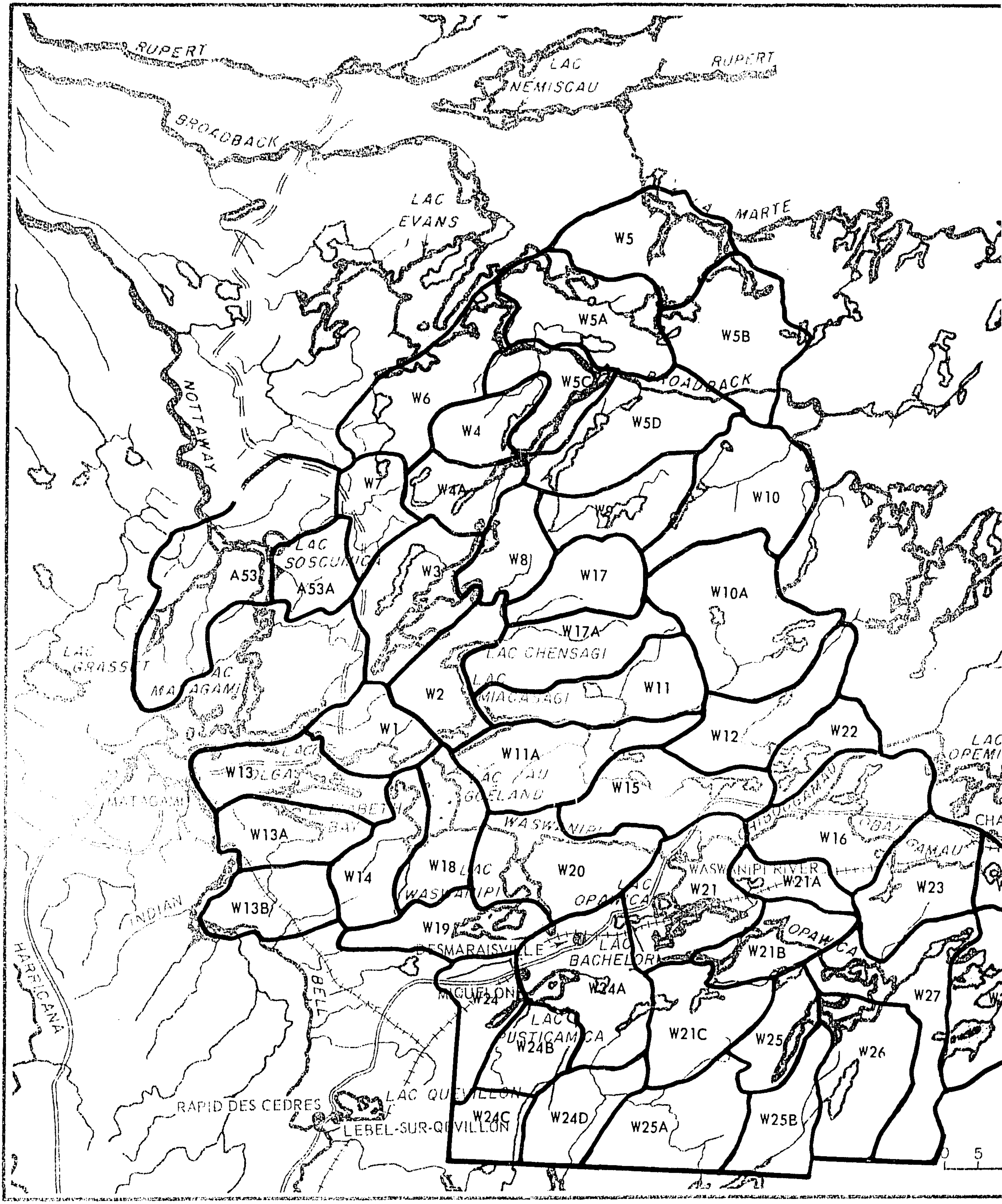


Source: Quebec Department of Tourism, Fish and Game

MAP 11-3 Traplines of Waswanipi Tallymen, 1977, Based on Consultations Among Tallymen

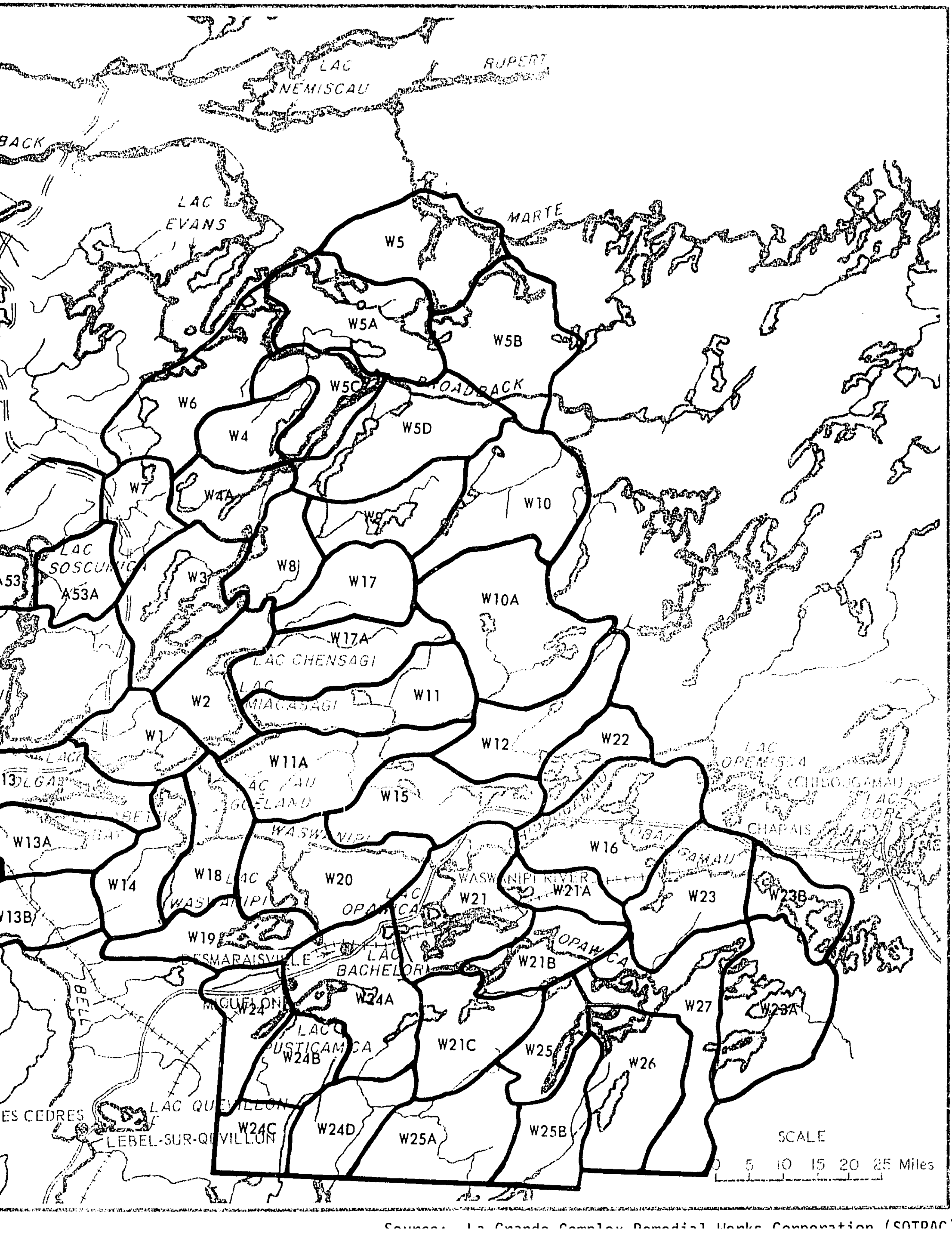
Redrawn from a map provided by the La Grande Complex Remedial Works Corporation (SOTRAC). It includes all, or most, of the traplines of men who are official members of the Waswanipi band. This map is not final, and is subject to some revisions as a result of further consultations.

Traplines of Waswanipi Tallymen, 1977, Based on Consultations Among Tallymen



Source: La Grande Complex Remedial Works

Traplines of Waswanipi Tallymen, 1977, Based on Consultations Among Tallymen



Source: La Grande Complex Remedial Works Corporation (SOTRAC)

Some additions to the hunting territories of the Waswanipi have also occurred during the period. Hunting territory A53 and A53A were owned by a man who transferred his registration from another Indian band and who thereby became a member of the Waswanipi band, so that his hunting territory is now considered a Waswanipi hunting territory. Three other territories which were apparently added, W25, W25A and W25B, may have not been included in 1962 because their owners were absent from the region. While I can only speculate as to the reasons why these hunting territories were not included in 1962, there is some evidence that the Waswanipi have considered them to be continuously Waswanipi hunting territories throughout the period.

Comparing the 1962 and 1977 maps, a striking feature is that the boundary of no single hunting territory is exactly the same on the two maps. Indeed, comparing the maps I collected with the other two it is clear that changes can occur within an even shorter period, and that they must be going on more or less continuously. Nevertheless, the hunting territories on the 1962 and 1977 maps are recognizably continuous despite the boundary changes that had occurred, suggesting that the basic area of a hunting territory has some continuity, while the exact boundary lines are subject to continuous revision and adjustment.

This can be seen also by comparing the map I collected with the two other maps. The 1962 and 1977 maps were "official" maps, made for the government agents and an outside agency, and were made to define the Waswanipi hunting territories for outsiders. The maps I collected in 1969 and 1970 were collected in the context of discussions of harvesting knowledge and activities, and were thus drawn in a setting where discussion focussed on actual patterns of use of the hunting territories, rather than "official" designation of the boundaries. It is therefore interesting to note that while the hunting territories are generally recognizable on all three maps, there is probably less correspondence between the map I collected and either of the other two, than there is between the two "official" maps.[5]

One reason for the differences is that not all parts of a hunting territory are equally accessible to hunters and some portions may only be very irregularly harvested as a result. These areas are generally quite limited, but they explain many of the cases of small areas between hunting territories on the maps I collected in the context of discussions on the actual use of the territory. A second feature is that certain areas near settlements were used intensively by those Waswanipi living in the settlements for fishing, small game hunting, waterfowl hunting, and sometimes for fur-bearer and moose hunting. These areas were areas where the rights of the wider community interest predominated. Almost all hunting by settlement based people did not involve establishing winter bush camps, nor intensive hunting by individuals. Rather what occurred was an intensive harvest that resulted from intermittent harvesting by a large number of people.

This relatively new kind of use of subsistence resources, which has intensified since more Waswanipi started living in the settlements year round in the middle of the 1960's, creates a use of wildlife resources which falls outside the regular categories of use. That is, this intensive hunting around a settlement is not intensive use by an individual which would clearly require the owners permission, but, it is also not a casual harvest that has only limited impact on the owners' management of the resources. Most owners have dealt with this problem by excluding the areas near the settlements, and heavily used by settlement based people, from the regularly used portions of their hunting territories. This is reflected in the locations of some of the unclaimed areas on the 1969-70 map, particularly those around the Bell River near and south of the city of Matagami, the southern portion of Waswanipi lake, near Miquelon, and the area around Gull Lake which was heavily used in summer by the men at the main commercial fishery camp. No adjustment of this sort was made near Waswanipi river settlement, but the division of hunting territory XVIB reflects a separation of the areas heavily used by settlement based hunters from that used by hunters living in bush camps. The former Hudson's Bay Company hunting territories around Waswanipi Post served a similar function, at least during the summer periods.

Competition for resources with illegal white trappers from Lebel-sur-Quévillon may also explain the unclaimed portion of land in the south west area of the Waswanipi traplines. This area, near hunting territories XXVII and XXIV, was considered unusable in 1969-70, and there was some re-organization of adjacent hunting territories under way at the time, including XXVIII. Interestingly, the 1977 pattern is closer to that mapped in 1962 than that of 1969-70. It therefore appears that re-adjustment may not only occur in response to permanent population re-settlement, but also to shorter term interference with regular resource use and management.

To summarize then: the boundaries of the hunting territories are easily and continually readjusted; territories may be subdivided and amalgamated overtime; not all portions of a hunting territory are equally intensively and regularly used, or equally important to the owner; areas near settlements are subjected to casual hunting by many individuals, which results in an intensive use of resources by people hunting without the owners' permission, and these areas are generally either defined as outside the regularly used and managed portions of the hunting territories by the owners, or are set aside as a distinctive section of the hunting territory.

By these means, the hunting territories are flexible and adaptable units for managing animal resources and harvesting activities, by which the owners can respond to diverse changes in the conditions of harvesting, some of which will be outlined below. However, lest the system seem too flexible, it should be noted: that the general geographical character of virtually all of the hunting territories is continuous over the fifteen years covered by the three maps; that all of the hunting territories were each comprised of the same core of geographical territory over the fifteen year period, so that the most frequent changes were to the peripheries of the hunting territories; and that the most significant changes resulted from a simple subdivision of hunting territories. This continuity of the hunting territories as geographical units which underlies the constant flux of boundary redrafting and sub-division can be seen from a longer historical perspective as well, and it appears to extend back to the last century.

ii) The History of the Hunting Territories

a. The Existence and Character of the Hunting Territory System

The continuity and general character of the hunting territories, as indicated by the series of maps prepared over the last fifteen years, extends back considerably further in time, as can be demonstrated both from the accounts of the contemporary Waswanipi and from the historical records, incomplete as they are.

As indicated above, the ownership of hunting territories is inherited. Inheritance is usually said to be from father to oldest son, but people also make clear that his is not a prescribed rule. When an owner dies without leaving any offspring, he will usually have chosen his successor by having hunted regularly with another hunter to whom he may declare he will give his powers when he dies. This may or may not be a kinsman. In those cases where no plans for transfer were made by an owner the territory may go to an offspring or a new husband of the widow. Where none of these are available to inherit, on or after the death of an owner, the widow may inherit, or the land may not be transferred for a considerable time. In the few stories I collected of such transfers, it was not kinship as such that was cited as the basis for the new claim to ownership that was eventually made and recognized, it was the former use of the area. That is, it is the existence of a relationship between a man and the animal and spirit beings of the land, rather than a kinship relationship to the former owner as such, that is the basis of the new ownership claim.

Each owner, as mentioned above, sees himself as having inherited his relationships to other beings in part from the former owner who permitted and encouraged the continuing use of the territory out of which appropriate spiritual relationships develop. Owners can trace the inheritance of their hunting territory back to at least the man from whom they inherited, and in many cases they can trace the ownership back at least one more step.

I have been able to trace back the ownership of thirty-four of the forty current Waswanipi hunting territories, and to identify the former owners from whom present owners inherited their rights. In some cases it is also possible to identify the persons from whom the former owners had inherited their rights. The data were collected in interviews during the fieldwork period, and also in a "Land Use and Occupancy Questionnaire" prepared for the Grand Council of the Crees (of Quebec) in 1974, and administered by Chief Peter Gull of Waswanipi to most hunting territory owners. The results are listed on Table 11-1.

Over two-thirds of the present hunting territory owners on whom there are data, inherited their hunting territories from their fathers, and over two-thirds of the immediately preceeding owners also inherited from their fathers (Table 11-2). Other relatives including brothers, father's brothers, mothers and variously related and unrelated "uncles" and "cousins" accounted for 27 percent of the inheritances by current owners and 17 percent of the transfers to the immediately preceeding owner. There were two transfers, of the total of 52 recorded, which were between persons explicitly said to be unrelated, and two involved inheritance by marrying a widow.

One of the two men who received their hunting territories by marrying a widow of a former owner usually spoke of the territory as if the two husbands were owners continuously, that is, the woman is not normally spoken of as an owner. Nevertheless, it is explicitly stated that the second husband owns the hunting territory because he married the widow and this is explicitly said to have been a factor in the marriage. Of the 34 transfers to the current owners, three in fact are transfers involving a relationship through the wife of the owner, from her former husband, her father or her brother. Of the 18 transfers to the immediately preceeding owners, two were relationships through women, and in one case a widow was spoken of as an owner who passed her husband's hunting territory on to one of their sons, who was just a boy at the time of his father's death.

Table 11-1 Inheritance and Transfers of Waswanipi Hunting Territories Up to 1970-1974[1]

Hunting Territory	Year of Birth of Present Owner	Present Owner Inherited from	Previous Owner Inherited from
I	1927	Father[6]	Father[6]
IIA	1906	"Uncle"[2]	Father
IIB	1914	Brother[3]	"Uncle"[2]
III	1931	Father	Does not know
IV	1910	Father	-[4]
V	1934	Father	Does not know
VI	1921	Father	Unrelated man[5]
VII	1918	Father[6]	-
VIII	1912	Father[6]	-
IX	1916	-	-
XA	1895	Father[7]	Does not know[7]
XC[8]	1922	Father	Does not know
XD	1881	-	-
XE	1923	Father	-
XF	1913	Father	-
XG	1919	Father	-
XH	1917	-	-
XI	1906	-	-
XII	1906	Father	-
XIII	1926	Father's brother	Father
XIV	1909	Father	-
XV	1925	Father	Does not know
XVIA	1929	Unrelated man[10]	Wife's husband[9]
XVIB	1909	Father	Father
XVII	1923	Half-brother of father[11]	Does not know
XVIII	1901	Father[7]	Father[7]
XIX	1934	Father	Father

(CONTINUED)

Table 11-1 Inheritance and Transfers of Waswanipi Hunting Territories Up to 1970-1974[1] (Continued)

Hunting Territory	Year of Birth of Present Owner	Present Owner Inherited from	Previous Owner Inherited from
XX	1930	Father	Does not know
XXI	1927	-	. -
XXII	1912	Father	Father
XXIII	1924	Brother	Father
XXIV	1904	Father[7]	Does not know[7]
XXV	1915	"Uncle"[12]	Father
XXVI	(Deceased)	"Uncle"[13,6]	Father[6]
XXVII	1924	Father	Father
XXVIII	1928	Brother	Father
XXIX	1916	Father	Mother[14]
XXX	1902	HBC employee "Cousin"[15,7]	"Cousin"[15,7]
XXXI	1934	Wife's former husband[16]	Father
XXXII	1903	-	-

Footnotes:

1. From interviews with hunting territory owners, and the Grand Council of the Crees (of Quebec) "Land Use and Occupancy Questionnaires" administered to hunting territory owners by Chief Peter Gull.
2. The man named as the former owner of this hunting territory is the brother of the mother of the present owner.
3. This territory was originally part of a single hunting territory and was split in two by the present owner of IIA, who gave half to his brother.
4. No data available.
5. The previous owner was said to be the grandfather of a man alive today. He had died and no transfer was made to a living person for some years. This actual transfer was made as part of the registering of the hunting territories and the establishment of the beaver reserves.

(CONTINUED)

Table 11-1 Inheritance and Transfers of Waswanipi Hunting Territories Up to 1970-1974[1] (Continued)

Footnotes: Cont'd

6. Reported by brother of present owner of hunting territory.
7. Reported by a son of present owner of hunting territory.
8. The territory numbered XB is an aggregate of territories XD,XE, and XG.
9. The former owner inherited the hunting territory of his wife's deceased husband.
10. The present owner inherited when the former owner moved away and ceased to use the territory. The present owner was raised on an adjacent hunting territory, but I have no definite data on whether the present owner had used this hunting territory prior to the transfer.
11. The present owner's father was a son by the same mother but a different father, of the former owner. The former owner had only female offspring.
12. The "uncle" was named, but the nature of the link, if any, was not determined.
13. The man named as the former owner of this hunting territory was the former husband of the presently recognized owner's brother's wife. The territory was apparently transferred after the re-marriage of the wife to the presently recognized owner's brother.
14. The present owner's father's father died while his children were young, and his wife kept the territory until she passed it on to her son. It is not known if she re-married during this interval.
15. The present owner was an employee of the Hudson's Bay Company and inherited this hunting territory from another former employee whom he called a "distant cousin". The former owner himself inherited the land from a "distant cousin". The hunting territory itself includes the site and the land surrounding the former Hudson's Bay Company store at Waswanipi Post.
16. This hunting territory was inherited through his wife and formerly belonged to her first husband.

Table 11-2 Persons From Whom Present and Former Owners Inherited or Received Their Hunting Territories

Owners	Category of Person From Whom Inherited or Received	Number of Cases	Percentage of Cases
Present Owners	Father	23	68
	Various "Uncles"-"Cousins"	6	18
	Brother	3	9
	Unrelated	1	3
	Wife's former husband	1	3
		34	100
Preceeding Owners	Father	13	72
	Various "Uncles"-"Cousins"	2	11
	Mother	1	6
	Unrelated	1	6
	Wife's former husband	1	6
		18	101

These data imply that the hunting territories have existed throughout the present century, and probably well back into the last century, at least. This implication is confirmed by the available historical data on Waswanipi hunting territories.

The first published reference to Waswanipi hunting territories dates from 1895. Henry O'Sullivan a geologist who surveyed the Waswanipi region with Indian guides taken from the region south of Waswanipi reported:

> "All the Indian families have their allotted hunting grounds and this hereditary right is vested in the woman. Any man marrying an Indian woman there has the right of hunting her grounds" (O'Sullivan, 1895:106).

O'Sullivan's apparent mis-understanding of the role of women in the ownership of hunting territories seems to have arisen from the fact that one of his non-Waswanipi guides, on seeing the numbers of beaver and otter in one part of the Waswanipi area "expressed his intention of taking a Waswanipi woman to give him the right to hunt there" (O'Sullivan, 1895:106).

A fuller and more accurate contemporaneous account was provided by the explorer A.P. Low who, although he did not visit Waswanipi, had surveyed most of the regions north and north-east of the Waswanipi region including the Rupert River, Nemiscau and Mistassini Lake areas. He wrote:

> "Widows are in great demand in marriage, and often a young boy is mated to a woman old enough to be his mother. As a widow inherits her dead husband's hunting grounds, a marriage with her provides the second husband with hunting grounds as well as a wife, and in consequence widows are taken by young men without lands" (Low, 1895, 47L).

Low goes on to describe the established hunting territory system at the end of the last century:

> "Each family is supposed to own a portion of territory, with exclusive rights to it. The territory is generally divided into three parts, each part being hunted over in successive years, and in this manner fur-bearing

animals are allowed to recuperate" (Low, 1895:50L).

That hunting territories existed at an earlier date at Waswanipi has recently been demonstrated in the ethno-historical research of Toby Morantz. She cites the comments of the manager of the Hudson's Bay Company store at Waswanipi, a Jacob Corrigal, who write in 1828:

> "Chechem. This Indian used formerly to make good hunts when he passed the winter on his own hunting ground but of late years he has been in the habit of passing the winter at a fishing place to the Sward... He was however prevailed upon last Fall to return to his own part of the Country to the Nuard about Nottaway River...
>
> "Maskeshan... however he has no ground to hunt on, his lot about Gull Lake is all burnt...
>
> "Napanash... very small hunt for him who is possessed of extensive and good hunting ground (B-227/e/6:9,9d)." (Quoted in Toby Morantz, 1977b).

The implications of the hunting territories for animal management was brought out clearly in reports cited by Morantz from the records of the trader at Rupert House, Joseph Beioley, writing in 1824:

> "It was recommended to them all... not to kill summer beaver or beaver out of season and also as much as possible to spare the beaver in Winter, particularly the cub beaver, an injunction which they always promise to comply with and which they represent as perfectly accordant with their own ideas on the subject and their desires of not impoverishing their lands. I believe that in regard to beaver on their own grounds they do in most instances pay attention to it but in travelling thro the country to and from their trading posts and when there are a number of them assembled together at fishing places, which may be termed neutral ground, it is not likely that they will hesitate to shoot a beaver or any other animal that comes their way" (B.186/e/6:8). (Quoted in Morantz, 1977b).

And finally, from the Rupert House correspondence book of 1842, kept by Robert Miles:

> "They alternate years,work different sections of their lands, leaving such to recruit two and even three years,

> or otherwise long ago their lands... would have been exhausted... (B.186/b/43:15)." (Quoted in Morantz, 1977b; elipses mine).

Thus, not only does a hunting territory system exist today, it existed during the last century.[6] Just how continuous this existence has been may be indicated by citing data from the early decades of the present century bridging the gap between 1895 and 1938 when the beaver reserve was established.

In 1914 a young Anglican missionary student, Harry Cartledge, began to visit Waswanipi post in the summers to serve as catechist and teacher, and later missionary, to the Waswanipi. Cartledge stayed several successive summers and then was resident all year round for several years before he departed for a posting in Manitoba. In the summer of 1915, Waswanipi was visited by H.C. Cooke of the Geological Survey of Canada. This was the year in which Frank G. Speck published the first article in a professional journal on the Algonkian hunting territory systems. While Cooke had been in the habit of inquiring as to the locations of the hunting grounds of the Indians, in order to select guides who knew well the area he was to explore, in the summer of 1915 he was asked to collect more extensive data from Harry Cartledge at Waswanipi. He wrote a memo on his return to Ottawa, entitled "Information concerning the hunting grounds of the Waswanipi Crees, collected by Harry Cartledge, Missionary at Waswanipi Post, summer, 1915"[7] which was based on the meeting with Cartledge and on a letter and map Cartledge prepared after his return to Winnipeg in the fall of 1915. The memo, letter and map and the data therein followed a circuitous route from Cook to publication. Cook passed them to Edward Sapir, who was then at the National Museum of Canada, who forwarded them to Frank G. Speck who forwarded them to D.S. Davidson. Davidson's article, published some thirteen years later, "Family Hunting Territories of the Waswanipi Indians of Quebec" (1928a) was based on these sources.

Cooke's memo based on Cartledge's data, which described the Waswanipi Indians hunting grounds as generally covering the headwaters of the "Broadback, Maikaksagi and Waswanipi Rivers", reported: that in general each man had his own territory, and hunted it from year to year, although there were disputes with Nemiscau Indians; that territories apparently continued in the same family as a rule, although a son and son-in-law might sometimes hunt parts of the same territory. This description is consistent with both earlier and current accounts.

However, Cartledge also provided some data that was not consistent with earlier and later descriptions. He indicated that although each man "kept his own territory or territories" searching inquiry indicated "no definite boundaries appear to exist between the hunting territory of one man and another." This Cartledge attributed to the fact that "much of this territory does not seem to be used at all." In addition, Cartledge said that the Hudson Bay factor was the "court of last resort in all cases," and that he "may and does arbitrarily decide where any man is to hunt" at least on occasion.

However, in 1927, after over a decade at Waswanipi, Cartledge himself again described the Waswanipi hunting territory system, this time in correspondence with the Department of Indian Affairs. In this letter his description is quite different on the question of hunting territory boundaries:

> "Until very recently the only hunters in these territories were Indians, and they, realizing that hunting was their only means of livelihood, hunted diligently but intelligently. By this I mean, each man divided his lands into sections and hunted on the sections alternate winters, and in this manner conserved the fur-bearing animals because they realized that they had to return to the same territory another year." (Letter of Harry G. Cartledge to D.C. Scott, Department of Indian Affairs, dated October 29, 1927).[8]

In an interview with Reverend Cartledge in February 1976, he reconfirmed his latter statement (H.G. Cartledge, personal communication).

When Davidson's article was published, D.H. Learmonth, who had been the Hudson's Bay Company manager at Waswanipi from 1922 to 1925 wrote to Frank G. Speck to correct Cartledge's first account. Learmonth claimed that there was no untrapped land, and that indeed there was not enough land available. "That which is untrapped in any year is simply being, according to old Indian custom, being /sic/ left fallow, for future hunting."[9]

Learmonth went on to claim that "since there was no tribal organization at Waswanipi and no chief, disputes were invariably brought to the manager for settlement," the disputes he recalls have to do with whether a widow's new husband can inherit her former husband's hunting territory and whether sons-in-law can inherit in cases where no heir had been named before the death of the owner. The disputes in the latter case appear to have been between the sons of the owner and the daughter's husbands, in the former between the widow's husband and male descendents. Learmonth regrets his inability to discover the regular rules of the Waswanipi, and notes how unpleasant his mediator role was as a fur trader because "there was a chance of offending a good hunter and loosing his business."

Learmonth's letter therefore implies a somewhat clearer definition of boundaries of hunting territories, and even sub-sections, than was reported initially by Cartledge. And his letter indicates that the Hudson's Bay Company manager was in a less authoritative position than Cartledge suggested, although he clearly did have an interest in settling such disputes to his own and everyone else's satisfaction.

About this same time John M. Cooper published "Some Notes on the Waswanipi" also confirming the existence of the hunting territories of Waswanipi (Cooper, 1928). Cooper's data were based on interviews with a few Waswanipi hunters who visited Obidjuan in the summer of 1926 when Cooper was doing ethnographic research among the Tête-de-Boule. These contemporaneous data were supplemented by data from the turn of the century provided by a half-breed who was born and grew up at Waswanipi and who was in 1926, hunting among the Tête-de-Boule. He was a former Hudson's Bay Company employee. One point of conflict with Cartledge's data was that Cooper's initial data indicated that there was no rotation of sections of hunting territories. However, in later years Cooper corrected this conclusion as more data were available to him during later trips to Obidjuan and with more extensive meetings with Waswanipi people in 1931 and 1937 (Unpublished field notes).

Therefore, all this evidence of hunting territories which predates government recognition of the hunting territory system, not only demonstrates the existence of the hunting territories, it also indicates the continuity of their use for purposes of conservation from at least 1824 through 1895 to 1936 and, as I will demonstrate, up to the present.

b. The Existence and Character of the Individual Hunting Territories

On the basis of the data available, it is also possible to consider the continuity of the locations of the individual hunting territories over the past fifty years. Davidson's article includes a map of the location of the "Family Hunting Territories of the Waswanipi Band, 1915". The map, based on the one provided by Cartledge, is not a map of the boundaries of individual traplines but of point locations of the hunting territory, and there is an accompanying chart with a description of each point by reference to a particular body of water, or its relationship to adjacent traplines (Table 11-3). The map has been redrawn here as Map 11-4.

The most interesting feature of this map of hunting territories in 1915 is the continuity of the general Waswanipi hunting territory area, and the specific continuity of the locations of the individual hunting territories with the areas now hunted by the men who inherited the hunting territories indicated in 1914-15.

The reported transfers of most of the present hunting territories link them directly with men who are listed in the 1915 list of hunting territories and owners. Furthermore, in most of the cases where the locations of the hunting territories can be determined from the 1915 map, there is a general continuity with the hunting territories of 1969-1970.

In some cases the data are very clear. For example, territories I and XXII, which are adjacent, are now owned by two brothers who report receiving their hunting territories from Joseph Happyjack their father. "Joseph Appechek" is

Table 11-3 Family Hunting Territories of the Waswanipi Band, 1915[1]

Location Number[2]	Hunters	Location Description
1.	Thomas Gull, wife (sister of 7 and 8). A married son and wife. One unmarried son.	Unmarked river south of Rivière à la Martre.
2.	James Shahgahnahsh.	Lake at end of Victoria river.
3.	Alex Pesemapah.	South of territory 2.
4.	Robert Shahoogahpoo.	Maikasagi river.
4a.	Joseph Shahoogahpoo (son of 4) and wife. Robert Ottereyes (son-in-law of 4) and wife.	(Maikasagi river.)
5.	Joseph Appechek.	Upper Gull lake.
6.	Samuel Appechek (brother of 5).	Chensagi river.
7.	Joseph Edwards.	Opotawaga lake.
8.	Willie Edwards (brother of 7).	Lady Beatrice lake.
9.	Alex Cooper. Robert Cooper (brother).	South of Opemiska lake.
10.	David Dixon. One unmarried son.	Obatagamau river.
11.	Bobby Dixon. Two unmarried sons.	Lake du Bras Coupé.

(CONTINUED)

Table 11-3 Family Hunting Territories of the Waswanipi Band, 1915 (Continued)

Location Number[2]	Hunters	Location Description
12.	Jacob Gull (not related to 1).	Pawakau lake.
13a.	Peter Nayahsett. Shy Nayahsett (unmarried son). Wigand Nayahsett (married son).	Opawikah river.
13b.	Ogemah Nayahsett, (married son of 13a).	The land used by 13b, 13c, and 13d is owned by 13a and was inherited by him from his father.
13c.	James Otter (son-in-law of 13a).	
13d.	Richard Grant. Josephine Grant (a married son).	
14.	Peter Robert Pehen. Daniel Pehen (married son). James Cheezoo (son-in-law).	Matagami lake.
15.	Joseph Frenchman (Eagle). One unmarried son.	Gull lake.
16.	Paul Otter (son-in-law of 15). James Shahgahnahsh.	Lake Olga and Middle Gull lake.
17.	John Blacksmith.	Waswanipi lake.
18.	William Blacksmith (no relation to 17).	Puskitanika lake.
19.	Alex Kahpeshashatah.	Opemiska lake.

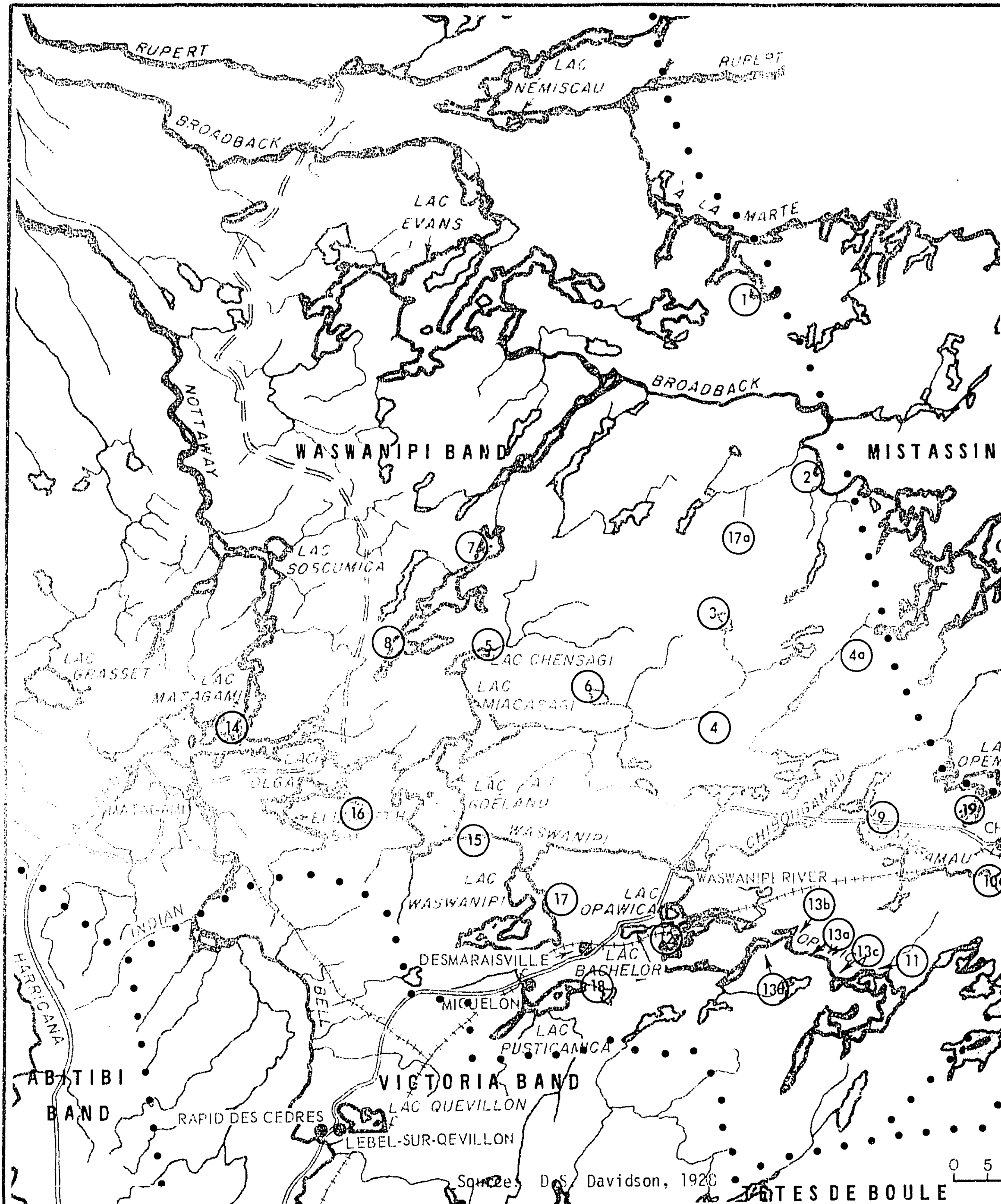
Footnotes;

1. From Davidson, 1928a: 57-59.
2. Corresponds to location numbers on Map 11-4.

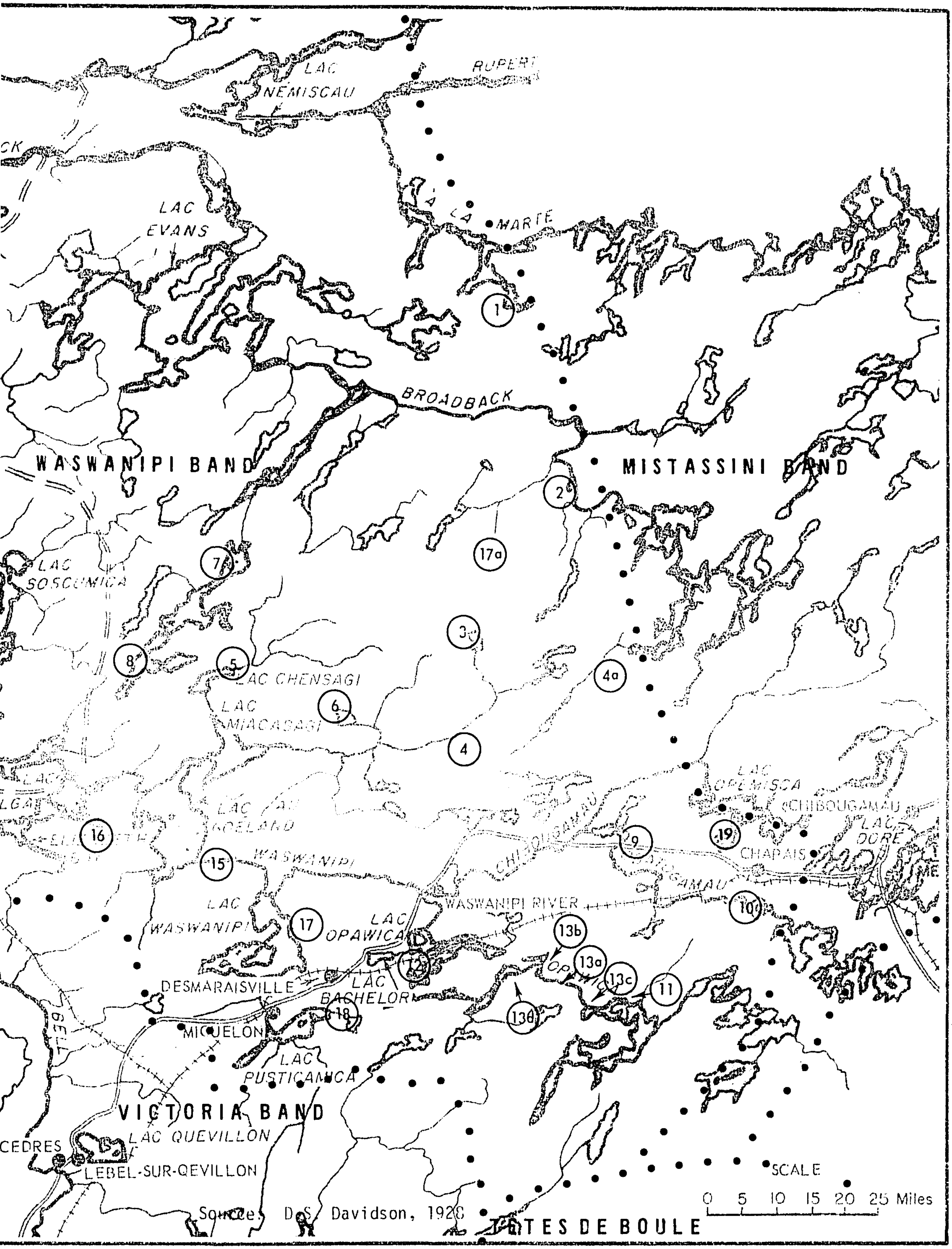
MAP 11-4 Location of Waswanipi Camps and Hunting Territories, 1915

Redrawn from Davidson, 1928a, and based on data provided by Reverend Harry G. Cartledge in 1915. The boundary lines separating Waswanipi hunting territories from those of other bands were added by Davidson on the basis of his and Frank G. Speck's ethnographic studies among those neighboring bands.

Locations of Waswanipi Camps and Hunting Territories, 1915



Locations of Waswanipi Camps and Hunting Territories, 1915



Source: D.S. Davidson, 1928

listed as a hunter with a family hunting territory on "Upper Gull Lake" in the 1915 list (Table 11-3), and which is labelled "L. Chensagi" on the 1915 map (Location 5 on Map 11-4). Hunting territories I and XXII today are both on Chensagi Lake, the former extending east from the lake, the latter west (Map 11-1). The geographical continuity of these hunting territories is therefore clear over the fifty-five years between mappings, and more than sixty years up to the most recent (1977) maps (see data summary on Table 11-4).

The data for hunting territories V and VIII directly parallel the situation for territories I and XXII. They are two adjacent territories, owned today by brothers, which were a single territory in the past and which was owned by the present owners' father. The father is identified by name as having a hunting territory in the same location in 1915 (Location 4a on Map 11-4). It is in fact a fairly common occurrence to find several contemporary hunting territories which can all be traced back through explicit reports of inheritance to a single owner in 1915 who had a hunting territory in the same geographical area as those contemporary territories said to have been inherited from him. The cases are listed on Table 11-4 along with the available data and they include territories: XIII, XIV, and XV all of which derive from Paul Otter who hunted at location 16 in 1915; XVIB and XXIX which derive from Jacob Gull who hunted at location 12 in 1915; XVIII, XV, XXIV, XXVIII all of which derive from William Blacksmith who hunted at location 18 in 1915; and XIX and XXVI both of which derive from Willie Edwards "Ottereyes" who hunted at location 8 in 1915 (Tables 11-4, 11-3 and 11-1 and Maps 11-4 and 11-1).

The data available on the remaining hunting territories are diverse, and sometimes incomplete, and in order to examine the continuity of the hunting territories a detailed review of the data was needed. The data are reported and analysed in Appendix 11-1, and are reviewed on Table 11-4.

To summarize the results of the analysis, there are 21 hunting territories on which clear data on inheritance of the territory and clear data identifying the location of the territory in 1915 are available.[10] In all these cases,

Table 11-4 Correspondence of Hunting Territories in 1970 With Those in 1915, and Comparison of Location of Corresponding Hunting Territories

Hunting Territory[1]	Reports by Present Owner/Informants	Historical Records of Former Locations[2]	Comparison of Locations[8]
I(XXII)	-Received from Joseph Happyjack, father. -Same as territory XXII; were once one territory; present owners are brothers.	-Joseph Appechek at location 5 in 1915.	1970 -Chensagi Lake and land to west (I) and east (XXII). 1915 -"Upper Gull Lake" ie. "Chensagi Lake".[3]
IIA(IIB)	-Received from Joseph Ottereyes. -Joseph Ottereyes was an "uncle". -Territories A and B split from single territory by present owners who are brothers. -Joseph Edwards full name was Joseph Edwards Ottereyes.[4] -See hunting territories XA,III	-Joseph Edwards at location 7 in 1915.[3]	1970 -From Lake Opatawaga north to Lac Salamandre. 1915 -"Opatawaga Lake".[3]
III	-Received from Charlie Gull, father. -Does not know who father received territory from. -Charlie Gull is a brother of the owners of territories IIA and IIB.		1970 -Adjacent to territory IIB.

(CONTINUED)

Table 11-4 Correspondence of Hunting Territories in 1970 With Those in 1915, and Comparison of Location of Corresponding Hunting Territories (Continued)

Hunting Territory[1]	Reports by Present Owner/Informants	Historical Records of Former Locations[2]	Comparison of Locations[8]
IV	-Inherited from father. -Family does not belong to Waswanipi.	-Not a Waswanipi territory in 1915.	1970 -North arm of Matagami Lake. 1915 -No data.
V(VIII)	-Received from Robert Ottereyes, father. -Same as VIII; were once one territory; present owners are brothers.	-Robert Ottereyes at location 4a in 1915.[3] -Robert was son-in-law of Robert Shahoogahpoo who was at location 4 in 1915.[3]	1970 -Miacasagi River and land to north (V) and south (VIII). 1915 -"Miakasagi River".[3]
VI	-Received when beaver reserves established. -Formerly belonged to "grandfather" of another man. -This mans son was Daniel Pehen. -See hunting territory XXI.	-Peter Robert Pehen lived with a married son, Daniel Pehen at location 14 in 1915.[3]	1970 -East end of Lake Matagami. 1915 -"Matagami Lake".[3]

(CONTINUED)

Table 11-4 Correspondence of Hunting Territories in 1970 With Those in 1915, and Comparison of Location of Corresponding Hunting Territories (Continued)

Hunting Territory[1]	Reports by Present Owner/Informants	Historical Records of Former Locations[2]	Comparison of Locations[8]
VII	-Inherited from father. -Family does not belong to Waswanipi.	-Not a Waswanipi territory in 1915.	1970 -Souscamica Lake. 1915 -No data.
VIII	-See hunting territory V.		
IX	-No information on transfer. -Wife of present owner is daughter of Joseph (Peter) Eagle.[6] -See hunting territory XXIII.	-Joseph Frenchman (Eagle) at location 15 in 1915.[3]	1970 -West side of Gull Lake. 1915 -"Gull Lake".[3]
XA	-Received from Joseph Ottereyes, father. -Shared for a time with brother. -Joseph Edwards full name was Joseph Edwards Ottereyes. -Joseph Ottereyes on Nemiscau band list, 1936. -See hunting territories IIA and IIB.	-Joseph Ottereyes at location 7 in 1915.[3] -Two Ottereyes "brothers" have territory together on southern Nemiscau area in 1933. Sometimes hunt at "Evans Lake".[5]	1970 -Southeast of Lake Evans, adjacent to territories IIA and IIB. 1915 -"Opatawaga Lake". 1933 -Broadback River and Evans Lake.[5]

(CONTINUED)

Table 11-4 Correspondence of Hunting Territories in 1970 With Those in 1915, and Comparison of Location of Corresponding Hunting Territories (Continued)

Hunting Territory[1]	Reports by Present Owner/Informants	Historical Records of Former Locations[2]	Comparison of Locations[8]
XB ~~XC~~(XD,XE,XF, XG)	-Owners all received territory from father who is owner of XD. -Was formerly all one territory. -Owner of territory XD received territory from James Saganash, his brother.	-James Shahgahnahsh, "his own land" was at location 2 in 1915.[3]	1970 -Broadback river and land north and south to approx. 15 mi. east of Keniapiscau Lake. 1915 -"Lake at end of Victoria (Broadback) River"[3], more than 15 miles east of Keniapiscau Lake.
XD	-See hunting territory XC.		
XE	-See hunting territory XC.		
XF	-See hunting territory XC.		
XG	-See hunting territory XC.		

(CONTINUED)

Table 11-4 Correspondence of Hunting Territories in 1970 With Those in 1915, and Comparison of Location of Corresponding Hunting Territories (Continued)

Hunting Territory[1]	Reports by Present Owner/Informants	Historical Records of Former Locations[2]	Comparison of Locations[8]
XC ~~XH~~	-No information on transfer. -Present owners father was Samuel Happyjack. -See hunting territory XXV.	-Samuel Appechek at location 6 in 1915.[3]	1970 -Upper Chensagi River and Amiskumiska Lake. 1915 -"Chensagi River".[3]
XH	- No information on transfer.		
XI	-No information on transfer. -Said to have been given by Hudson's Bay Company employee. -Said to be Hudson's Bay Company hunting territory.	-Hudsons Bay Company employee lived and hunted at Iserhoff River 1895.[7]	1970 -Iserhoff River. 1915 -No data. 1895 -Iserhoff River.
XII(XIII, XIV)	-Received from Paul Otter, father. -Same as XIII and XIV; were once one territory; present owners are two brothers and a son of one of them.	-Paul Otter at location 16 in 1915.[3]	1970 -Olga Lake to Bell River. 1915 -"Lake Olga and middle Gull Lake".[3]
XIII	-See hunting territory XII.		
XIV	-See hunting territory XII.		
XV	-See hunting territory XVIII.		

(CONTINUED)

Table 11-4 Correspondence of Hunting Territories in 1970 With Those in 1915, and Comparison of Location of Corresponding Hunting Territories (Continued)

Hunting Territory[1]	Reports by Present Owner/Informants	Historical Records of Former Locations[2]	Comparison of Locations[8]
XVIA	-Received from an unrelated man who himself received it from wife's first husband. -Unable to trace wife's first husband with certainty. -Wife was daughter of Richard Grant (see also XVII).	-Richard Grant at location 13d in 1915, on land of Peter Nayahsett.[3]	1970 -Lakes Margry and Nicobi, just south of Opawica River. 1915 -"Opawikah River" actual location of camp on map is "conjectural".[3]
XVIB(XXIX)	-Received from Jacob Gull, father; was once one territory; split among brothers.	-Jacob Gull at location 12 in 1915.[3]	1970 -Opawica Lake and River. 1915 -"Pawakau Lake".[3]
XVII	-Received from James Otter, half-brother of father, Josephine Grant. -Josephine Grant's father was Richard Grant. -James Otter was son of Richard Grant's wife by a former husband. (see also XVIA)	-James Otter at location 13c in 1915; was living on father-in-laws territory, Peter Nayahsett.[3]	1970 -Lake Germian and Father Lake, just south of Opawica River. 1915 -"Opawikah River"[3]

(CONTINUED)

Table 11-4 Correspondence of Hunting Territories in 1970 With Those in 1915, and Comparison of Location of Corresponding Hunting Territories (Continued)

Hunting Territory[1]	Reports by Present Owner/Informants	Historical Records of Former Locations[2]	Comparison of Locations[8]
XVII Cont'd	-No data on how James Otter received territory.	-Richard Grant at location 13c in 1915, on Peter Nayahsett's territory.[3]	
XVIII(XV, XXIV,XXVII, XXVIII)	-Received from Willie Blacksmith, father. -Was once all one territory; now two brothers are owners, and three sons of one of the brothers.	-William Blacksmith at location 18 in 1915.[3]	1970 -Pusticamica Lake and land to south. 1915 -"Puskitanika Lake".[3]
XIX	-Received from Wally Ottereyes, father. -Wally Ottereyes also known as Willie Edwards Ottereyes.[4] -See hunting territory XXVI.	-Willie Edwards at location 8 in 1915.[3]	1970 -Lady Beatrix Lake and Westcapis Lake. 1915 -"Lady Beatrice Lake".[3]
XX	-Received from Daniel Capississit, father. -Does not know who former owner received it from.	-None for this geographical area.	1970 -Capississit Lake.

(CONTINUED)

Table 11-4 Correspondence of Hunting Territories in 1970 With Those in 1915, and Comparison of Location of Corresponding Hunting Territories (Continued)

Hunting Territory[1]	Reports by Present Owner/Informants	Historical Records of Former Locations[2]	Comparison of Locations[8]
XXI	-No information on transfer. -Grandfather of present owner is Peter Robert Pehen, father of present owner is Daniel Pehen. -See hunting Territory VI.	-Peter Robert Pehen and Daniel Pehen at location 14, 1915.[3]	1970 -Southwest of Matagami Lake. 1915 -"Matagami Lake".[3]
XXII	-See hunting territory I.		
XXIII	-Received from Edward Eagle, brother; who received from Peter Eagle, father. -Peter Eagle also known as Joseph Eagle.[4] -See hunting territory IX.	-Joseph Frenchman (Eagle) at location 15 in 1915.[3]	1970 -East side of Gull Lake. 1915 -"Gull Lake".[1]
XXIV	-See hunting territory XVIII.		
XXV	-Received from Samuel Happyjack. -See hunting territory XH.	-Samuel Appechek at location 6 in 1915.[3]	1970 -Chensagi River. 1915 -"Chensagi River".[3]

(CONTINUED)

Table 11-4 Correspondence of Hunting Territories in 1970 With Those in 1915, and Comparison of Location of Corresponding Hunting Territories (Continued)

Hunting Territory[1]	Reports by Present Owner/Informants	Historical Records of Former Locations[2]	Comparison of Locations[8]
XXVI	-Received from Wally Ottereyes. -Wally Ottereyes also known as Willie Edwards Ottereyes.[4] -See hunting territory XIX.	-Willie Edwards at location 8 in 1915.[3]	1970 -East arm of Lady Beatrix Lake and east side of Lake Opatawaga. 1915 -"Lady Beatrice Lake".[3]
XXVII	-See hunting territory XVIII.		
XXVIII	-See hunting territory XVIII.		
XXIX	-See hunting territory XVIB.		
XXX	-Received from Fred McLeod, Hudson's Bay Company employee. -This hunting territory is immediately around Waswanipi Post and Hudson's Bay Company store. -Present owner is a retired Hudson's Bay Company employee.	-John Blacksmith at location 17 in 1915.[3] -He was "stationed in this territory as a hunter for the post", "his duties there being to secure as much fresh meat as possible for the use of the post".[3]	1970 -Land around northern half of Waswanipi Lake. 1915 -"Waswanipi Lake".[3]

(CONTINUED)

Table 11-4 Correspondence of Hunting Territories in 1970 With Those in 1915, and Comparison of Location of Corresponding Hunting Territories (Continued)

Hunting Territory[1]	Reports by Present Owner/Informants	Historical Records of Former Locations[2]	Comparison of Locations[8]
XXXI	-Received from Wife's former husband, George Diamond. -Former owner received from Thomas Diamond. -George Diamond from Rupert House, but lived in Senneterre in 1939.[6] On Abitibi Dominion band list.	-Not a Waswanipi territory in 1915.	
XXXII	-No information.	-Not a Waswanipi territory in 1915.	

Footnotes:

1. See map 10-1.
2. For numbered locations see map 10-4.
3. Davidson, 1928a.
4. According to reports of informants in 1969 and/or 1970 and supported by church parish records, St. Barnabas Church, Waswanipi, P.Q.
5. Unpublished field notes of John Cooper.
6. Church parish records, St. Barnabas Church, Waswanipi, P.Q.
7. O'Sullivan, 1901:49.
8. See text for discussions.

the description of the 1915 location of the hunting territory used by the man from whom the present owners trace their inheritance is geographically overlapping with the location of the present hunting territory. Of the remaining 19 hunting territories for which data on inheritance is incomplete and/or data on geographical locations is incomplete, it is possible to make plausible inferences concerning the missing data for twelve territories on the basis of kinship linkages, hunting group composition, and geographical data from other sources that pre-date establishment of the beaver reserves. Of these twelve, six hunting territories are probably geographically continuous,[12] and six probably have shifted geographical location to areas adjacent to the former lands.[13]

Thus, overall, 82 percent of present hunting territories are at least partially located in the same geographical area as the hunting territory which the present owner inherited; 18 percent of hunting territories are on land adjacent to the location of the hunting territory which the present owner inherited;[14] and no present hunting territories were found where a present owner claimed to have inherited a territory from an owner whose territory in 1915 was not geographically located in the same place or on an adjacent area (Table 11-5).

The data therefore confirm that the considerable majority of hunting territories have been located on the same lands over a period of more than fifty years. And, where shifts have occurred overtime they have been adjacent lands, that is, they may be the cumulative result of an incremental process of boundary adjustment.

c. Changing Characteristics of Hunting Territories

While there has clearly been a social and geographical continuity of Waswanipi hunting territories over the last six decades, this period has also been one of important changes to the hunting territory system. The Waswanipi note that the period of the founding of the beaver reserves was a time of important changes.

The Waswanipi express this by saying that before the beaver reserves were established people could "hunt anywhere", whereas after the reserves were established "everybody had a hunting territory." However, as I have indicated, there were hunting territories before the reserves were set up, indeed the reserve system was viewed by the Waswanipi as a recognition of their hunting territory system by government agencies. What happened with the formation of the beaver reserves was that the expectations with respect to the possibility of ownership of hunting territories changed, boundaries became more precisely defined, and the recognition of the system by government agencies was established.

When the beaver reserves were formed in the Waswanipi area in 1938 and 1948, each mature hunter with a wife and children to support was supposed to have a territory. In practice, since there was no significant new land to use, this meant that the sub-division of territories was encouraged. Such sub-division is relatively easy because it was consistent with existing practice as outlined previously. Often a son or other future heir, would have a part of a hunting territory which was his to use, although he would only inherit on the death of the owner.[16] The creation of the beaver reserves created a new stimulus to the immediate recognition of such areas and to earlier formal sub-division of the hunting territories.

This change had its origin in the desire of government agents to assure each hunter with dependents a harvest of beaver, as a means of limiting the demands for government transfer payments. The government agents perceived the beaver reserve system as a means of helping to maintain the economic viability of those Indian bands which were living by hunting and trapping, and which were relatively self-sufficient, and of preventing them from becoming dependent on welfare. These peoples, including the Waswanipi, depended on trade goods, and therefore on the sale of furs. Assuring them of a steady supply of beaver provided the hunters and their families with cash necessary to purchase trade items and it provided them with food, which reduced the need to use available cash to buy "traditional" trade food. Thus, it reduced dependence on govern-

Table 11-5 Geographical Continuity of Present Hunting Territories with 1915 Hunting Territories

Evidence	Number of Present Hunting Territories that are Geographically Related to 1915 Hunting Territories by: Continuity	Shift to Adjacent Area	Shift to Non-Adjacent Area
Clear Inheritance Statements and Clear Geographical Identification	21	0	0
Incomplete but Inferrable Inheritance Statements and/or Geographical Identification	6	6	0
All above	27	6	0
Percentage	82	18	0

ment issued food rations and also on government assistance with cash. This was important in the 1940's when income from furs declined and when government relief and welfare for Indians was being re-organized and considerably expanded, especially in northern Canada. This was the period when federally funded social security programs such as family allowances, were being established for the first time. The government, in short, was particularly interested, at just this time, in assuring access to beaver for all hunters with dependents, and assuring the most intensive use of beaver compatible with conservation of the resource.

The problem was not that anyone who wanted to hunt could not do so, every man at Waswanipi was an active hunter at this time. The problem was that conservation practices had failed during the 1920's, and that beaver had been seriously depleted by over-hunting. Some of the reasons for this will be discussed below. It appeared to the government agents that a return to stable beaver management was needed. This was to be accomplished by combining the old traditional Indian hunting territory system with government supervision. Setting up the beaver reserves was one step, because it excluded non-Native hunters, and generally allotted areas to each community, thereby discouraging other Indian people from hunting on a reserve used by another band. Recognition of individual hunting territories also was to discourage trespass among members of the same band.

The government agents directly entered the beaver management process by asking for the help of the Indians in administering the changed system. Each owner was to make a map of the active beaver lodges on his hunting territory each year, and then a beaver harvest quota was to be set by the government administrator based on the number of active lodges. This was to be the number of beaver that could be harvested on that hunting territory in the following trapping year. Initially quotas were given to each hunter individually, based in part on the size of his family, as well as on the number of beavers. Later quotas were by hunting territory and allocated to individual hunters by the owners.

For this system to work, it was felt by the government people that the counts of active beaver lodges had to be accurate and this led to several features of the early design of the management system. Since the counts of beaver colonies were made on a hunting territory by hunting territory basis, it became important for the boundaries of each hunting territory to be precisely defined to prevent double counting (Kerr, 1950:156-157).

The process of periodically holding a meeting of all owners and having them agree to the boundaries of the hunting territories so that all land is included, and so that there were no overlaps, was begun when the beaver reserves were established. This process is being continued but, as the map I complied in 1969-1970 indicates, in fact the use of hunting territories is such that in practice some areas are unused and some overlapping claims, and use, also occur.

The mapping of hunting territories so that all anomalies are eliminated and all boundaries are contiguous is therefore a product of the setting up of the beaver reserve system. While the boundaries so drawn may have been used in the early years of the reserve system for counting and reporting active beaver colonies, the actual geographical distribution of hunting activity on the ground, was not in the past, and is not today, completely consistent with these contiguous boundary definitions. Therefore, a result of the establishment of the beaver reserves was to create an "official" system which gives the appearance of greater precision of definition and rigidity of hunting territories than in fact exists.

As compensation the hunters who participated in the annual census of beaver colonies were paid for the work. Initially, when some of the reserves were under Hudson's Bay Company administration, a limited number of "prestigious" hunters were made guardians of the beaver reserves and asked to police the reserve, prevent poaching and trespass, report forest fires, and make most of the inventories. In return for this they received a badge, a windbreaker, and an annual retainer (Denmark, 1948:40). Other men who worked on the lodge count were paid by the time spent on the work. Initially the guardians put tags near the lodges to indicate those which had been counted. When the Nottaway Beaver Reserve was set up in 1938, it was leased from Quebec by the Indian Affairs Branch, but it was managed for the Branch by the Hudson's Bay Company, and the Hudson's Bay Company had a monopoly on the purchases of beaver pelts caught on the reserve. The method of having beaver guardians kept the costs of management low.

In 1956-57, eleven years after the Nottaway Reserve came into production, the management of the Nottaway reserve was taken over jointly by Quebec and Canada (Interview, J. Armand Tremblay). The Mistassini reserve, which was set up in 1948 and which came into production in 1954, was administered by both governments. Under the government system, annual inventories were made by each owner, or tallyman as he was called in keeping with the work, and a $50.00 fee was paid to each for his work. The amount was paid in the fall, and was intended to serve for a grubstake (Interview notes, J. Armand Tremblay) to help outfit hunters for the winter and make it possible for all to go hunting. This minimized the need for winter welfare payments.

The government system also involved Quebec becoming the exclusive legal purchaser of beaver pelts from the beaver reserves. The Hudson's Bay Company still actually collected the pelts, but as an agent for Quebec, for a service fee. Quebec graded and processed the furs, and auctionned them off for the hunters. Each hunter then received the actual amount his pelts sold for, less a 5 to 10 percent service charge for transportation, insurance, collection agents, licenses, and the tallymen's fees (Emond, 1968). This system eliminated the middle man, and increased the percentage of the auctioned price that actually went to the hunter. It also paid for the costs of the inventories out of the service charge from the hunters, although most Waswanipi thought of the $50.00 as a payment from the governments in recognition of their status as owners and in recognition of their contribution to making the government system work.[17]

Thus, under the government system there was a recognition of each owner of a hunting territory and both a pressure and an incentive to increase the number of recognized owners and territories, in order to have accurate lodge counts and in order to take advantage of the tallyman's wage.

The sub-divisions were arranged by the Waswanipi in accordance with traditional inheritance practices. But this arrangement was new in that it involved a modification to the cultural beliefs about when in the life cycle of the owner and his heirs transfer of a hunting territory should take place, and possibly, it encouraged more sub-divisions than would otherwise have occurred.

In several senses then the setting up of the beaver reserves demarcates the beginning of a modified hunting territory system. First, it led to early transfer of hunting territories. Second, it encouraged greater sub-division of territories. Third, it gave an impression of greater rigidity of hunting territory boundaries. Forth, it made hunting territories more exclusive, with respect to beaver hunting at least, by making it illegal for outsiders to hunt beaver on the reserves.

Finally, the new system established a new structure, a governmental structure alongside the Waswanipi hunting territory system. The new system was run by people who required that hunting activities appear to conform with the governmental structure, but in exchange they provided additional resources to the hunters in the form of tallymen's wages and better prices for pelts, and they gave a new external legitimacy to the Waswanipi hunting territory system which could be called on in the course of difficult decisions or disputes. Thus, it was now possible, in principle at least, to complain if non-Natives trapped illegally, and it was now possible to turn to the fur officer to help settle internal disputes, just as the Hudson's Bay Company manager had done before. In some senses, the intervention of the governments was not unlike the previous interventions of the Hudson's Bay Company managers. Since the early 19th Century at least, the Hudson's Bay Company had been intermittently directing its post managers to encourage the hunting territory system and Indian conservation of resources. But, as Learmonth's letter quoted above indicated, the managers could not really control the system. Although they could influence particular decisions on allocations, they were not there day to day on the hunting territories where hunting decisions and activities really occur. The government agents were in a similar position, appearing to take management decisions which were really being made on the ground, in a literal sense, by the hunters who then assured an appearance of conformity between their own decisions and those of the government agents. This became apparent at Waswanipi, as I have noted earlier, when most features of the government system were withdrawn in the mid-1960's, and the Waswanipi continued their own practices.

It should be noted that the government agents also conducted an information program to promote conservation of beaver among the Waswanipi and neighboring Indian bands when the beaver reserves were established. Like much of the advice offered by Hudson's Bay Company employees over the preceeding century, these proposals were of a general kind, focussing on the value of letting beaver grow, of not hunting out a colony, of not catching small beaver, and of not catching beaver in summer. Some of this material was made available in Cree syllabics, particularly a "Hudson's Bay Company Table of Beaver Increase at Minimum Increase of 2 Young Per Pair." Most of this information was generally consistent with Waswanipi beliefs and practices, but most was also very general and it did not reflect the Waswanipi models of beaver social organization, hunting practice, and harvest management outlined in this study.

During the period of the closed season the Waswanipi generally cooperated and respected the general agreement, although some older men say that they occasionally caught a beaver, because they had to taste beaver once in a while. And when the season opened, the Waswanipi generally caught beaver within the limits of the quota that was set, or made the exchanges among themselves necessary to keep an appearance of conformity between their own practices and the government system of regulation.

Why did the Waswanipi agree to go along with the new system, and why did they make things appear to conform to the government system? One answer clearly is that they did so because it brought them new and important resources. But the Waswanipi men who were active hunters during the period when the beaver reserves were set up state that the government agents came to them and first asked them to stop hunting beaver so that the animals could grow again, and then they would be able to hunt again. And, the hunters say that they agreed to this because they thought it was a good idea. The Waswanipi therefore interpret the setting up of the reserves as a decision in which they actively participated, and which was broadly consistent with their own management practices.

The government beaver reserve system is therefore in the Waswanipi view not a threat to their own hunting territories, resource use and stewardship, it complements those practices, although at the same time it also brings changes to those practices.

D - Hunting Territories, Units of Management

The Waswanipi system of resource use can be said to rest on the rights and obligations which are exercised by the owners of hunting territories and the hunting territories may be said to be the units of management. The first right the owner of a hunting territory has is the right to decide whether or not his hunting territory, or a part thereof, will be used intensively in any given year, and he does this by deciding whether he or others will establish winter hunting camps on the territory. The outcome of these decisions is the pattern of the frequency of use of a hunting territory or its sections. The second right the owner of a hunting territory has is the right to decide who will use the hunting territory. The outcome of these decisions is the pattern of distribution of the human population on the hunting territories. The third right is to decide how many of each of the most important species will be caught on the hunting territories by the hunters. The outcome of this decision is a particular mix of resource use. The outcome of all of these decisions is a level of harvesting of the most intensively harvested species that can be continually altered to respond to and to influence the historical conditions of the animal populations on a hunting territory. I will examine the patterns of exercise of each of these kinds of decisions in turn, and will consider how each serves to manage animal harvests, hunting activity and human subsistence.

i) Intermittent Harvests as a Management Technique

a. Patterns of Use of Hunting Territories and of Sections of Hunting Territories

The owner of a hunting territory has the right to decide whether or not his hunting territory will be used intensively in any given year, and most hunting territories, including those which are in regular use, are not used every year.

For the five years from 1965-66 to 1969-70, the years during which each hunting territory was used by at least one winter hunting group for a period of at least two months have been recorded on the basis of data gathered from hunting territory owners and close kinsmen. Where these data were incomplete for the early years I have supplemented it, to the extent possible, with information recorded in the field notes of the McGill-Cree Project team members.

Overall, between 16 and 21 of the 40 hunting territories were used in anyone year, or an average of about 50 percent per year (Table 11-6). Tabulated from a different perspective, a hunting territory was used on average 2.5 of the five years or 50 percent of the winter hunting seasons (Table 11-7). Phrased this way however, the variation in the intensity of use of different territories becomes apparent, ten hunting territories were not used at all during the five years, and nine hunting territories were used each of the five years.

In order to evaluate the non-use of hunting territories I have assigned each hunter who was classed as an active hunter, or a training or retiring hunter who was living in a bush camp during 1968-69 or 1969-70, to the hunting territory which the hunter either owns or to which he has a primary right of

Table 11-6 History of Use of Waswanipi Hunting Territories, 1965-66 to 1969-70

Hunting Territory Number	Used in Winter Hunting Season					Number of Years Used
	1965-66	1966-67	1967-68	1968-69	1969-70	
I	+	+	-[1]	+	+	4
IIA	-	-	-	-	+	1
IIB	-	-	+	-	+	2
III	N.A.[2]	+	-	+	-	2
IV	N.A.[2]	+	-	+	+	3
V	-	-	+	+	-	2
VI	+	-	+	-	+	3
VII	+	+	+	+	+	5
VIII	-	-	+	+	-	2
IX	+	-	+	+	+	4
XA	-	-	+	+	-	2
XC	-	-	-	-	+	1
XD	-	+	+	+	+	4
XE	-	-	-	+	+	2
XF	-	-	-	-	-	0
XG	-	+	+	+	+	4
XH	-	-	-	-	-	0
XI	+	+	+	+	-	4
XII	+	+	+	+	-	4
XIII	+	+	+	+	+	5
XIV	+	+	+	+	+	5
XV	+	+	+	+	+	5
XVIA	+	+	+	+	+	5
XVIB	+	+	+	+	+	5
XVII	-	-	-	-	+	1
XVIII	+	+	+	+	+	5
XIX	-	-	-	-	+	1
XX	+	+	+	+	+	5

(CONTINUED)

Table 11-6 History of Use of Waswanipi Hunting Territories, 1965-66 to 1969-70 (Continued)

Hunting Territory Number	Used in Winter Hunting Season 1965-66	1966-67	1967-68	1968-69	1969-70	Number of Years Used
XXI	+	+	+	+	+	5
XXII	-	-	-	-	-	0
XXIII	-	-	-	-	-	0
XXIV	+	+	-	-	-	2
XXV	-	-	-	-	-	0
XXVI	-	-	-	-	-	0
XXVII	-	+	-	-	-	1
XXVIII	+	+	+	-	-	3
XXIX	-	-	-	-	-	0
XXX	-	-	-	-	-	0
XXXI	-	-	-	-	-	0
XXXII	-	-	-	-	-	0
Number Used	16	18	20	21	21	
Average - All Hunting Territories						2.5
Average - Active Hunting Territories[3]						3.3

Footnotes:

1. Not used.
2. No data available.
3. See text for definition.

Table 11-7 Number of People With Rights of Access to Territories for the Winter Season, and Persons Per 100 Square Miles, by Hunting Territory, 1968-1970

Hunting Territory Number	Number of People With Right of Access (Winter)	Persons per 100 Square Miles
I	6	2.6
II	15	4.4
III	6	3.4
IV	12	7.7
V	8	2.9
VI	6	4.3
VII	3	1.6
VIII	3	1.0
IX	6	4.5
XA,XB,XC	34	2.2
XH	0	0
XF	0	0
XI	23	12.6
XII	11	5.6
XIII	7	7.7
XIV	6	5.3
XV	4	1.2
XVI	9	1.3
XVII	3	1.2
XVIII	2	1.4
XIX	3	1.3
XX	7	2.6
XXI	6	2.0
XXII	11	5.9
XXIII	2	1.5
XXIV	4	3.2

(CONTINUED)

Table 11-7 Number of People With Rights of Access to Territories for the Winter Season, and Persons Per 100 Square Miles, by Hunting Territory, 1968-1970 (Continued)

Hunting Territory Number	Number of People With Right of Access (Winter)[1]	Persons per 100 Square Miles
XXV	0	0
XXVI	0	0
XXVII	0	0
XXVIII	0	0
XXIX	0	0
XXX	0	0
XXXI	0	0
XXXII	0	0
All Territories	197	2.1
All Territories in Use		3.0

Footnote:

1. See text for definition.

access, the one that would be used as a last resort has been listed. The members of the commensal group who normally accompany the hunter in winter are similarly assigned, and where the children change regularly, the usual number of children present has been used. In many cases, I have statements from informants identifying the hunting territory or territories to which they have a right of access, but in other cases I have had to infer this right on the basis of the past patterns of use of hunting territories. Where rights exist to more than one territory I have sometimes had to infer the primary right of access on the basis of informants' statements in other contexts, and on the basis of the records of actual use or of having lived and been raised on a particular hunting territory over a long period of time. The intention is to indicate the distribution of the hunting population if no one exercised any privileges of access to use of hunting territories.

There were 197 people who could be so classified, as compared with 187 and 186 people who actually spent two months or more in hunting groups in winter bush camps in 1968-69 and 1969-70 respectively (Tables 7-7 and 7-8). The number of people who would live on each hunting territory under the hypothetical conditions set out above are listed on Table 11-7.

On the ten hunting territories not used during the five-year period, from 1965-66 to 1969-70, eight were hunting territories for which no individuals who were active winter bush camp hunters in 1968-70 had rights of access. There were owners of these hunting territories, and there were other people with rights of access to these hunting territories, but neither the owners nor those with rights of access were active winter bush camp hunters during this period.

Thus extended periods of non-use of a hunting territory are associated, in most cases, with extended periods of abandonment of intensive hunting by those with rights to the hunting territory. In most cases this is related to commitments to wage employment, although extended illness and old age of some individuals are also factors which in combination with employment create the situation in which no individual is using a hunting territory during an extended period.

As I have indicated in a previous discussion, the population which does in fact hunt from winter bush camps varies from year to year, and the number of men who have permanently ceased winter bush camp hunting is relatively small. The majority of those classed as "former" hunters at any time may return to be active hunters at a later date. As a consequence of this changing participation of men in winter bush camp hunting, the identification of hunting territories to which no winter bush camp hunters have a primary right of access changes with time, and with this the pattern of use of those hunting territories also changes over time.

Thus, of the ten hunting territories listed as being without any active bush camp hunters with rights of access in 1968-70, seven of these hunting territories were used regularly for at least part of the period from 1972-73 to 1977-78. For this period I have supplementary data gathered during brief field trips and subsequent research. While the records of use of hunting territories I have for these seven years are incomplete, they are sufficient to indicate that six of the ten hunting territories were used at least four years out of the seven covered by the supplementary data. A seventh territory, XXXII, is no longer considered a Waswanipi hunting territory and is now used by Nemiscau hunters, although I have no records of the frequency of its use. Of the three remaining territories, XF, XH and XXVI, I believe that two were used, although not by their owners.

Some use is suggested by the extensive overlapping claims to territory XF (Map 11-1); and by the fact that the man who is now making a claim to ownership of territory XXVI has been hunting on adjacent territories for several years. I have data that the use of these two territories by the new owners was planned during the period, but delayed. The use of territory XF was delayed by the death of the former owner and the new owner's need to arrange for the necessary cash advances to get to this distant territory; and the use of XXVI has been delayed by the process of recognizing a new owner, following the death of an owner who left no clear heir. Thus, it is likely that only one hunting territory has remained unused in winter over the entire 13-year period from 1965-66 to 1977-78.[19]

Such long-term shifts in the use of hunting territories, as some hunters move from the category of "former" hunters to "active" hunters, and back again is a reflection of longer term changes of commitments of individuals to alternative ways of providing a living. From the present analysis, these decisions are not considered part of the short-term decisions on the use of hunting territories, although in a long-term analysis it could be appropriate to consider such choices. In the present study, these ten hunting territories will simply be considered as unused in winter by bush camp hunters during 1968-69 and 1969-70, and the patterns of decision-making will be examined on the other thirty hunting territories.

If only the thirty hunting territories which were used during the period from 1965-66 to 1969-70 are considered, then approximately two-thirds of the hunting territories were used each year by hunters in winter bush camps, and each territory was used an average of 3.3 out of five years.[20] Nine of these hunting territories were used in each of the five years but, not all of these cases involved the actual use of the same area for hunting over the five years. Some of these hunting territories were sub-divided into sections, and in some cases, different sections were used in different years.

In 1969-70, owners were asked if their hunting territories had sections which they used regularly, and the twelve owners who reported such sub-divisions were asked to indicate the areas on the maps of their hunting territories. These sections are indicated on Map 11-1 by dashed lines within the boundaries of numbered hunting territories. There were usually two such sections (Table 11-8). There were also territories on which the owners indicated that they did not use the entire area in each year, but which were not divided into sections with any permanence. From year to year they would use different

Table 11-8 History of Use of Sections of Waswanipi Hunting Territories, 1965-66 to 1969-70

Hunting Territory Number	Section Identification	Used in Winter Hunting Season					No. of Years Used of Last Three Years
		1965-66	1966-67	1967-68	1968-69	1969-70	
I	a	-[1]	+	-	-	+	1
	b	+	-	-	+	-	1
V	a	N.A.[2]	-	-	+	-	1
	b	N.A.	-	+	-	-	1
VII	a	N.A.	-	+	-	+	2
	b	N.A.	+	-	+	-	1
	c	-	-	-	+	-	1
IX	a	N.A.	N.A.	+	-	+	2
	b	N.A.	N.A.	-	+	-	1
XII	a	N.A.	N.A.	+	-	-	1
	b	N.A.	N.A.	+	+	-	2
XV	a	+	+	+	+	+	3
	b	N.A.	+	-	-	+	1
XVIA	a	N.A.	N.A.	-	+	+	2
	b	N.A.	N.A.	+	+	-	2
XVIB	a	N.A.	N.A.	+	+	+	3
	b	N.A.	N.A.	-	-	-	0
XVII	a	-	-	-	-	+	1
	b	-	-	-	-	-	0
XVIII	a	N.A.	+	+	-	+	2
	b	+	+	+	+	-	2

(CONTINUED)

Table 11-8 History of Use of Sections of Waswanipi Hunting Territories, 1965-66 to 1969-70 (Continued)

Hunting Territory Number	Section Identification	Used in Winter Hunting Season 1965-66	1966-67	1967-68	1968-69	1969-70	No. of Years Used of Last Three Years
XX	a	+	+	+	+	+	3
	b	-	-	-	-	-	0
XXI	a	+	+	+	+	+	3
	b	N.A.	N.A.	+	+	+	3
Number Used		N.A.	N.A.	13	14	12	
Average							1.6

Footnotes:

1. Not used.
2. No data available.

areas, but the boundaries of the areas would change. This has not been considered a sectioning of the hunting territory in the present analysis.

Decisions concerning the use of hunting territories are therefore not necessarily decisions about whether to use the whole of a hunting territory or not, there are also decisions about the use of different sections of a hunting territory. My records of the actual use of the hunting territory sections are incomplete for the period before 1967-68 and cover primarily the three years from 1967-68 to 1969-70 (Table 11-8).

Combining the data on use of territories and sections thereof, and considering each hunting territory and section as a distinct unit of management, forty-one such units were in use in 1969-70. Of this total seven were used continuously during the period of record, and 34, or over eighty percent, were used on an intermittent basis.

The decisions on the use of hunting territories or of sections thereof may be taken on an ad hoc basis, as circumstances indicate is appropriate, or they may be taken as part of a several-year plan to regularly rotate the use of a hunting territory. Seven of the thirty owners of hunting territories which were being used indicated that they tried to use their hunting territories on a rotating basis, either using different sections in successive years, or using the territory as a whole only in alternative years.[21] Thus, about one-quarter of the hunting territories are used on what is planned to be a regular rotation. However, the difference between rotation and ad hoc decision is less clear in practice than in planning because regular use and rotation schedules have to be altered on occasion to respond to unanticipated circumstances, as I will indicate below.

b. Frequency of Use in Relation to the Intensity of Animal Harvests

In the analysis of the Waswanipi belief systems I have indicated that the conception of hunting is linked to the associated meanings of the root nitao-, primary among those meanings being both "fetching-" and "growing-", which I have also indicated suggest an ideal alternation of periods of harvesting with periods of non-hunting and growth of wildlife populations (Chapter 5). This model of hunting is articulated at the level of annual hunting plans and decisions in the statements that what a hunter wants and gets in any one year depends on what he has taken in previous hunting. Thus, I have indicated that the most common reasons the hunters give for their present, planned or actual harvests refer back to the levels of harvests they took in the past, especially when hunting the same animal populations on the same geographical areas (Chapter 6).

From an alternative perspective, the analysis of the possible strategies for management of beaver, moose and fish populations has indicated the possible value of harvesting these species on an intermittent basis (Chapter 10). In the case of beaver, a periodic intensive harvest followed by periods of fallow is a means of maintaining long-term population resilience, and minimizing unplanned declines, while maintaining as high a level of productivity of the beaver population as is consistent with long-term stability. In the case of moose, periodic harvests were indicated to be a means of marginally increasing harvestable yields in a population whose stability and productivity were increased by means of an intensive but regulated harvest. Furthermore, in the case of fish, intermittent harvesting of individual lakes has been recognized in recent years as a major tool for the management of fish stocks in northern Canada (see Berkes, 1977a for a review).

Thus both the analysis of Waswanipi belief systems and of Canadian game management systems reveal a consistent view, namely that the management by means of intermittent harvests is a rational and effective means of hunting the animal resources which are utilized intensively. The most obvious level at which intermittent hunting is planned and actualized is in the decisions on the annual or seasonal use or non-use of geographical areas for hunting. And, the most obvious manifestation of these decisions is in the frequency of hunting on individual hunting territories and sections thereof.

Such decisions are, however, also related to the decisions on how many individual animals are being given in any season on a territory; that is, the decisions are related to the size of the harvests.

The relationship between the frequency of use of a hunting territory and the intensity of the harvest of animal population can be examined by allocating the hunting group harvest records reported previously (Chapter 8), to the hunting territories on which those harvests were taken. In general each hunting group which was formed for two months or more during the winter hunting seasons of 1968-69 and 1969-70 hunted on a single hunting territory or section thereof (Table 11-9). In several cases two sections of a hunting territory were used by the same hunting group, for example, territories VII and XXI in 1968-69 (Table 11-9). Sometimes two adjacent hunting territories, or adjacent sections of two hunting territories were used by a hunting group, for example, territories XII and XIII in 1968-69, IIA and IIB in 1969-70, XA and XB in 1968-69, XB and XC in 1969-70, and XVIA and XVIBa in 1968-69. In one case two hunting groups used different sections of the same hunting territory, territory XV in 1969-70.

The data collected from diaries and interviews on the harvests of moose and beaver made by each hunting group formed during 1968-69 and 1969-70 have been retabulated to allocate harvests of these species by hunting territory. Where a single hunting group used more than one hunting territory, the territories are grouped because harvests of a hunting group often could not be segregated geographically with the data available. The harvests of moose and beaver taken by hunters in winter bush camps are listed by hunting territory on Table 11-10.

To be able to compare hunting territories the harvests are converted into densities, animals harvested per square mile. The areas of the hunting territories and sections are listed on Tables 11-11 and 11-12 respectively, and the areas used in 1968-69 and 1969-70 are listed on Table 11-13. The density of moose and beaver harvests are listed on Table 11-14.

Table 11-9 Hunting Territories and Sections of Hunting Territories Used by Hunting Groups in 1968-69 and 1969-70

Hunting Territory Identification	Used in 1968-69		Used in 1969-70	
	Territories	Sections	Territories	Sections
I	I	b	I	a
II	-[1]	-[2]	IIA	-
	-	-	IIB	-
III	III	-	-	-
IV	IV	-	IV	-
V	V	a	-	-
VI	-	-	VI	-
VII	VII	b,c	VII	a
VIII	VIII	-	-	-
IX	IX	b	IX	a
X	XA	-	XB	-
	XB	-	XC	-
XI	XI	-	-	-
XII	XII	b	-	-
	XIII			
XIII		-	XIII	-
XIV	XIV	-	XIV	-
XVa	XV	a	XV	a
XVb	-	-	XV	b
XVI	XVIA	a,b	XVIA	a
	XVIB	a	XVIB	a
XVII	-	-	XVII	a
XVIII	XVIII	b	XVIII	a
XIX	-	-	XIX	-
XX	XX	a	XX	a
XXI	XXI	a,b	XXI	a

Footnotes:

1. Not Used.
2. Not used and/or not sectioned.

Table 11-10 Harvest of Moose and Beaver by Hunting Territory, 1968-69 and 1969-70

Hunting Territory Identification[1]	Harvest 1968-69		Harvest 1969-70	
	Beaver	Moose	Beaver	Moose
I	210	7	109	1
II	-	-	202	5
III	120	4	-	-
IV	119	8	103	3
V	206	9	-	-
VI	-	-	143	3
VII	113	3	70	2
VIII	170	4	-	-
IX	115	3	129	3
X[2]	279	21	300	26
XI	145	3	-	-
XII	174	9	-	-
XIII			102	2
XIV	38	2	110	5
XVa	185	3	174	3
XVb	-	-	103	0
XVI	365	14	186	5
XVII	-	-	100	3
XVIII	68	2	70	2
XIX	-	-	298	9
XX	109	4	56	2
XXI	117	4	123	3

Footnotes:

1. For listing of hunting territories and sections included see table 11-9.
2. Includes hunting territories XA, XB and XC.

Table 11-11 Areas of Waswanipi Hunting Territories

Hunting Territory	Area of Territory (Square Miles)	Hunting Territory	Area of Territory (Square Miles)
I	229	XX	265
IIA	175	XXI	304
IIB	162	XXII	187
III	179	XXIII	136
IV	156	XXIV	125
V	272	XXV	163
VI	140	XXVI	182
VII	183	XXVII	144
VIII	306	XXVIII	236
IX	133	XXIX	113
XA	419	XXX	288
(XB)[1]	(809)	XXXI	593
XC	287	XXXII	325
XD	141		
XE	259	All	9235
XF	288		
XG	409	Average	231
XH	249		
XI	182		
XII	196		
XIII	91		
XIV	113		
XV	324		
XVIA	240		
XVIB	419		
XVII	260		
XVIII	138		
XIX	224		

Footnote:

1. Hunting territory XB includes XD, plus XE, plus XG.

Table 11-12 Number and Area of Defined Sections of Hunting Territories

Hunting Territory Number	Number of Defined Sections of Territory	Includes Total Area	Percentage of Total Area in Each Section	Area and Identification of Each Section (Square Miles)
I	2	yes	43,57	99(a),130(b)
IIA	0	-	-	-
IIB	0	-	-	-
III	0	-	-	-
IV	0	-	-	-
V	2	yes	43,57	117(a),155(b)
VI	0	-	-	-
VII	3	yes	30,40,30	55(a),74(b),54(c)
VIII	0	-	-	-
IX	2	yes	55,45	73(a),60(b)
XA	0	-	-	-
(XB)	0	-	-	-
XC	0	-	-	-
XD	0	-	-	-
XE	0	-	-	-
XF	0	-	-	-
XG	0	-	-	-
XH	0	-	-	-
XI	0	-	-	-
XII	2	yes	30,70	58(a),138(b)
XIII	0	-	-	-
XIV	0	-	-	-
XV	2	no	26,20	84(a),65(b)
XVIA	2	yes	48,52	114(a),126(b)
XVIB	2	yes	39,61	164(a),255(b)
XVII	2	yes	39,61	101(a),159(b)
XVIII	2	no	27,49	37(a),67(b)

(CONTINUED)

Table 11-12 Number and Area of Defined Sections of Hunting Territories (Continued)

Hunting Territory Number	Number of Defined Sections of Territory	Includes Total Area	Percentage of Total Area in Each Section	Area and Identification of Each Section (Square Miles)
XIX	0	-	-	-
XX	2	yes	35,65	92(a),173(b)
XXI	2	yes	62,38	190(a),114(b)
XXII	0	-	-	-
XXIII	0	-	-	-
XXIV	0	-	-	-
XXV	0	-	-	-
XXVI	0	-	-	-
XXVIII	0	-	-	-
XXIX	0	-	-	-
XXX	0	-	-	-
XXXI	0	-	-	-
XXXII	0	-	-	-
Average area per section				109
Average area of all traplines				231

Table 11-13 Extent of Area Used on Each Hunting Territory in 1968-69 and 1969-70

Hunting Territory Identification[1]	Area (Sq.Mi.)	Area Used 1968-69	Area Used 1969-70
I	229	130	99
II	337	-	240[3]
III	179	179	-
IV	156	156	156
V	272	117	-
VI	140	-	140
VII	183	128	55
VIII	306	306	-
IX	133	60	73
X[2]	1515	1228	1096
XI	182	182	-
XII	196	229	-
XIII	91		91
XIV	113	113	113
XVa	324	84	84
XVb		-	65
XVI	659	404	278
XVII	260	-	101
XVIII	138	67	37
XIX	224	-	182[3]
XX	265	92	92
XXI	304	304	190
Total	6205	3779	3092

Footnotes:

1. For listing of hunting territories and sections included see table 11-9.
2. Includes hunting territories XA, XB and XC; XA and XB were used in 1968-69, XB and XC in 1969-70.
3. Only used in part.

Table 11-14 Harvest Densities of Moose and Beaver by Hunting Territory 1968-69 and 1969-70

Hunting Territory Identification	Harvest Density 1968-69		Harvest Density 1969-70	
	Beaver per Sq.Mi.	Moose per Sq.Mi.	Beaver per Sq.Mi.	Moose per Sq.Mi.
I	1.62	.054	1.10	.010
II	-	-	0.84	.021
III	0.67	.022	-	-
IV	0.76	.051	0.66	.019
V	1.76	.077	-	-
VI	-	-	1.02	.021
VII	0.88	.023	1.27	.036
VIII	0.56	.013	-	-
IX	1.92	.050	1.77	.041
X	0.23	.017	0.27	.024
XI	0.80	.017	-	-
XII	0.76	.039	-	-
XIII			1.12	.022
XIV	0.34	.018	0.97	.044
XVa	2.20	.036	2.07	.036
XVb	-	-	1.58	0
XVI	0.90	.035	0.67	.018
XVII	-	-	0.99	.030
XVIII	1.01	.030	1.89	.054
XIX	-	-	1.64	.049
XX	1.18	.043	0.61	.022
XXI	0.38	.031	0.65	.016

The relationship of harvest intensity to frequency of territory use can be examined by grouping hunting territories according to the history of the recent use of each territory (Table 11-15), at the time a harvest was taken on the territory. Thus, each use of a hunting territory is a separate case of a harvest on an area with a given history of recent use. Three categories of recent use of hunting territories, or sections of hunting territories, were established: those used the year previous to the year of the recorded harvest; those not used for the one year previous to the year of the recorded harvest; and, those not used for two or more years prior to the year of the recorded harvest.

The classification of harvested areas by frequency of recent use is complicated only in those cases where two hunting territories and/or sections with different histories of use were harvested as a single unit during 1968-69 or 1969-70. In these cases, the main area hunted was used to allocate the areas to a single category, or a weighted average of years of non-use was calculated based on the relative size and history of use of each area. In the case of hunting territories IIA and IIB, the main hunting was located on territory IIB, and the easier access to this territory resulted in more of the harvests being taken there rather than on territory IIA. The combined territory II was therefore grouped on the basis of the history of use of hunting territory IIB, i.e., with territories not used for one year prior to the use in 1969-70. In 1968-69 two sections of hunting VII were used, the larger of which had not been used for five years, the smaller had not been used for one year. Territory VII was listed for 1968-69 as not having been used for two or more years.

Territory XB was harvested in 1968-69 conjointly with territory XA and in 1969-70 conjointly with territory XC. These three territories were being used cooperatively, and with clear exchanges of privileges of access. Essentially the same group of hunters lived together as a hunting group for three successive years, using in turn the hunting territories owned by two of the three owners in the hunting group. Territory XA had been used the year prior

Table 11-15 History of Recent Use of Hunting Territories Used in 1968-69, 1969-70

Territory Number	Section	Years Previous to 1968-69 Not Used	Use 1968-69	Use 1969-70
I	a	1	-	+
	b	2	+	-
IIA		4	-	+
IIB		0	-	+
III		1	+	-
IV		1	+	+
V	a	2	+	-
	b	0	-	-
VI		0	-	+
VII	a	0	-	+
	b	1	+	-
	c	5	+	-
VIII		0	+	-
IX	a	0	-	+
	b	(1)[1]	+	-
XA		0	+	-
XB		0	+	+
XC		(1)	-	+
XI		0	+	-
XII	a	0	-	-
	b	0	+	-
XIII		0	+	+
XIV		0	+	+
XV	a	0	+	+
	b	1	-	+
XVIA	a	(1)	+	+
	b	0	+	+
XVIB	a	0	+	+
	b	(1)	-	-

(CONTINUED)

Table 11-15 History of Recent Use of Hunting Territories Used in 1968-69, 1969-70 (Continued)

Territory Number	Section	Years Previous to 1968-69 Not Used	Use 1968-69	Use 1969-70
XVII	a	4	-	+
	b	(3)	-	-
XVIII	a	0	-	+
	b	0	+	-
XIX		3	-	+
XX		0	+	+
XXI	a	0	+	+
	b	0	+	-

Footnote:

1. Numbers in brakets are minima.

to 1968-69 and would have been in the first category, territory XC had not been used for at least four years prior to its use in 1969-70 and would have been in the third category, hunting territory XB had been used for several years continuously and would have been in the first category. Thus, for 1968-69 the combined territory X, including XA and XB, was in the first category. And the combined hunting territory X for 1969-70, including XB and XC, was listed as not having been hunted for one year previous to the year of recorded harvest, to balance the different histories of use of XB and XC.

Hunting territory sections XVIAb and XVIBa were both used the year previous to the 1968-69 year, whereas XVIAa was not used for one year previous. The combined territory is listed as having been used the year previous to 1968-69. For 1969-70, territory XVI, combining XVIAa and XVIBa, is unambiguously in the first category. The combined territory XII for 1968-69, which includes XIIb and XIII, was similarly listed as unambiguously in the first category.

The beaver harvest per square mile for the three groups of hunting territories with different recent histories of use indicates that the harvest per square mile is related to the previous frequency of use. The group of hunting territories and sections used in 1968-69 or 1960-70 which had been used the year previous to the recorded harvest year had recorded harvests that averaged 0.89 beaver per square mile (Table 11-16). Those hunting territories and sections used in 1968-69 or 1960-70 which had not been used for the one year previous to the recorded harvest year had harvests of beaver that averaged 1.16 beaver per square mile. Finally, those hunting territories and sections used in 1968-69 or 1969-70 which had not been used for more than one year previous to the recorded harvest had beaver harvests that averaged 1.37 beaver per square mile. Thus, there is a clear increase in the beaver harvest density if the area hunted has been used less frequently during the immediately preceding period.

It will be noted that considerable variation occurs within each of the three groups of hunting territories, which suggests the possible importance of

Table 11-16 Beaver Harvest Densities on Hunting Territories Harvested at Different Frequencies

Territories Used Year Previous to Recorded Year	Recorded Year	Beaver Harvest Density (Beaver per Sq. Mi.)	Territories Not Used One Year Previous to Recorded Year	Recorded Year	Beaver Harvest Density (Beaver per Sq. Mi.)	Territories Not Used More Than One Year Prior to Recorded Year	Recorded Year	Beaver Harvest Density (Beaver per Sq. Mi.)
IV	69-70	0.66	II	69-70	0.84	I	69-70	1.10
VIII	68-69	0.56	III	68-69	0.67	I	68-69	1.62
X	68-69	0.23	IV	68-69	0.76	V	68-69	1.76
XI	68-69	0.80	VI	69-70	1.02	VII	68-69	0.88
XII	68-69	0.76	VII	69-70	1.27	XVII	69-70	0.99
XIII	69-70	1.12	IX	69-70	1.77	XIX	69-70	1.64
XIV	68-69	0.34	IX	68-69	1.92	XVb	69-70	1.58
XIV	69-70	0.97	X	69-70	0.27			
XVa	68-69	2.20	XVIII	69-70	1.89			
XVa	69-70	2.07						
XVI	68-69	0.90						
XVI	69-70	0.67						
XVIII	68-69	1.01						
XX	68-69	1.18						
XX	69-70	0.61						
XXI	68-69	0.38						
XXI	69-70	0.65						
Average		0.89	Average		1.16	Average		1.37

factors other than frequency of use of the hunting territory or section. Among these other factors would be variations in the biological productivity of hunting territories and the intensity of the hunting efforts.

Thus, hunting territory section XVa, which was used on a continuing basis, had an exceptionally high beaver harvest density relative to other hunting territory sections which were used on a continuing basis. The two-year average beaver harvest density on this hunting territory section was 2.13 beaver per square mile, whereas the next highest beaver harvest density on territories or sections used in the year previous to the recorded year was 1.18 beaver per square mile, on territory XX in 1968-69. This continuing high beaver harvest density on hunting territory section XVa was noted by the Waswanipi hunters themselves who claimed that beaver reproduction was exceptionally good on this hunting territory. I will note below however that some hunters were reporting possible declines in beaver populations on this hunting territory at the end of 1969-70. The very good beaver production in this area was also noted in part with respect to the harvest on hunting territory XVIII and section XVb.

On the other hand, some of the lowest harvest densities, those on hunting territories X in 1968-69 and 1969-70, reflect the geographical dispersion of the hunt. These hunting groups were able to harvest two large territories because they were equipped with skidoos. In fact, there were only two hunting groups using skidoos in winter bush camps in 1968-69 and 1969-70, that on territory X and that on territory XVI. The low beaver harvest density on territory X in both years reflects the unique pattern of hunting adopted by members of this hunting group. Unable to use skidoos to travel up along the smaller streams, they hunted mainly at the river and lakeshore beaver colonies which are less densely located, and they travelled longer distances daily between colonies. This pattern resulted in a harvest distributed over a wider geographical area than was the case on other territories and it accounts for the low densities of beaver harvests in both 1968-69 and 1969-70.

Despite variations such as these, the date indicate that the frequency of harvesting is an important variable affecting the beaver harvest yield of each territory.

A similar pattern is found for the harvest densities of moose (Table 11-17). In this case one hunting territory, XVb, is not included in the analysis because the lack of any moose harvest on this territory was reported by the leader of the hunting group to be the result of fears about harassment by provincial game wardens. I will explain the situation in greater detail below.

The lowest average density of moose harvests, 0.027 moose per square mile, is found for the hunting territories and sections which were hunted the year previous to the year of the recorded harvest. The highest average density of moose harvests, 0.041 moose per square mile, is found for hunting territories and sections which had not been used for two or more years prior to the year of the recorded harvest. And, an intermediate average moose harvest density, 0.036 moose per square mile is found for hunting territories and sections which were not used the one year prior to the year of the recorded harvests.

When beaver and moose harvests are converted into caloric values and the harvests combined (Table 11-18), the total edible Calories of moose and beaver harvested per square mile on hunting territories used with different frequencies run from 32,359 Calories on territories and sections used the previous year, to 42,397 Calories on those not used for one year, to 48,588 Calories on those not used for two or more years (Table 11-19).

Thus, after letting a hunting territory or a section of a hunting territory go unharvested for one year a hunter takes a more intensive harvest of both beaver and moose, on average, than he would if the land had been harvested the previous year. The available data indicate an increase of 31 percent in the harvest. After letting hunting territory or section to unharvested for more than one year a hunter takes an even more intensive average harvest of

Table 11-17 Moose Harvest Density on Hunting Territories Harvested at Different Frequencies

Territories Used Year Previous to Recorded Year	Recorded Year	Moose Harvest Density (Moose per Sq. Mi.)	Territories Not Used One Year Previous to Recorded Year	Recorded Year	Moose Harvest Density (Moose per Sq. Mi.)	Territories Not Used More Than One Year Prior to Recorded Year	Recorded Year	Moose Harvest Density (Moose per Sq. Mi.)
IV	69-70	.019	II	69-70	.021	I	69-70	.010
VIII	68-69	.013	III	68-69	.022	I	68-69	.054
X	68-69	.017	IV	68-69	.051	V	68-69	.077
XI	68-69	.017	VI	69-70	.021	VII	68-69	.023
XII	68-69	.039	VII	69-70	.036	XVII	69-70	.030
XIII	69-70	.022	IX	68-69	.050	XIX	69-70	.049
XIV	68-69	.018	IX	69-70	.041			
XIV	69-70	.044	X	69-70	.024			
XVa	68-69	.036	XVIII	69-70	.054			
XVa	69-70	.036						
XVI	68-69	.035						
XVI	69-70	.018						
XVIII	68-69	.030						
XX	68-69	.043						
XX	69-70	.022						
XXI	68-69	.031						
XXI	69-70	.016						
Average		.027	Average		.036	Average		.041

Table 11-18 Total Calories of Moose and Beaver Produced Per Square Mile on Hunting Territories, 1968-69 and 1969-70

Hunting Territory Identification[1]	1968-69 Cal.Beaver per Sq.Mi.[1]	1968-69 Cal.Moose per Sq.Mi.[1]	1968-69 Total Cal. per Sq.Mi.	1969-70 Cal.Beaver per Sq.Mi.[1]	1969-70 Cal.Moose per Sq.Mi.[1]	1969-70 Total Cal. per Sq.Mi.
I	39,779	20,952	60,731	27,112	3,933	31,045
II	-	-	-	20,727	8,100	28,827
III	16,509	8,685	25,194	-	-	-
IV	18,784	19,978	38,762	16,260	7,477	23,737
V	43,409	29,948	73,357	-	-	-
VI	-	-	-	25,152	8,334	33,486
VII	21,739	9,113	30,852	31,340	14,176	45,516
VIII	13,682	5,102	18,784	-	-	-
IX	47,199	19,472	66,671	43,515	16,006	59,521
X	6,169	6,723	12,892	6,747	9,230	15,977
XI	19,619	6,426	26,045	-	-	-
XII	18,710	15,188	33,898	-	-	-
XIII				27,602	8,568	36,170
XIV	8,281	6,893	15,174	23,972	17,213	41,185
XVa	54,234	13,903	68,137	51,008	13,903	64,911
XVb	-	-	-	39,021	0	39,021
XVI	22,249	13,514	35,763	16,474	7,010	23,484
XVII	-	-	-	24,379	11,566	35,945
XVIII	24,992	11,644	36,636	46,588	21,030	67,618
XIX	-	-	-	40,321	19,277	59,598
XX	29,176	16,941	46,117	14,989	8,451	23,440
XXI	9,478	12,151	21,629	15,945	6,153	22,098

Footnote:

1. Based on caloric values listed on Table 8-12.

Table 11-19 Total Calories of Moose and Beaver Produced Per Square Mile on Hunting Territories Harvested at Different Frequencies

Territories Used Year Previous to Recorded Year	Recorded Year	Total Calories From Moose and Beaver (Per Sq. Mi.)	Territories Not Used One Year Previous to Recorded Year	Recorded Year	Total Calories From Moose and Beaver (Per Sq. Mi.)	Territories Not Used More Than One Year Prior to Recorded Year	Recorded Year	Total Calories From Moose and Beaver (Per Sq. Mi.)
IV	69-70	23,737	II	69-70	28,827	I	69-70	31,045
VIII	68-69	18,784	III	68-69	25,194	I	68-69	60,731
X	68-69	12,892	IV	68-69	38,762	V	68-69	73,357
XI	68-69	26,045	VI	69-70	33,486	VII	68-69	30,852
XII	68-69	33,898	VII	69-70	45,516	XVII	69-70	35,945
XIII	69-70	36,170	IX	69-70	59,521	XIX	69-70	59,598
XIV	68-69	15,174	IX	68-69	66,671			
XIV	69-70	41,185	X	69-70	15,977			
XVa	68-69	68,137	XVIII	69-70	67,618			
XVa	69-70	64,911						
XVI	68-69	35,763						
XVI	69-70	23,484						
XVIII	68-69	36,636						
XX	68-69	46,117						
XX	69-70	23,440						
XXI	68-69	21,629						
XXI	69-70	22,098						
Average		32,359	Average		42,397	Average		48,588

both beaver and moose. In the six cases on which data are available (Tables 11-19, 11-15), the average duration of the fallow of this group of territories was approximately three years, and the additional increase in harvests over the harvests after a one-year fallow was 15 percent. Thus, as the duration of the fallow increases hunters increase the harvest intensity, on average, but the data suggest that the marginal rate of increase in the harvest intensity declines. The overall effect of leaving an area fallow for an average of three years, versus hunting it without a fallow is a 50 percent increase in the harvest densities the hunters will take when the area is again hunted.

It needs to be stressed that the mechanism by which this variation occurs involves both the natural changes in the densities of the game populations, and the decisions made by the hunters. When an area is left unhunted for one or more years, the beaver and moose populations are able to increase because, as I have indicated previously, they appear to be generally kept at below saturation densities.

This increase, again as I have indicated previously, is itself a sign to the hunters that more animals will be given to them to hunt. The signs of increases in the animal populations therefore result in a decision on the part of hunters to increase the harvests following a period of fallow, and this is reflected in the higher harvest densities on areas that have been fallowed.

The hunters therefore regulate the size of their harvests in response to the periods of fallow, and also in response to their judgments of the increases occurring in the game populations.

This is reflected in the explicit anticipation of increased harvests that hunters express both when returning to an area that has not been harvested for one or more years, and when explaining the reasons for decisions to leave a hunting territory or section in fallow for a period. In the latter case the decision to leave an area in fallow is usually a response to signs of declines in game densities. In this instance, hunters usually can indicate how long they think it will take for the animal populations to grow, and how long they plan to leave an area fallow.

The extent to which planning and owner's decisions regulate the size of the harvest, and therefore harvest densities, and also the duration of the fallows, is indicated in case when harvests are increased to above normal levels because the owners himself does not plan to return to an area for several years. If an owner does not plan to return to an area for reasons unrelated to the condition of the animal population on his territory, he may decide to hunt it out, knowing that a fallow period will allow time for recovery of the animal populations. Alternatively, if an owner decides he needs to take a larger harvest than is possible on a sustained basis he will plan to leave the area fallow for a period.

Two cases of this occur in the data presented. Hunting territory V had not been used for several years prior to 1967-68. In that year the owner returned to harvest one of the two sections and reported that he had a good hunt. In 1968-69 the owner hunted the other section, along with two other commensal groups, and said that they had "killed all the small beaver", and that the territory would not be good to use the next year. In 1969-60, he did not use his hunting territory in order to let the beaver grow, and instead arranged to use the hunting territory of another owner. The owner did not state the reasons why he trapped out his hunting territory, but he indicated that he did so intentionally and with plans for a fallow period. The fact that the territory had not been hunted for several years, plus the decision to harvest intensively produced the highest density of moose harvests, one of the highest densities of beaver harvests, and the highest overall density of calories produced from moose and beaver that was reported during 1968-69 and 1969-70 (Tables 11-16, 11-17 and 11-19).

A second instance of intentional hunting out occurred on hunting territory XVb in 1969-70. The owner of the hunting territory gave permission for another hunter to use a section of his hunting territory extending along one side of a major provincial highway. The area had not been hunted for two years previous. Because the area was bounded by the road to the south and Waswanipi Lake to the north, a hunter using the area was always within approximately five miles of the highway. As reported earlier, provincial game wardens were informing the Waswanipi and, occasionally, enforcing an ad hoc rule that moose could not be killed within ten miles of the highways and towns. The hunter who used this section of territory XV reported that he was visited several times during the winter by the game wardens making inspections, presumably because his camp was easily accessible. As a result he did not harvest moose. He also indicated, however, that moose hunting was not promising because the location of the area and its proximity to several sporting hunting and fishing outfitters led to its being heavily hunted each fall by sportsmen. In short, it was a hunting territory section that was not suited to regular harvesting by Waswanipi hunters. However, several years of non-use produced high beaver populations. It was therefore worthwhile to harvest the beaver in this area every few years. And, since the area was not suitable for regular use, it was planned to clean it out of beaver and leave it fallow again for several years.

In summary, the intermittent and rotational use of hunting territories and hunting territory sections is related to the levels of harvesting by hunters through a complex series of decisions. Decisions on how many beaver and moose to harvest are related to whether or not the area has been fallowed, and to how long it has been fallowed. And, decisions by hunters to leave a hunting territory or section fallow may be a response to declines in animal populations, or to a decision to create such declines by intensive harvesting because more regular harvests are not possible or desired.

The general effectiveness of the system of adjusting harvest levels to the history of use, and of adjusting fallow periods to harvesting intensity and trends in animal populations is indicated by the overall stability of the animal populations over the years, documented in a previous chapter. That harvests vary more than do animal population levels is a further indication that it is decisions on harvests that are being used to regulate and generally enhance the stability of animal populations.

c. The Relationship Between the Intensity of Animal Harvests and the Levels of Subsistence Production

Since the intensity of the harvests taken is related to the management of the animal resources, it is important to examine the outcomes, the level of subsistence production, in relation to subsistence needs.

The number of individuals resident in the winter bush camps on each hunting territory in use in 1968-69 and 1969-70 has been tabulated (Table 11-20). Each individual has then been given a weighting on the basis of the proportion of the caloric needs of an adult that individuals of that age and sex are considered to require, using the adult consumption unit system outlined previously (Table 8-57). The number of months each individual spent in a camp has then been used to calculate the adult-months of subsistence demand for each hunting group, and this figure has then been allocated by hunting territory (Table 11-21). The total calories available from the harvests of moose and beaver have then been calculated per adult-day of subsistence demand (Table 11-22).[22]

There is a clear trend: the number of Calories produced per adult-day of subsistence demand from moose and beaver harvests increases when a hunting territory is fallowed for one year, and when it is fallowed for two years or more (Table 11-23). This follows from the increasing harvests on territories used less frequently, and from the fact that the total subsistence demand does not increase with decreasing frequency of use (Table 11-24). How frequently a hunting territory is used, as such, appears to be unrelated to the number of people and how long they stay on a hunting territory, to the subsistence demand density. As a result, those using a territory that has not been used for two or more years previous to the year of use average 5,600 Calories per adult-day, those on territories not used for one year previous to the year of

Table 11-20 Number of Individuals Resident in Winter Bush Camps on Each Hunting Territory During 1968-69 and 1969-70

Hunting Territory Identification	Number of Individuals Resident During Winter Hunting Season		
	1968-69	1969-70	Average for Year(s) in Use
I	10	6	8
II	-[1]	18	18
III	9	-	9
IV	13	17	15
V	19	-	19
VI	-	16	16
VII	3	3	3
VIII	8	-	8
IX	8	6	7
X	16	17	16.5
XI	17	-	17
XII	6	-	6
XIII		7	7
XIV	7	11	9
XVa	12	17	14.5
XVb	-	9	9
XVI	28	19	23.5
XVII	-	3	3
XVIII	17	8	12.5
XIX	-	12	12
XX	9	7	8
XXI	19	36	27.5

Footnote:

1. Not in use.

Table 11-21 Subsistence Demand Density on Hunting Territories, 1968-69 and 1969-70

Hunting Territory Identification	1968-69		1969-70	
	Adult Months of Subsistence Demand[1]	Adult Months of Subsistence Demand Per Sq. Mi.	Adult Months of Subsistence Demand[1]	Adult Months of Subsistence Demand Per Sq. Mi.
I	55.86	.43	25.62	.26
II	-	-	72.95	.30
III	28.63	.16	-	-
IV	51.27	.33	48.93	.31
V	60.52	.52	-	-
VI	-	-	45.33	.32
VII	21.00	.16	21.00	.38
VIII	41.93	.14	-	-
IX	37.28	.62	35.90	.49
X	95.48	.08	100.93	.09
XI	90.86	.50	-	-
XII	27.90	.12	-	-
XIII			30.64	.34
XIV	30.30	.27	41.98	.37
XVa	54.63	.65	80.25	.96
XVb	-	-	34.95	.54
XVI	140.13	.35	71.63	.26
XVII	-	-	21.00	.21
XVIII	29.17	.44	24.98	.68
XIX	-	-	44.25	.24
XX	51.31	.56	26.65	.29
XXI	57.34	.19	75.46	.40

Footnote:

1. See text for definition.

Table 11-22 Total Calories From Moose and Beaver Per Adult-Day of Subsistence Demand by Hunting Territories, 1968-69 and 1969-70

Hunting Territory Identification	Calories From Harvests of Moose and Beaver Per Adult-Day of Subsistence Demand 1968-69	Calories From Harvests of Moose and Beaver Per Adult-Day of Subsistence Demand 1969-70
I	4,713	3,999
II	-	2,998
III	5,254	-
IV	3,931	2,524
V	4,724	-
VI	-	3,449
VII	6,271	3,972
VIII	4,566	-
IX	3,511	4,034
X	5,211	5,784
XI	1,739	-
XII	9,307	-
XIII		3,580
XIV	1,886	3,697
XVa	3,493	2,265
XVb	-	-
XVI	3,342	2,728
XVII	-	5,763
XVIII	-	3,340
XVIII	2,804	-
XIX	-	8,168
XX	2,756	2,699
XXI	4,822	8,409

Table 11-23 Subsistence Level Attained on Hunting Territories Harvested at Different Frequencies

Territories Used Year Previous to Recorded Year	Recorded Year	Calories per Adult-Day of Subsistence Demand	Territories Not Used One Year Previous to Recorded Year	Recorded Year	Calories per Adult-Day of Subsistence Demand	Territories Not Used More Than One Year Prior to Recorded Year	Recorded Year	Calories per Adult-Day of Subsistence Demand
IV	69-70	2,524	II	69-70	2,998	I	69-70	3,999
VIII	68-69	4,566	III	68-69	5,254	I	68-69	4,713
X	68-69	5,211	IV	68-69	3,931	V	68-69	4,724
XI	68-69	1,739	VI	69-70	3,449	VII	68-69	6,271
XII	68-69	9,307	VII	69-70	3,972	XVII	69-70	5,763
XIII	69-70	3,580	IX	68-69	3,511	XIX	69-70	8,168
XIV	68-69	1,886	IX	69-70	4,034			
XIV	69-70	3,697	X	69-70	5,784			
XVa	68-69	3,493	XVIII	69-70	3,340			
XVa	69-70	2,265						
XVI	68-69	3,342						
XVI	69-70	2,728						
XVIII	68-69	2,804						
XX	68-69	2,756						
XX	69-70	2,699						
XXI	68-69	4,822						
XXI	69-70	8,409						
Average		3,872	Average		4,030	Average		5,606

Table 11-24 Subsistence Demand Density on Hunting Territories Harvested at Different Frequencies

Territories Used Year Previous to Recorded Year	Recorded Year	Adult Months of Subsistence Demand per Sq.Mi.	Territories Not Used One Year Previous to Recorded Year	Recorded Year	Adult Months of Subsistence Demand per Sq.Mi.	Territories Not Used More Than One Year Prior to Recorded Year	Re-corded Year	Adult Months of Subsistence Demand per Sq.Mi.
IV	69-70	.31	II	69-70	.30	I	69-70	.26
VIII	68-69	.14	III	68-69	.16	I	68-69	.43
X	68-69	.08	IV	68-69	.33	V	68-69	.52
XI	68-69	.50	VI	69-70	.32	VII	68-69	.16
XII, XIII	68-69	.12	VII	69-70	.38	XVII	69-70	.21
XIII	69-70	.34	IX	68-69	.62	XIX	69-70	.24
XIV	68-69	.27	IX	69-70	.49			
XIV	69-70	.37	X	69-70	.09			
XVa	68-69	.65	XVIII	69-70	.68			
XVa	69-70	.96						
XVI	68-69	.35						
XVI	69-70	.26						
XVIII	68-69	.44						
XX	68-69	.56						
XX	69-70	.29						
XXI	68-69	.19						
XXI	69-70	.40						
Average		.37	Average		.37	Average		.30

use average 4,000 Calories per adult-day, and those on territories that were used the year previous to the recorded use average 3,900 Calories per adult-day (Table 11-23). All three classes of groups average harvests that are near to or greater than the 4,000 Calories of food per adult-day calculated as the mean daily caloric requirement for the bush camp population.

However, variation among hunting territories and groups of territories is also significant in subsistence terms. On those hunting territories which were not used for two or more years previous to the recorded year, effectively all hunting groups achieved a subsistence production from moose and beaver of at least 4,000 Calories per adult-day (Table 11-23). On the hunting territories which had not been used one year prior to the recorded use, nearly half of the hunting groups, four of nine, produced significantly less than 4,000 Calories per adult-day from harvests of moose and beaver. However, none produced less than the 2,500 Calories calculated to be the portion of the mean daily caloric requirement that would have to be provided from moose and beaver assuming only the minimum intakes of other animals and purchased foods.

The situation of some hunting groups which are using hunting territories that were used in the year previous to the recorded year is strikingly different. While this group of hunting territories include some of the highest subsistence levels attained, a majority of the hunting territories, 12 of 17, produced less than 4,000 Calories per adult-day from moose and beaver. And, of these 12, three hunting territories produced less than 2,500 Calories per adult-day from moose and beaver.

What this indicates is that hunters who use hunting territories that have been fallowed, and who harvest the moose and beaver populations at levels consistent with the higher densities of these animals on their territories, are able to produce a surplus over the maximum immediate subsistence requirements of the members of the hunting group for moose and beaver. The same is true for most of the hunting territories harvested on an annual basis as well, although the size of the average surplus is smaller. On the other hand, on some hunting territories that have been used the year previous to the current use, harvests of moose and beaver consistent with management of those populations will be insufficient to meet the need for moose and beaver if members of the hunting group keep consumption of other animal foods and purchased foods to a minimum. Thus, some of the hunting groups using territories that have been harvested the previous year may have to use more than minimal levels of other animal foods and/or of purchased foods, or have a net balance of food exchange to them, in order to meet immediate subsistence requirements of hunting group members. In 1968-69 and 1969-70 three of 32 cases appeared to fall into this category, or about ten percent.

The significance of these data are that they indicate that some hunters are limiting the use of the most efficiently harvestable resources to levels below immediate subsistence requirements in order to harvest in a manner consistent with management of the wildlife populations.

Thus, where hunting territories are not fallowed, cases of difficulties in management of animal populations can arise. Such cases are the acid test of the Waswanipi wildlife management system, and the Waswanipi have a number of specific responses for dealing with such situations. These cases appear to arise most frequently in the context of human population pressure on a particular hunting territory.

ii) Seeking and Granting Privileges to Hunting Territories as a Management Technique

a. Why Not All Hunting Territories are Easily Fallowed: The Significance of Human Population Densities

Given the relatively low subsistence levels attained on some hunting territories that have not been fallowed, it is not clear why the tactic of intermittent use and fallowing is not used by all hunting territory owners.

According to the owners of hunting territories a major reason why hunting territories are fallowed is as a response to declining animal populations. These statements have been reviewed in Chapter 6 (Sections A, vi and A, vii). If the cases of relatively low harvests of moose and beaver and of relatively low subsistence levels,on hunting territories that are used regularly, are a response to declines in animal populations, then it would appear that some owners are finding it hard to fallow their hunting territories for some reason.

That the cases of relatively low subsistence levels are in fact cases where declining animal populations have occurred may be indicated indirectly. I do not have measures of trends in animal populations at the level of individual hunting territories. However, information gathered from hunting territory owners on the condition of their territories, the history of use of the territories and the perceived degree of success of their hunting, often included statements on the trends in animal populations, especially downward trends. These comments have been summarized along with the comments of other hunters and along with my observations on patterns of use on Table 11-25.

The data indicate that on eight of the twenty-five hunting territories which were used during 1968-69 and for 1969-70 some signs of animal population declines were recognized by the owners, or by other hunters using the territory, territories IV, VII, XI, XII, XIII, XIV, XVI, XXI. These eight cases included the two territories XI and XIV, on which subsistence levels significantly below 2,500 Calories per adult-day of subsistence demand were recorded. And the third territory in this group (XV) is one for which a suggestion of the beginning of a decline was recorded in 1969-70, but on which I have no decisive data.

I will discuss these eight cases in greater detail below; here I would note that the most common reason given by owners of hunting territories for why populations of moose and/or beaver are declining on their hunting territories

Table 11-25 Condition and Use of Hunting Territories, 1968-69 and 1969-70 as Reported by Waswanipi Hunters and as Suggested in Their Behavior

Hunting Territory Identification	Comments by Owners and Hunters Plus Additional Observations
I	Owner says he "has a good hunt each year", using his territory on a two section rotation. Has been used every year but one, for the last fifteen years; catches 80-90 beaver per season constantly.
IIA,IIB	One territory not used for two years, one territory not used for five years prior to 1969-70, many moose and beaver present. Originally planned to be two hunting groups, one on each separate territory, but freeze up caught them and sore leg of one man led to formation of a single co-residential group. Could use only 2/3 of territories, "too many people to have a good year" said one of the owners. At easter visit to town two commensal groups of four arrange to go elsewhere, one to be nearer town for an expected baby, one because the man's leg is sore. Both groups were the ones that could not get to their territory.
III	Owner "plenty to eat". Tries to use territory every second year to economize costs of going to distant location, maximize return in harvest. Used 1968-69 for good hunt, but found signs of people from Nemiscau trapping his land. After Easter was joined by second commensal group. Had tried to use ground in Fall of 1967-68 after using it all year 1966-67, but left at Christmas. Said the hunt was "no good".
IV	Tries to get off his territory every second year, last was able to make arrangements 1967-68. Owner says, "before I have a chance (to go elsewhere) people ask me to come to my ground". Signs of moose down in 1969-70 as signs of wolves increase. "Not too good a hunt" 1969-70. Three commensal groups used the ground in 1968-69. In 1969-70 four groups started in Fall, two left at Christmas, one the end of January. The kids of one group were sick, and the hunter, son of the owner, did not get what he wanted. "Hardly any beaver today and they don't want to grow ... People kill too many to help themselves". His brother also left and did not hunt the remainder of 1969-70, he "did not have a good hunt".
V	Tries to use territory on rotation. Used by three commensal groups in 1967-68. In 1968-69 he had a good hunt but he "killed all small beaver". Three commensal groups used territory. In 1969-70 didn't use territory to let beaver grow, paid $35 to use part of another hunting territory.

(CONTINUED)

Table 11-25 Condition and Use of Hunting Territories, 1968-69 and 1969-70 as Reported by Waswanipi Hunters and as Suggested in Their Behavior (Continued)

Hunting Territory Identification	Comments by Owners and Hunters Plus Additional Observations
VI	Used since 1965 on alternate years only. In 1969-70 had a second commensal unit until Christmas and again after Easter, i.e. for most of the year. Good hunt, 1969-70.
VII	Usually alternates two of three sections. Began Fall of 1968-69 on another territory, because one of regular sections was hunted out. Had a bad hunt, returned to his ground after Christmas, had a good hunt using hunted out regular section and the third section which had been unused for five years. In 1969-70 a good hunt again using alternate regular section. Only one commensal group of two hunters use the territory each year.
VIII	Was not used 1964-66. Was used 1967-68 and 1968-69, by two commensal units in the latter year. Had a good hunt. Not used 1969-70.
IX	Uses sections of territory alternately. Used territory for last twenty years, with one exception, 1966-67. Has a good hunt each year. Was joined by a second commensal unit in 1968-69 until Christmas when owner suggested to the man that he stay near town as his baby was sick. In 1969-70 eldest son began learning to trap.
X	A conglomerate of several territories, some territories used intermittently, some used lightly each year. Skidoo facilitates communication over vast area and light use of some territories. Three commensal units have used the area regularly since 1966-67, having seven active hunters in 1968-69 and nine in 1969-70. A good hunt every year.
XI	Hunted regularly until abandonment in 1969-70 for a projected two or three more years. Used by three commensal units in 1968-69 with twelve people 15 years old or more. By Christmas it was reported that there was "not too much food" and "sometimes not enough to eat". The group "killed nearly all (the beaver)". This ground is traversed by little used old logging roads and it is hunted by whites during the provincial moose season. Territory was not used in 1969-70 to let the beavers grow.

(CONTINUED)

Table 11-25 Condition and Use of Hunting Territories, 1968-69 and 1969-70 as Reported by Waswanipi Hunters and as Suggested in Their Behavior (Continued)

Hunting Territory Identification	Comments by Owners and Hunters Plus Additional Observations
XII,XIII	Territories used in close conjunction, and regularly. XIII was split off from XIV to help relieve pressure on XII by mutual agreement of brothers who own XII and XIV. Heavily trapped in 1968-69 when owner not present until Easter. By Easter XII was "trapped out" so group moved to XIII. Group included son and son-in-law of owner, and was "sent by the Indian Agent". XII was used in 1969-70 till Christmas, then abandoned. A child was expected so a commensal unit moved to XIV by the railway. Other commensal unit returned to town, did not trap. Territory XIII was used in 1969-70 and was "trapped out, just babies". One man "didn't trap". Another man stayed until Easter, the remaining man all season. Had a fair hunt.
XIV	Used regularly, "really low on beaver now, because too many guys trapping". Catches increased in 1969-70, possibly from recovery after low catches of 1968-69.
XV	A section has been used regularly for at least five years, generally good. One hunter had a poor hunt in 1968-69 but another an exceptional hunt, a third did well. In 1969-70 was heavily populated by people from XI. One young man who came to join the hunting group in February left within a month, not having hunted at all. There was a general decline in the quality of the hunt. Hunters expected to return again and expected continued good hunting -- I believe because a new section would be used. The other section was used in 1969-70 after two years of non use. Good trapping, but was cleaned out by Easter. All hunting was on beaver as the area is hunted by Whites in the Fall and patrolled by game wardens in winter.
XVIA,XVIB	Used regularly for over five years. Moose are declining a little. In 1968-69 five commensal units used the land in the Fall, six after Christmas with a total of nine hunters. The man who joined at Christmas had tried to hunt the Fall on a territory in the road area, and had had a poor hunt. In 1969-70 there were suggestions of a declining catch. The owner reported traps were missing the beaver, and only two of the original four commensal units stayed after Christmas.
XVII	Not used for five years. Hunted 1969-70 by one commensal unit, good hunt. Owner's son hunted for first time 1969-70.

(CONTINUED)

Table 11-25 Condition and Use of Hunting Territories, 1968-69 and 1969-70 as Reported by Waswanipi Hunters and as Suggested in Their Behavior (Continued)

Hunting Territory Identification	Comments by Owners and Hunters Additional Observations
XVIII	Sector b used regularly up to 1968-69. Hard hunt. Leader took sick, two of three commensal groups left at Christmas. Sector a used in 1969-70 after one year of non-use. Good hunt. Two commensal units - one gave non-resident owner one out of every five beaver pelts. Other didn't give any, reported to be unwelcome to territory in future.
XIX	Not used several years prior to 1969-70. Very good hunt, many beaver, many houses, large houses. Hardly hunted in spring. Two commensal groups used territory, third joined at Easter. Would be good to hunt again.
XX	Used regularly. In 1968-69 short of food, because moose hunting limited by coming of game wardens. Otherwise good hunts both years. Commensal units live at settlement. Hunter visits hunting territory for a week or two at a time. Has a bush camp, but visits back to settlement regularly.
XXI	Used constantly, but irregularly by owner, and by arrangement for exchange of services with owner. Heavily used. "Not many beaver, mostly rabbit and partridge". Good when used briefly, poor for hunting all season.

is that there are too many people who have or want access to their territory, and in some cases, they specify that they are unable to both meet these requests and leave their territory fallow when it needs it.

The existence of a high level of demand for access to hunting territories on which animal populations were reported to be declining can be seen in the distribution of the rights of access of the population of active hunters and their families among hunting territories. The numbers of individuals with rights of access to each hunting territory have been indicated above (Table 11-7). If hunting territories are compared on the basis of the number of persons with rights of access to the territory per square mile of territory there is considerable variation found in the densities (Table 11-7). That is, the size of hunting territories today is not related to the number of active winter bush camp hunters who claim access rights to those hunting territories today. Indeed, extensive correspondence would be surprising given the long-term sub-division of the hunting territories, and given the significant difference in reproductive histories of extended kinship sized groups, which was demonstrated by Dunning (1959) among a Northern Ojibwa band and which is common among sub-arctic bands.[23]

The specific instances of potential population pressure are indicated by those hunting territories with particularly high densities of people with access rights, relative to the average levels. Five of the eight hunting territories reported to be experiencing recognized declines in beaver and/or moose populations are among the six hunting territories with the highest density of people with rights of access. Hunting territory XI has a density of 12.6 people with rights of access per 100 square miles, territories IV and XIII have densities of 7.7, and territories XII and XIV have densities of 5.6 and 5.3 persons per 100 square miles respectively (Table 11-7). The average density of people with rights of access to hunting territories which were being used in 1968-70 was 3.0 persons per square mile. One hunting territory with signs of animal population declines did not experience human population pressure, territory VI, and this is the territory on which declines in animal populations were reported for only one of three sections.

The two other hunting territories, XVI and XXI, also had below average densities of people with rights of access, but were in fact in considerable demand for privileges of access, because they were hunting territories on which town and village sites were located. There are no data available to directly measure the intensity of such demand over an extended period of time, but an indication of continuing high demand over a several year period is indicated by the fact that all three of the hunting territories on which the permanent settlements of Matagami (XXI), Miquelon (XV) and Waswanipi River (XVI) were located, were used in each of the five years for which I have records (Table 11-6). This suggests that a high density of people who have rights of access, or who desire privileges of access, can make the short-term response to changes in animal populations on a hunting territory more difficult because high densities make the fallowing of a hunting territory more difficult.

When the density of people with access rights to a hunting territory and the density of people granted privileges of access are low an owner can use only part of the total area of a hunting territory each year, and part can be kept in reserve. This makes it relatively easy to adjust the areas used and the harvests taken each year to changes in the animal populations. An alternative to this is the sub-division of a hunting territory. If not all the area of a hunting territory can be used each year then the hunting territory can be sectioned, and the sections used in a regular rotation. Yet other owners may be unable to section their territory, but they may be able to arrange for rotational use of the whole territory, using privileges of access to other hunting territories in intervening years.

While this latter strategy is potentially available to all owners who cannot section or use only part of their territory, in practice when there are many people with access rights it is more difficult for all those with rights to arrange for privileges. This may deter owners from readily fallowing such territories.

The relationship of these management tactics to the density of persons with rights of access is indicated on Table 11-26. Hunting territories have been placed into one of five groups on the basis of the general method of use which the owner reported he practices and on the basis of what I judged to be a reasonable conformity between plan and practice. Those territories which owners only used in part each year, either on an ad hoc partition or an ad hoc alternation of sections, or on a rotation of regular sections, were characterized by low average densities, 2.2 and 2.9 persons with rights of access per 100 square miles. These averages were below the overall average densities for all hunting territories in use in 1968-69 and/or 1969-70, although individual hunting territories in these groups had densities above the overall average. Similar but somewhat higher densities are found for hunting territories which the owners must use fully when they are used, but which they generally use on an alternate year rotation. Territories which are used fully when they are used, and which are used regularly, although not necessarily every year, have a decidedly higher average density of people with access rights. All but one of these territories also have a higher individual density of people with access rights than does any of the hunting territories in the other groups. Finally, hunting territories on which permanent towns are located are characterized by relatively high actual densities of populations living in winter bush camps on the territory. The latter are considered a somewhat special case. For a comparison of the densities of peoples with a right of access to the actual density of people using each territory in 1968-69 and 1969-70 see Table 11-27.

The implication of these results is that owners of hunting territories which have high densities of persons with rights of access to the territory find it more difficult in the long-term to adopt the methods of rotational or partial use of the area. The data also imply that nearly all those owners who have territories with below average densities use them only in part, or on some sort of rotation. There is therefore a relationship between higher densities of

Table 11-26 Density of People With Rights of Access to Hunting Territories, Classified According to the General Method of Use of the Hunting Territory, 1965-66 to 1969-70

General Method of Use of Hunting Territory	Hunting Territory Identification	Persons With Rights of Access Per 100 Square Miles
Only Part of Hunting Territory Area Used	II	4.4
	XA,XB,XC	2.2
	XVII	1.2
	XVIII	1.4
	XIX	1.3
	XX	2.6
	Average	2.2
Territory Divided in Sections Which Are Used in Rotation	I	2.6
	V	2.9
	VII	1.6
	IX	4.5
	Average	2.9
Territory Area Fully Used, Territory Used in Rotation	III	3.4
	VI	4.3
	Average	3.9
Territory Area Fully Used, Territory Used Most Years	IV	7.7
	VIII	1.0
	XI	12.6
	XII	5.6
	XIII	7.7
	XIV	5.3
	Average	6.7
Territories on Which Permanent Settlements Are Located	XV	1.2 (15.6)[1]
	XVI	1.3 (6.9)[1]
	XXI	2.0 (12.6)[1]
	Average	1.5 (11.7)[1]
Average All Territories in Use[2]		3.0 (5.5)[1]

(CONTINUED)

Table 11-26 Density of People With Rights of Access to Hunting Territories, Classified According to the General Method of Use of the Hunting Territory, 1965-66 to 1969-70 (Continued)

Footnotes:

1. Actual density of population using the hunting territory from winter bush camps, average of two years on areas used.
2. In use in 1968-69 or 1969-70.

Table 11-27 The "Hypothetical" Distribution of Individuals With Rights of Access to Each Hunting Territory, and the Actual Distribution of Individuals Resident During the Winter Hunting Season on Each Hunting Territory, 1968-69 and 1969-70

Hunting Territory	Number of Individuals		
	With Right of Access	On the Territory	
		1968-69	1969-70
I	6	10	6
II	15	0	18
III	6	9	0
IV	12	13	17
V	8	19	0
VI	6	0	16
VII	3	3	3
VIII	3	8	0
IX	6	8	6
XA,XB[3],XC	34	16	17
XF	0	0	0
XH	0	0	0
XI	23	17	0
XII,XIII	18	6	7
XIV	6	7	11
XV	4	12	26
XVI	9	28	19
XVII	3	0	3
XVIII	2	17	8
XIX	3	0	12
XX	7	9	7
XXI	6	19	36
XXII	11	0	0
XXIII	2	0	0
XXIV	4	0	0

(CONTINUED)

Table 11-27 The "Hypothetical" Distribution of Individuals With Rights of Access to Each Hunting Territory, and the Actual Distribution of Individuals Resident During the Winter Hunting Season on Each Hunting Territory, 1968-69 and 1969-70 (Continued)

Hunting Territory	Number of Individuals		
	With Right of Access	On the Territory	
		1968-69	1969-70
XXV	0	0	0
XXVI	0	0	0
XXVII	0	0	0
XXVIII	0	0	0
XXIX	0	0	0
XXX	0	0	0
XXXI	0	0	0
XXXII	0	0	0
All	197[1]	201[2]	212[2]

Footnotes:

1. Includes all individuals considered to be active hunters, and the regular members of their commensal groups.
2. Includes some double counting of individuals who shifted fron one hunting territory to another during the winter hunting season.
3. Territory XB includes XD, XE and EG.

people with rights of access to the territory and full and regular use of a hunting territory; and therefore between higher population densities and the conditions under which resource management problems are likely to be more difficult to resolve. Declines in animal populations would be more difficult to manage because fallowing is more difficult.

b. Reducing Harvests of Declining Animal Populations by Reducing the Number of People Using a Hunting Territory

Fallowing is an effective response to declining populations of animals on a hunting territory because the harvests drop with the declining human population, and it therefore permits populations of animals to grow. In cases where fallowing is difficult, or not desired, it is possible to continue to use a hunting territory, but to adopt alternative tactics for reducing the harvests of animal populations showing signs of declines. While fallowing may be a first resort on hunting territories not used by relatively large numbers of people, a partial step towards fallowing may be an easier tactic to adopt where there are relatively large numbers of people with rights of access to a territory.

Such a step would be reducing the number of people who actually use a hunting territory on which some animal populations have declined. While the problems involved are the same as those with fallowing, the scale of the problem is smaller, because some people exercise privileges while others continue to use the hunting territory.

In Chapter 7 I have described the basic social groupings of the Waswanipi population: commensal groups and hunting groups, I will briefly summarize some of the relevant conclusions here. Commensal groups are built around male-female pair, almost always a conjugal pair. Approximately three-quarters of the commensal groups are nuclear families and the rest are either "extended" by the inclusion of other relatives, or by the inclusion of a non-related "friend", which occurs in about five percent of the cases.

These commensal groups are generally stable over a period of years. Of the commensal groups that went to winter bush camps in 1968-69 and 1969-70 over eighty percent had either identical membership or just changes in the children who went to the bush and those who went to school. This general stability of commensal groups is in contrast to the hunting groups, which are decidedly less stable. Hunting groups are formed on the basis of a combination of rights of access and of privileges linking the male head of each commensal group comprising the hunting group to the head of the hunting group. The head is either the owner of the hunting territory or a hunter with rights or permission to use the hunting territory and the approval of the owner. Hunting group formation therefore reflects the combination of rights of access and the granting of privileges, sometimes in a long-term pattern of generalized exchanges of privileges. The hunting group would therefore be expected to show limited stability overtime, as was indicated in Chapter 7, because the factors affecting hunting group formation are related to the management of hunting territories.

An initial assessment of the importance of hunting group formation is possible by comparing the actual distribution of the Waswanipi hunting population with the distribution which would result if each hunter and commensal group went to the hunting territory to which they have a right of access. On the same table I have listed the number of people with rights of access to each hunting territory and those on the territory during the season of 1968-69 and 1969-70 (Table 11-27). The total of the individuals resident on the hunting territories is elevated by double counting of those individuals who shifted from one hunting territory to another during the winter hunting season.

Comparison of the distribution of individuals with rights of access with the distribution of individuals who actually use hunting territories indicates that a minority of uses of hunting territories correspond to use by a hunting group composed exactly of those individuals with rights of access to that territory. All instances on Table 11-27 where the number of people using a territory is the same as the number with rights of access are in fact cases where the same individuals are involved. There was one such case in 1968-69, territory VII, and five in 1969-70, territories I, VII, IX, XVII and XX. Thus, during the two-year period only six of the occasions of use of the 23 hunting territories with active hunters who have rights of access, were uses by hunting groups composed of exactly those individuals who had the rights, a total of twenty-two percent of the actual occasions of use. Privileges therefore play an important role in the actual distribution of the human population to hunting territories.

A preliminary evaluation of the extent to which this flexibility of distribution of the Waswanipi population among hunting territories is responsive to resource management decisions can be made by examining the statements of the Waswanipi.

Waswanipi men do not speak extensively or frequently of the process of hunting group formation as an important part of their adjustment of human populations to land and to animal populations. Indeed, there is a general lack of comment on ecological considerations in hunting group formation. Whenever the "invitation" by hunting territory owners to other men to hunt on their territories was discussed a series of non-resource use factors would be cited. Men would say they wanted someone to hunt with them because he was a friend, or that this family needed to be near a town because a woman was pregnant or someone was sick. Similarly, it was said that a man should hunt elsewhere so his pregnant wife could be nearer to town. One man was said to have been invited by an owner to hunt on his not too distant hunting territory for a whole winter in order that in the spring he could bring back to the settlement the canoe of a third man which had been left on that territory the previous year. He was a man without a canoe of his own. In a limited number of cases gifts were arranged for the use of territories as previously reported.

The logic of such explanations appears to lie precisely in their placing the decisions of hunting territory owners into a frame of reference in which the elements of personal judgments and opinions about others who are offered or denied privileges are withheld from public view. Just as the hierarchical structure of owners versus non-owners is de-emphasized by talking of the dependence of some men on privileges granted by other men in terms of invitations, so the personal judgments involved in who receives privileges are explained in terms of the types of mundane practicalities that provide a non-evaluative explanation of why privileges were or were not given to one man, as opposed to another. Resource related explanations are not appropriate here because they cannot explain why a particular individual as opposed to other individuals should be included or excluded.

On those occasions when the problems of size of hunting groups and group formation were discussed in general, rather than around specific cases, Waswanipi men spoke explicitly in terms of the impact of formation of hunting groups on the possibilities for rotation or periodic abandonment of the hunting territories, as indicated above. One man complained that "before I have a chance (to go elsewhere) people ask me to come to my ground".

Thus, despite the fact that explanation of the exchange of particular privileges deals more directly, or indirectly in this case, with the interpersonal dimensions of the choices, the resource use dimensions of the decisions are in fact an important part of the information exchanged prior to the making of decisions about privileges of access to hunting territories.

Hunters usually work in pairs, or at least state a definite preference for sharing residences with another hunter, for security reasons and for companionship. While the hunters are occasionally called "partners", in fact each is an independent producer with individual ownership of the products of the hunt; although there is extensive sharing of subsistence production through exchanges. A man may hunt only with his son but most hunting territories are utilized by social groupings that are themselves composed of more than one commensal group. Most hunting groups are therefore composed of two or more commensal units that have formed under a leader, i.e., someone who owns or has access to a hunting territory.

Leadership is well defined but ideologically de-emphasized in the society as a whole. Within the hunting groups leadership is not emphasized, but does exist. In the past informants report that the owner of a territory always went to his own territory and was leader of the hunting group on it. Today the owners of territories may not be able to go to their hunting territories because of age or illness, or may intermittently spend a year not hunting, or may in fact go to other hunting territories for a year. Therefore, leadership of the hunting group today does on occasion fall to a man who has a right or a privilege to utilize a territory of which he is not the owner.

The aspect of leadership with which I am particularly concerned here is the process of formation of the hunting groups. Men who do not want to exercize their right of access to a hunting territory must arrange with an owner to use another hunting territory, and although strong claims for privileges can be established by most hunters to one or more other territories, often because of a history of previous exchanges, a choice has to be made. For each man, hypothetically at least, there usually is a number of strong claims for privileges he can make to use different hunting territories. Therefore a process of selection must occur.

Decisions on the privileges sought and given are taken throughout each summer as each owner and each hunter begins to plan for the coming winter hunting season. From August on, people physically start to prepare to go back to the hunting territories, equipment is repaired, purchases are planned, arrangements for travel organized. It is during the summer that the plans for the use or non-use of particular hunting territories during the coming winter become public knowledge.

Men who are seeking privileged access to a hunting territory for the coming winter make their needs known during this period. Such hunters put information concerning their own needs into the informal discussion/gossip network. They make clear that they will not be going to a hunting territory to which they have a right of access and, in some instances, they cite some factors that could affect which other territories they would like to use.

What is interesting in the present context is that resource management factors are among the most common factors for explaining why a hunter will not be using a hunting territory to which he has a right of access. For example, a man would say his father's ground was trapped out or too crowded, thereby serving notice on other owners whose hunting territories were potential alternative residences for him that he wants to join one of them. Resource related factors imply a predicament that the hunter is morally obliged to respond to by finding a privilege to use an alternative hunting territory. Non-resource related factors indicate which ones he hoped to get an invitation to use. A man may say he wishes to remain near town because he has been feeling ill lately, or because his canoe or motor may not be good enough for a long trip.

Such bits of information in the gossip network go a long way to making a man's situation clear because, while the social network itself is very elaborate, the number of choices likely open to any man are limited, and within the community they are more or less public knowledge.

This is why informants are able to state during the fall either who will be hunting with whom, or who they expect will be hunting with whom. It was this information, based both on publicly stated decisions by hunters and on publicly widespread expectations about hunters, that was the basis of my identification of the expected heads of hunting groups in the fall of 1968 whom I asked to keep diaries. As this process indicated, however, some invitations are given and accepted up until literally the day of departure.

Thus, resource related factors appear to be publicly stated reasons for the non-use of hunting territories, but the actual invitations made are explained in terms of social and non-resource related practical reasons. The entire process of deciding on the actual use of hunting territories is therefore not usually spoken of as a process of adjusting human populations to the land and resource base, although such factors explicitly enter into the process. The extent to which they are influential will become clearer in the analysis of the use of hunting territories which follows.

With data on the use of hunting territories over a two-year period it is possible to follow the response to the subsistence levels attained in the first year on the allocation of the human population to hunting territories in the second year. There were a total of eleven hunting territories which were used in both 1968-1969.[24] Changes in the human populations on the territories in the two years can be determined by comparing the densities of the people on each of the eleven territories in each of the two years (Table 11-28). There was a lower density of people in 1969-70 than in 1968-69 on six hunting territories, a higher density of four and essentially the same density on one (Table 11-29).

Those hunting territories on which the density of winter residents declined from 1968-69 to 1969-70 averaged moose and beaver harvests of 3,446 Calories per adult-day in 1968-69 whereas those hunting territories on which the density of winter residents went up averaged 4,629 Calories per adult-day in 1968-69. This suggests that in general decisions about how many people will use a hunting territory in a given year is responsive to the subsistence levels attained in the previous year, and therefore to harvests of moose and beaver and to perceived conditions of the populations of those animals. Nevertheless, there is variation in the subsistence levels attained on territories in each category and there is some overlap of subsistence levels between groups. One anomalous figure is the low subsistence level recorded on territory XIV in 1968-69, given that there was an increase in the human population density in the following year. This case will be discussed below.

The increases or decreases in the population densities on hunting territories between 1968-69 and 1969-70 generally were accompanied by increases or decreases in the harvests of moose plus beaver, measured as Calories from moose and beaver per square mile of territory used. Of the six territories with

Table 11-28 Density of Population Resident in Winter Bush Camps on Each Hunting Territory During 1968-69 and 1969-70

Hunting Territory Identification	Density of Residents During Winter Hunting Season (People Per 100 Square Miles) 1968-69	1969-70	Average for Year(s) in Use
I	7.7	6.1	6.9
II	-[1]	7.5	7.5
III	5.0	-	5.0
IV	8.3	10.9	9.6
V	16.2	-	16.2
VI	-	11.4	11.4
VII	2.3	5.5	3.9
VIII	2.6	-	2.6
IX	13.3	8.2	10.7
X	1.3	1.5	1.4
XI	9.3	-	9.3
XII	2.6	-	2.6
XIII		7.7	7.7
XIV	6.2	9.7	7.9
XVa	14.3	20.2	17.3
XVb	-	13.9	13.9
XVI	6.9	6.8	6.9
XVII	-	3.0	3.0
XVIII	25.4	21.6	23.5
XIX	-	6.6	6.6
XX	9.8	7.6	8.7
XXI	6.3	18.9	12.6
Average	4.9	6.0	5.5

Footnote:

1. Not in use.

Table 11-29 Subsistence Level Attained in 1968-69 on Hunting Territories on Which the Density of People Went Up, Down and Was Unchanged From 1968-69 to 1969-70

Population Density Up in 1969-70		Population Density the Same		Population Density Down in 1969-70	
Hunting Territory Identification	Subsistence Level, 1968-69[1]	Hunting Territory Identification	Subsistence Level, 1968-69[1]	Hunting Territory Identification	Subsistence Level, 1968-69[1]
IV	3,931	XVI	3,342	I	4,713
VII	6,271			IX	3,511
X	5,211			XVIII	2,804
XIV	1,886			XX	2,756
XVa	3,493				
XXI	4,822				
Average	4,629			Average	3,446

Footnote:

1. Calories from moose and beaver per adult day of subsistence demand.

increases in population densities the combined caloric harvests of moose and beaver increased or changed less than ten percent on five territories.[25] On one hunting territory the combined harvests went down, territory IV, which the owner indicated began to show signs of decreasing moose and beaver populations in 1969-70.

On the other hand, three of the four hunting territories on which the density of winter residents declined also had declining combined harvests of moose and beaver, territories I, IX and XX. The exception was territory XVIII, which was the only one of the group which was not hunted by the owner himself in either year. It may be significant that this is the only occasion on which I was explicitly told that the owner was unhappy with one of the hunters whom he had given the privilege to use the territory, and that he would not be welcome again. It must be noted however that the reason cited was a failure to give the owner any of the beaver pelts captured. I failed to inquire if this was related to any disagreement over the number of beaver to be captured.

These data therefore suggest a general relationship between harvests of moose and beaver, and subsistence levels attained in one year and the number of people and/or the size of the area used, i.e., the density of people using the territory, and the intensity of the harvests of moose and beaver in the following year. However, the data demonstrate the relationship is complicated by several factors, including: the intermittent use of some territories and occasional absence of owners from hunting groups.

iii) Use of Alternative Food Resources as a Management Technique

Adjusting the number of people using a territory and the location and size of the area used to changes in the condition of moose and beaver populations is the main mechanism for managing animal populations. However, as indicated above, there are hunting territories on which it is difficult to use this mechanism because high densities of people with rights of access limits opportunities for partial use and makes alternative privileges more complex to arrange. Under these conditions the one alternative that permits continued use is to reduce the harvests of moose and beaver by depending less heavily on those resources and using alternative animal resources and/or purchased foods to meet subsistence needs.

The use of alternative food species is always possible but it does involve significant costs because declines in populations of moose or beaver usually go hand in hand; or the declines of one species rapidly follow declines in the other. Therefore, the alternative kinds of wild foods available are fish and small game, which may be relatively abundant, but which are generally less efficiently harvestable than moose and beaver, and hunters working schedules are already very heavy (see Chapters 9 and 10). Nevertheless, such an option may be more desirable than abandoning harvesting of the hunting territory, and the work loads may be somewhat moderated by also increasing the harvesting work of women and children, if the latter are old enough to actively participate in the hunting.

Of the eight hunting territories on which there were recognized signs of animal declines, two owners responded by reducing harvests of moose and beaver and turning to alternative foods. In 1968-69 the hunters on territory IV harvested sufficient moose and beaver to provide 3,931 Calories per adult-day of subsistence demand. In 1969-70 declines of both moose and beaver were recognized, but the owner reported that he was unable to fallow the territory because of the number of people asking to use it. Although the number of people went up from 1968-69 to 1969-60, the harvests of moose and beaver were reduced to the level of 2,524 Calories per adult-day of subsistence demand, or about the minimum level (Table 11-22). The data available do not extend over a sufficient number of years to indicate whether this response was effective.

In the case of hunting territory XIV the owner reported that beaver and moose populations were low for several years and in 1967-68 and 1968-69 he reported making inadequate harvests of moose and beaver. The total 1968-69 harvest of moose and beaver was only 1,886 Caloires per adult-day (Table 11-22). In this hunting group moose and beaver together provided only 71 percent of all Calories from bush food harvests, as compared with an average of 89 percent for the hunting group sample considered in Chapter 8 (Table 8-19). And whereas, on average, fish plus small game provided 10 percent of all Calories from bush food harvests, the hunting group using territory XIV in 1968-69 derived 29 percent of all Calories from bush foods from these sources. Thus, although moose and beaver harvests were reduced, harvests of fish, game birds and/or small game were marginally increased, with the result that a total of 2,850 Calories were available from harvested animals per adult-day of subsistence demand. The group did not replace all foregone harvests of moose and beaver with harvests of small game and fish, presumably because of the high labor costs involved. Greater use was also made of less desirable purchased foods to meet subsistence needs. Whereas the sampled hunting groups averaged 22 percent of available Calories from purchased foods, the hunting group on territory XIV averaged nearly 40 percent of available food from purchased foods.

Thus, while the owner of hunting territory XIV reduced his harvests of beaver and moose in order to let the populations grow, he increased the harvests of fish, game birds and other small game, and he increased the quantities of purchased foods consumed during the winter hunting season to compensate for the lowered harvests of moose and beaver. In total approximately 4,700 Calories of food were available per adult-day.

While I do not have comparable data for the hunting group which used territory IV the relationship between the harvest of less moose and beaver and the increased use of other wildlife resources and of purchased foods is consistent with the findings reported in Chapter 8.

One means of responding to declines in populations of moose and beaver is by harvesting less of those species and meeting subsistence needs by increased use of alternative resources. The effectiveness of this method, at least under some conditions is indicated by the history of hunting territory XIV.

The reduced use of moose and beaver which were documented for this hunting territory for 1968-69 were in fact practiced for two successive years according to the owner, 1967-68 and 1968-69. At the end of these two years however the owner reported that the beaver had grown and were no longer very low. As a result, the harvests of 1969-70 were returned to normal or near normal levels. Thus, despite a higher subsistence demand density placed on the territory in 1969-70 (Table 11-21) the Calories from moose and beaver per adult-day of subsistence demand were increased from 1,886 in 1968-69 to 3,697 in 1969-70. This resulted from an increase in moose harvests from 2 in 1968-69 to 5 in 1969-70 and an increase in beaver harvests from 38 to 110.

The procedure appears therefore to have been successful in this case, but at a cost of intensive work, and high dependence on purchased foods that most hunters consider to be less desirable and healthy than bush foods. The advantage was that it allowed a reduction in harvests of moose and beaver and a recovery of the populations without requiring a reduction in the group of people who regularly use the hunting territory.

iv) Responses to Extended Declines in Animal Populations

a. The Development of Extended Declines

The short-term tactics for managing animal populations are generally effective as responses to recognized declines in animal populations, but on some occasions declines in the animal populations may continue over several years without remedy, creating an extended decline. This indicates that the responses made during the first year or two may not always be sufficient. This did not happen if a hunting territory was fallowed, but it did happen on some occasions when a hunting territory was not completely fallowed but only the number of people using it was reduced, or the use of other food resources was increased.

Thus, of the eight cases I cited above of hunting territories which were recognized to show signs of declines in beaver and/or moose populations, all were instances in which the declines had been developing over several years, and two were cases where the responses which were initially tried were inadequate.

The owner and the hunters who used hunting territory IV reported declines in beaver and moose were apparent in 1969-70, but these had been foreseen a year or two earlier. The owner of hunting territory VII reported that one of the three sections of his territory had been hunted out by the beginning of 1968-69. Hunting territory XI had been under pressure for several years and was said to have been cleaned out of "nearly all the beaver" by mid-1968-69, and moose were said to be low as well because the territory was easily accessible to sport hunters during the fall. Similarly, the owners of three adjacent territories reported extended problems. Territory XII was "trapped out" in late 1968-69, territory XIII was "trapped out, just babies" in 1969-70, and territory IV was "really low on beaver" in 1968-69. On territory XVI there were signs of a declining moose population during 1968-69 and of declining beaver populations in 1969-70. And, on territory XXI there were reported to be not many beaver, or big game, mainly small game in both 1968-69 and 1969-70, and for several years previous.

On these hunting territories unplanned declines in the populations of beaver and moose occurred and were recognized by the owners and/or hunters as extending over a period of years. This was recognized either as a decline in the numbers of animals or, in the case of beaver, as removal of all adult beaver so that there were only small beaver left. The reasons for the declines in the wildlife populations were explicitly stated by most of the owners and hunters on their own initiative. The reasons were without exception that the hunting territories or sections had been "trapped out", or the hunters "kill too many" or "killed nearly all", or that there are "too many guys trapping." That is, in the six of the eight cases of hunting territories with extended animal declines, the men involved attributed the decline to the hunters' own harvesting activities. The hunters clearly accepted responsibility for the declines in the populations. This is, of course, consistent with Waswanipi belief systems as I outlined in greater detail in Chapter 6.

Waswanipi beliefs emphasize that things do not always come out as men hope, and they provide a standardized set of responses for the unintended outcomes of human action. The most common of these tactics have been outlined above, and these were in fact used on the hunting territories on which declines were recognized.

One impact of the reported declines of the beaver or moose populations on hunting territories is reflected in the relatively low or declining densities of the harvests taken by the hunters during the year of reported decline. In seven of the eight cases of reported declines in wildlife populations, the density of the harvests of the species for the year in which the decline was reported was low relative to the average of the harvest densities reported over all hunting territories being used.

In 1968-69 and 1969-70 the average harvest densities of beaver were 1.00 and 1.12 per square mile, whereas seven of the eight hunting territories with reported declines in populations had beaver harvest densities of 0.34 to 0.88 beaver per square mile (Table 11-30). Only one hunting territory, XIII, had an average beaver harvest density equal to the average. For two territories, IV and XVI there are data on the beaver harvest density for the year prior to the reported beaver decline and these data indicate a downward trend from 1968-69 to 1969-70 in both cases (Table 11-14).[26]

A generally similar situation occurs with respect to moose. Moose harvest densities for the hunting territories and years in which declines were definitely reported were all lower than or equal to the average moose harvest densities of .035 and .029 per square mile for 1968-69 and 1969-70 respectively. The range on territories with definite reports of declines ranged from .017 to .035 moose harvests per square mile (Table 11-30). The trends on territories for which there are data on harvest densities for the year previous to the reported decline (IV) and on territories for which the decline was reported over two years (XVI and XXI) are all downward.

Table 11-30 Harvest Densities of Beaver and Moose, on Hunting Territories Reported to Have Declining Populations of Those Species, and on All Hunting Territories in Use, 1968-69 and 1969-70

Hunting Territory Identification	Species Reported Declining		Comments on Declines	Year(s)	Density of Harvests	
	Beaver	Moose			Beaver	Moose
IV	Yes	Yes	Reported in 1969-70	1968-69	0.76	.051
				1969-70	0.66	.019
VII	Yes	Yes	One of three sections only. That section was used in 1968-69 only.	1968-69	0.88	.023
XI	Yes	Yes	Reported in 1968-69	1968-69	0.80	.017
XII	Yes	?	Reported in 1968-69	1968-69	0.70	.039
XIII	Yes	?	Reported in 1969-70	1969-70	1.12	.022
XIV	Yes	?	Reported in 1968-69	1968-69	0.34	.018
XVI	Yes	Yes	Moose reported in 1968-69, beaver and moose in 1969-70	1968-69	0.90	.035
				1969-70	0.67	.018
XXI	Yes	Yes	Reported in 1968-69 and 1969-70	1968-69	0.38	.031
				1969-70	0.65	.016
Averages for All Territories Used				1968-69	1.00	.035
				1969-70	1.12	.029[1]

Footnote: 1. Average excludes the case of hunting territory XVb on which no moose were harvested, see text.

In short, the data indicate that an initial response to recognized declines in animal populations is a reduction of harvests. This response is accompanied in many of the cases by a decline in the number of hunters using the hunting territory. Four commensal groups formed the hunting group on territory IV in the fall of 1969-70, but two left at Christmas and one at the end of January, and only the commensal group of the owner stayed to complete the winter hunting season (Table 11-25). Hunting territory XII was abandoned at Easter time in 1968-69 and left unharvested during the spring. In 1969-70, hunting territory XIII was occupied by three hunters, one of whom did not trap at all, one left at Easter and only one completed the winter hunting season. On hunting territory XVI, four hunting groups began the winter hunting season in 1969-70, but two left at Christmas and only two completed the season.

Thus, in four of the eight cases the perceived declines in wildlife resulted in a number of hunters ceasing to harvest on the hunting territory during the remainder of the winter hunting season in which the animal populations were perceived to be declining.

On one of the other hunting territories, XIV, the declines were reversed by using alternative food sources, as indicated above. On another hunting territory the decline was effectively dealt with by rotating use. In the latter case the owner of hunting territory VII reported that one of three sections on that territory had been hunted out by the beginning of 1968-69. As a response an infrequently used section of the territory was used in 1968-69, along with the depleted section, in order to reduce harvesting on the latter section, and a third section was used in 1969-70 on a regular rotation while the depleted section was fallowed. This reportedly was effective in restoring animal populations on the depleted section. Thus, where the declines occur on only one section of a hunting territory the situation can be effectively resolved by utilizing other sections of the territory and reducing harvests or fallowing the depleted section.

On the other hunting territories, the opportunity to simply rotate use of sections of a hunting territory was not available and more extended declines had to be managed. Because of the timing of the declines I have data on the final responses adopted in only three of the six cases. On the others, territories IV, XVI and XXI, the declines were still being dealt with in 1970-71.

b. Fallowing for Extended Periods as a Last Resort

The last resort response to seriously declining populations of moose and/or beaver is to fallow the hunting territory for two or more years to permit animal populations to recover before being harvested again. This is an important reason for ad hoc abandonment of a hunting territory, although such fallowing also occurs before animal population declines extend over a few years. This response was adopted in two of the six cases of declines recognized in 1968-69. Hunting territories XI and XII were not used for most of the year following the year of serious reported declines. The owner of hunting territory XII, who had not been present in 1968-69 when declines were reported, tried to hunt on the territory in the fall of 1969, but the group abandoned the territory at Christmas, and it was left unused the rest of the year. According to reports I received after leaving the field, this territory was also left unused in 1970-71.

These two cases make clear that abandonment of a hunting territory on which animal populations have declined over several years is often a last resort after other tactics have failed to reverse the trend. The owner of territory XII wanted to use the hunting territory in 1969-70 because he had no effective alternative; and, when he was certain that the territory needed to be fallowed, he left the hunting territory and ceased hunting for the rest of the winter hunting season, along with other members of his commensal group. The situation that led to this circumstance extends over several years.

The owner of hunting territory XII had six surviving sons and three daughters, of which four sons and two daughters were maried in 1968-70, and all but one of which were regularly involved in hunting from winter bush camps. The group of sons has primary access rights to territories XII and XIII, the latter territory having been given to one of the sons of the owner of territory XII by his brother. The combined density of people with primary access rights was 6.1 people per 100 square miles, the third highest density recorded (Table 11-7). Declining trends in moose and beaver populations were recognized for several years, but arranging to reduce harvest proved complicated.

The sons and daughters of the owners have married the offspring of the owners of three other hunting territories, IV, VI and XXI, and these are the most likely territories to which the sons of the owner of territory XII could receive privileges of access. However, territory IV has an even higher density of people with long-term access rights, 7.7 per 100 square miles, territory VI has an above average density, 4.3 people per 100 square miles, and territory XXI is the heavily used area on which the town of Matagami is located. Access to each of those areas was in fact arranged in 1967-68, but it could not be arranged for all the hunters with long-term access rights to territories XII and XIII.

In 1968-69, to try to further reduce use, the owner of territory XII started to use an area immediately to the south of the Waswanipi hunting territory area. As a result, only one son and one son-in-law hunted on territories XII and XIII for most of 1968-69 and one section of XII was left completely unused. That the territory was used at all, I would infer, was at least partly a result of the need to reciprocate a privilege granted the previous year. What happened however was that the two young hunters, hunting by themselves for most of the season, took a high harvest of both moose and beaver and seriously depleted the moose and beaver populations. The son-in-law, who was leader of the hunting group, indicated to me that he felt in general that permission to use a hunting territory meant a hunter could harvest what he wanted rather than only a number specified by an owner.

The result was that the effort to reduce harvests before the populations were seriously depleted was undercut, and in the winter of 1969-70 the owner of hunting territory XII had to cease his hunt after unexpectedly finding the animal populations depleted. It was the first time he had not hunted during the winter in his life. The next year I understand the territory was again left fallow, although arrangements for the owner to hunt on the area south of the Waswanipi traplines were made for that year.

The problems confronted by the owner of hunting territory XI were of similar origin. This is the hunting territory with by far the highest density of persons with access rights, 12.6 persons per 100 square miles (Table 11-7). The owner has three adult daughters and four adult sons, all active in winter bush camp hunting. The linkages by marriage are to the owners of hunting territories IIA and XF, both in the north of the area of the Waswanipi hunting territories, and both expensive to use and not used often by their owners.

This territory was recognized to be in need of reduced harvesting prior to 1968-69, but in that year it became clear that it was in need of fallow and after reducing use of the territory during the course of that winter, it was left fallow in 1969-70. The hunters who use it thought it would take two or three, possibly four years, of non-use for the beaver and moose populations to return to their former levels. All the hunters were able to make arrangements to use other territories in 1969-70. However, at the end of that season it was claimed that one territory on which the owner of territory XI and three of his offspring had stayed was itself beginning to show signs of declines, and there might have to be changed the following year.

Hunting territories with high population pressures are clearly the most difficult to use consistently and to manage well, and they are also the hunting territories which are the most difficult to fallow. It appears that they are only fallowed in those cases when other options have been exhausted.

v) Review of Strategies and Tactics of Management

The nature of the strategies and tactics generally used by owners of hunting territories to regulate the use of the wildlife resources of their hunting territories can now be summarized and reviewed.

When small scale changes in the populations of beaver and/or moose occur, particularly signs of declining availability or of declines in the numbers of adults, the initial responses may occur within the winter hunting season when signs are recognized. These will be to reduce the harvests of the species affected and possibly to reduce the number of people residing on and subsisting from the hunting territory affected. If only moose or beaver are affected the other of these two species may be harvested somewhat more intensively.

If the hunting territory or section on which the signs appeared is one on which hunting activities are not normally continuous then that territory or section will not be used the following year. Either another section or area of the territory or another hunting territory will be used. This may be part of a regular rotational plan or it may be as an ad hoc response to signs of the condition of the animal populations. This response appears to be generally effective, so that year to year changes in animal populations are effectively regulated by intermittent use of the hunting territory or section. This is reflected in the fact that no territory used on a sectional or regular intermittent basis was identified as showing extended signs of animal population declines.

Among those hunting territories which are usually used every year, the initial response to signs of changes in animal populations will normally be followed by a reduction in the number of people living on the territory during one or more following winters, and by a continued reduced harvest of the moose and/or beaver populations for one or more years. These territories are generally those on which high densities of people have access rights so that it is easier to try to reduce the number of people who are using the territory than it is to fallow the territory completely. An alternative, or parallel, strategy on such territories is to reduce the harvests of moose and/or beaver and to meet basic subsistence needs from less valued alternative wild food resources and purchased foods. In general however, the intensive use of fish, small game, and game birds in winter is limited by the labor involved, and it may be limited by the animal populations, at least during the years when those resource populations which vary significantly from year to year are at low densities. Increased use of purchased foods is the only alternative in these cases, and it is practiced, although such foods are generally considered to be of much lower value than bush foods.

These measures to reduce harvests of moose and beaver while continuing some use of the hunting territory are generally effective ways of allowing animal populations to recover, and eventually reestablishing conditions which permit a return to normal harvest levels.

In some cases, however, these procedures do not succeed and an unplanned decline of moose and/or beaver populations continues and becomes more serious. In this two-year study two of twenty-six hunting territories, which were used, were reported to be experiencing these more serious declines, or about four percent per year. In these cases the hunting territory is completely fallowed for anywhere from two to four years, depending on the owner's estimate of how long it will take for the beaver and moose populations to grow. This _ad hoc_ fallowing is practiced even though the consequence may be that the owner and/or some of the hunters who have rights of access to the territory may find it difficult to arrange for privileges to hunt other hunting territories during this period. This method is an effective means of permitting the recovery of the animal populations of the hunting territory, and both of the territories given _ad hoc_ multi-year fallows during 1968 to 1970 were reported to be back in regular use when follow-up data were collected in the mid-1970's. The exact duration of the fallows was not however determined.

By these methods then the Waswanipi hunting territory owners are able to regulate the harvests of moose and beaver on their hunting territories so that the long-term survival of the animal populations is assured, and so that the long-term resilience is maintained.

The means by which they do this may be conceptualized as a hierarchical ranking of responses, immediate responses which occur the year the change is recognized, responses in the following year or two, and longer term responses when necessary. These are outlined on Table 11-31. In the hierarchy of responses to perceived changes in wildlife populations, each step in the response involves somewhat greater difficulty to implement, but each assures a higher chance of success of returning game populations to conditions consistent with long-term goals for maintenance and resilience of the populations.

That this system of management of animal populations, human populations, distributions, hunting activity, and human subsistence, works is indicated at the community-wide level by the overall maintenance and relative stability of animal populations and harvests.

vi) Variations in Skill and Reputation of Hunting Territory Owners

Success with the Waswanipi system of management rests in the hands of the individual hunting territory owners, whose experience, judgements and decisions concerning the condition of the populations of moose and beaver on their hunting territories and the hunting activity appropriate to those conditions is the key to their success as owners. Such success must vary over time, and between owners. Correctly assessing the situation and appropriate responses requires extensive information and considerable experience with conditions within the area of a hunting territory. Differences are likely to exist, and the Waswanipi themselves recognize differences in the success of different hunting territory owners.

Despite the fact that fallowing a hunting territory for an extended period will

Table 11-31 Types of Responses to Recognition of Changes in Animal Populations on Hunting Territories

Time of Response	Conditions for Responses	Responses	Usual Outcomes
I Immediate, Year in Which Change in Animal Populations is Recognized		a-Reduce harvests, and b-Reduce people living on territory	-Type I responses are usually followed by Type II responses
II Year or Two Following Recognition of Change	A-On territories with low densities of hunters and dependents	a-Rotate sections, or b-Use alternate part of territory, or c-Fallow territory	-Type II-A responses are typically effective
	B-On territories with high densities of hunters and dependents	a-Reduce people living on territory, or b-Increase use of alternative wild foods and purchased foods	-Type II-B responses are usually effective, if not they are followed by Type III responses
III Medium-term Responses, Two to Four Years After Change is Recognized	B-On territories with high densities of hunters and dependents	a-Fallow hunting territory	-Type III responses are typically effective

under almost all conditions create an increase in moose and beaver populations, and offset extended declines in the populations, the Waswanipi belief system and values emphasize that good hunting and good relationships between men, animals and spirit beings result in cyclical variations in animals and harvests, variation which is seen as ideally recurring and short-term. Thus when extended declines in animal populations occur on a hunting territory, this is spoken of negatively, and owners of hunting territories who seldom have such problems are held in high esteem, whereas those who do have problems are accorded lower prestige.

It will be recalled in the context of eliciting the hunting skill ratings of individual men comments explaining comparatively positive ratings were most frequently to be to the effect that a hunter "always has a good hunt," or that "he is good at everything". These comments suggest that reputations as hunters depend on long-term success not short-term harvests, and that it is relative continuity in the long-term rather than great variability that is respected. This standard is applied to the owners of hunting territories as well.

Two points need analysis here, first whether significant differences in the long-term success of hunting territory owners occur; and second to see if these differences are related to the reputations of these men. On the first issue I would turn first to the implicit Waswanipi view.

It will be recalled that in the system of Waswanipi beliefs it is the animals and spirit beings that give animals to men, and it is the relationship between men and the other powerful beings of the world that is at the base of hunting success. It is therefore how hunters "think" about power beings, and how they act, that are the primary facts Waswanipi use for understanding and explaining the outcomes of harvesting activities. Thus what a man catches in one year is explained by what he caught and did previously. These beliefs lead to explicit statements that it is the hunters and their actions that are important. The existence of differences in managerial success has been indicated in the data presented above on the public identification of hunting territories on which extensive declines in animal populations had occurred in 1968-69 and 1969-70. The importance of managerial decisions in affecting animal populations and harvests over a longer period is evident in the data available on the management of beaver resources.

As an indication of the degree of variation that can occur over time as a result of the management decisions of hunting territory owners, I have reviewed the annual inventory of beaver colonies made by each hunting territory owner for government the period from 1954 until the year when inventories were ceased by an owner, which varies between 1960 and 1965. The figures were provided by the Quebec Fur Service, of the Quebec Department of Tourism, Fish and Game. The use of such inventories must be qualified because they are subject to variations in the accuracy among the owners completing them, and to some conscious adjustments. Nevertheless, because they parallel the information the owner himself must use, I think they also reflect real changes in conditions on the hunting territories. In order to use these data, the hunting territories as defined in the present study (Map 11-1) are grouped so as to best correspond to the officially recognized traplines during the period from 1954 to the early 1960's, and where necessary the areas included in each territory have been recalculated accordingly.

While there are few standard procedures for estimating the maximum density of beaver populations that can be supported on any area short of a long-term biological study, I will assume that a reasonable approximation is the maximum density of colonies that were actually present on the territories during the period covered by these records. The highest single report of beaver colonies for a year on each territory during the period is listed on Table 11-32, and the density of the lodges per square mile is calculated.

The period covered by these data is significant because the hunting territories which were originally in the Mistassini reserve began being harvested on a limited basis in 1954, after several years of restricted beaver harvests. This means that the inventories for this period probably show the beaver populations at a time they should have been very high, after at least five years without

Table 11-32 Highest Number and Density of Beaver Colonies on Waswanipi Hunting Territories During 1954-1965

Hunting Territories Grouped to Approximate Traplines	Area (Sq.Mi.)	Highest Number of Beaver Colonies Reported 1954-1965	Highest Density of Beaver Colonies Per Square Mile, 1954-1965
I	229	129	0.57
II	337	128	0.38
III	179	93	0.52
IV[1]	225	148	0.66
V, VIII	578	245	0.42
VI	140	114	0.81
VII	183	100	0.55
IX	133	50	0.38
XA	419	206	0.49
XB,XH,XE[1]	1,577	454	0.29
XC	287	120	0.43
XI	182	70	0.38
XII,XIII,XIV	400	234	0.58
XV,XVIII[1]	955	420	0.44
XVI[1]	1,093	381	0.39
XIX	224	92	0.41
XX	265	100	0.38
XXI	304	108	0.36
XXII	187	110	0.59
XXIII	136	75	0.55
XXX	288	102	0.35

Footnote:

1. Plus other land.

being hunted. In fact, on fifty percent of the hunting territories the highest inventory occurs between 1954 and 1956 inclusive (Table 11-33).

Comparing the highest density of beaver colonies on one hunting territory to the highest density on the others, all the figures are within a range of 2.8 times the lowest figure, and all but two of the figures are within a range defined by twice the value of the lowest figures in the series (0.29) (Table 11-32). This range of variation between the highest densities on different territories is assumed to be a measure of the degree of variation in beaver populations that may be attributable to variations in long-term ecological conditions.

This range of variation between hunting territories which is assumed to result from long-term ecological differences may be compared with the short-term variations on each individual hunting territory. On Table 11-33 I have listed the extremes of high and low beaver colony inventories on each hunting territory between 1954 and approximately 1966. The highest divided by the lowest gives a numerical estimate of the variability in densities, which respond to several short-term variables, of which I assume that annual harvests are the most important. This ratio I have called the multiplier. Most high inventories varied by at least two times the low and the overall average multiplier is 4.1. The time between the high and low on a given territory was as little as two years and averaged only 6.3 years. This variation on individual hunting territories compared to a maximum variation <u>between</u> the high inventories of different hunting territories of 2.8.

Therefore, there appears to be considerably greater variation within a hunting territory, over a period of several years, than occurs between long-term conditions on different hunting territories. This difference indicates the significance of differences in management decisions and resource utilization on hunting territories. While hunting territories do differ ecologically, how the owners take this into account when making management decisions, and what harvests they actually make, creates greater variation than do broad

Table 11-33 Range of Variation of Beaver Colony Inventory on Waswanipi Hunting Grounds 1954-1966

Hunting Territory Groups	Highest No. of Beaver Colonies 1954-1966	Year	Lowest No. of Beaver Colonies 1954-1966	Year	Ten Year Average No. of Colonies	No. of Years Between High and Low	Highest/ Lowest Multiplier	Lowest as a Percentage of Highest
VI	114	1957	25	1962	70.3	5	4.6	22
XXII	110	1954	20	1961	70.5	7	5.5	18
XIX	92	1954	13	1960	50.1	6	7.1	14
II	128	1954	61	1962	80.1	8	2.1	48
XB	434	1956	149	1960	318.7	4	2.9	34
XA	206	1956	14	1962	80.9	6	14.7	7
III	93	1954	11	1962	56.9	8	8.5	12
XC	120	1955	33	1963	75.2	8	3.6	28
V,VIII	245	1960	112	1955	158.3	5	2.2	46
XII,XIII,XIV	234	1955	67	1963	157.7	8	3.5	29
IX	50	1960	23	1963	36.5	3	2.2	46
XX	100	1965	54	1962	67.9	3	1.8	54
I	129	1955	40	1963	97.1	8	3.2	31
XXIII	39	1958	20	1960	26.2	2	1.9	51
XI	70	1965	18	1961	35.2	4	3.9	26
XXX	102	1961	60	1965	86.7	4	1.7	59
XVI	387	1962	97	1954	211.9	8	4.0	25
XV,XVII	420	1960	164	1954	334.4	6	2.6	39
IV	148	1954	30	1962	76.8	8	4.9	20
VII	100	1965	29	1962	70.4	3	3.4	29

Table 11-33 Range of Variation of Beaver Colony Inventory on Waswanipi Hunting Grounds 1954-1966 (Continued)

Hunting Territory Groups	Highest No. of Beaver Colonies 1954-1966	Year	Lowest No. of Beaver Colonies 1954-1966	Year	Ten Year Average No. of Colonies	No. of Years Between High and Low	Highest/ Lowest Multiplier	Lowest as a Percentage of Highest
XXI	108	1954	52	1963	92.8	9	2.1	48
Averages	-	-	-	-	-	6.3	4.1	33

ecological differences as such.

The result of differences in the ways owners use their hunting territories is a considerable difference in the magnitude of the long-term variablility of beaver populations on their territories. Over the approximately 10 year-period covered, the highest number of beaver colonies on some territories varied by as little as 1.7 times the minimum number, whereas on other hunting territories the highest number was as much as 14.7, 8.5 and 7.1 times the lowest. To phrase this another way, the lowest inventory of beaver colonies on three of twenty-one hunting territories was 50 to 60 percent of the highest inventory on the same territories, whereas on the three hunting territories at the other end of the range, the lowest inventory was 7, 12 and 14 percent of the highest inventory on these three territories. Considerably different levels of managerial success would therefore appear to have been achieved by different hunting territory owners.

Such variation was indicated by the differences in the hunting skill ratings of the men who were owners of hunting territories during the period covered by the present study. The method of collecting these ratings in 1969-70 has been described in Chapter 7, and the ratings for the owners of hunting territories are listed by hunting territory number on Table 11-34. It will be recalled that ratings below 1.0 indicate qualified or negative assessments, those above 1.0 indicate comparatively positive assessments. On the whole, hunting territory owners averaged 1.1, slightly above the average rating of 0.9, but there were significant individual variations.

There were nine hunting territory owners with skill rating below 1.0, of which eight were owners of hunting territories used during this study. Of these eight, five were the owners of hunting territories on which extended declines of moose and beaver populations were recorded, and one was the owner of the hunting territory on which there were inconclusive comments on the possibility that such a decline was occurring. Thus in over seventy percent of the cases on which there is clear evidence, the hunting territory

Table 11-34 Skill Ratings of the Owners of Hunting Territories

Hunting Territory Number	Skill Rating of Owner
I	1.5
IIA	1.3
IIB	1.0
III	1.0
IV	1.3
V	1.3
VI	1.0
VII	0.8
VIII	0.5
IX	2.0
XA	1.3
XC	1.7
XD	1.0
XE	1.0
XF	1.3
XG	1.0
XH	1.7
XI	0.0
XII	1.3
XIII	0.5
XIV	0.3
XV	0.5
XVIA	1.0
XVIB	0.0
XVII	0.7
XVIII	1.5
XIX	1.8
XX	1.8
XXI	1.0
XXII	1.3
XXIII	1.0
XXIV	1.8
XXV	1.0
XXVI	-
XXVII	1.0
XXVIII	1.0
XXIX	0.3
XXX	1.0
XXI	1.0
XXXII	1.7
Average	1.1

owners with relatively lower skill ratings, and relatively poorer reputations, were experiencing difficulties managing the animal population of their hunting territories during 1968-70.

On the other hand, there were 16 hunting territory owners who rated comparatively positively, of whom 11 were owners of hunting territories which were used in either 1968-69 or 1969-70. Of these, two, or less than twenty percent, were among the owners who were experiencing difficulties managing the animal populations of their hunting territories during 1968-70. Another way to phrase this would be to say that of the eight hunting territories on which declines of beaver and moose were reported in 1968-69 and/or 1969-70, 63 percent were owned by men with low skill ratings (5 territories), thirteen percent wered owned by men who received a good assessment (1 territory), and 25 percent were owned by men with a comparatively positive skill ratings (2 territories).

In short, the skill ratings of individual owners of hunting territories appear to be related to the success of the owners in managing their hunting territories for long-term stability of populations and harvests, and the prestige of hunting territory owners appears to reflect the success they have using and managing their hunting territories.

Thus, despite a system of management that includes means to effectively assure, at least under normal conditions, that moose and beaver populations will not be permanently depleted in the long-run, there are clear and recognized differences in the degree of success attained by individual owners of hunting territories. Those who manage most effectively, that is, with the smallest variations in animal populations have the best reputations and are accorded the highest prestige. They serve as models for other owners.

E - Management Practices in Historical Perspective

Over the period from 1954 to the present the Waswanipi system of management of hunting and of animal populations has been working without any reported community-wide break-downs. The owners of hunting territories vary in the degree of success they achieve, but in the last resort the technique of extended fallowing would appear to be effective as a means of reversing adverse population trends that result on occasions and as a means of assuring that the animal populations are maintained over the long-term. Waswanipi management practices have not however worked effectively throughout the period covered by the historical record and it is therefore important to consider the conditions under which these practices may not work. The only recorded and serious community-wide breakdown in this century occurred in the 1920's and 1930's when the beaver populations of the Waswanipi region as a whole, and in fact over much of the Canadian north, were seriously depleted and nearly exterminated. It was this depletion that led to government intervention in beaver management through the setting up of the beaver reserves. An examination of how and why this depletion of beaver came about will help to provide a more long-term assessment of the Waswanipi management practices. In particular it will provide an understanding of some of the limiting conditions of Waswanipi management, and some of the ways in which the present management practices have been altered by historical conditions. I will examine this question in two steps. First, I will develop a very general model of the relationship between changes in animal populations, human populations and human subsistence possibilities during the course of the present century. Having set the events of the 1920's in a general historical context, I will then provide an explanation for the depletion of the beaver populations.

i) Changes in Resource Populations, Human Populations, and the Possibilities for Human Subsistence

a. Changes in Resource Populations

The long-term geographically widespread changes in the animal populations of the Waswanipi region during the course of the present century are closely related to the changes that have occurred in the vegetational cover of the region, particularly as a result of forest fires.

The history of the forests is reviewed in Appendix 11-2. Briefly, the available data indicate that at the end of the last century the forests of the region were predominantly mature forests. Starting in the first decade of the present century the frequency of extensive forest fires increased significantly and roughly fifty percent or more of the forests were destroyed by fires in the succeeding two decades. In the southern portion of the Waswanipi region, approximately south of the 50°N latitude, the extensive forest fires were relatively common up to about 1920, in the northern portion of the region it appears that extensive fires continued to be a relatively common occurrence for another two decades. Following the fires young forest was re-established within approximately thirty years, but mature forests develop only after that time. Because of this pattern, the forests in the southern portion of the Waswanipi region had returned to being predominantly mature coniferous or mixed coniferous and deciduous forests by the 1960's. In the northern portion of the region there were still large areas that were roughly thirty years of age or less, and that were relatively young forests in the 1960's. In the northern portion of the region there are also indications of lower fertility, due to differences in soil conditions and geological history, and mixed forests are only a small portion of the total forest cover, whereas in the southern portion of the region mixed coniferous and deciduous forests are more common. This difference may also be reflected in slower regeneration of forests in the more northernly areas.

The impacts of these changes on the wildlife of the region are reflected in the reports from both older Waswanipi people and differences between reports of various clergymen and geologists working in the area, in different periods. Both the Waswanipi and the geologists portray significant changes in the wildlife of the region early in the present century.

The changed conditions may be indicated by comparing a sample of the available reports, those selected being from 1881, 1895 and 1913-1914.

In 1881 J.B. Proulx, a Roman Catholic missionary who made a visitation from Montreal to Lake Abitibi in the James Bay drainage, wrote:

> "At the height of land is the end of the moose country which gives its place to the caribou whose mobile herds are found as far as James and Hudson's Bays" (Proulx, 1882:130, translation mine).

Robert Bell's explorations 15 years later in 1895 indicated that by the turn of the century moose were probably found in just to the south of the Waswanipi region and that hare and fish were the most important animals and the basis of the Indian diet. Writing of the area north of the height of land between the Ottawa River drainage system and the Nottaway River drainage system, i.e., from south of Senneterre to Waswanipi, he reported:

> "In the region explored, fur-bearing animals and game of all kinds were scarcer than might have been expected, and this circumstance probably accounts for the small number of Indians in the district. Caribou are found throughout the whole region, but usually not in any great numbers. Moose and Virginia deer are confined to the southern part. Only a few black bears were seen. The common American hare (or 'rabbit') was rather plentiful, but the chickadee or red squirrel was rare, notwithstanding the abundance of its favorite food, the cones of the balsam fir, and the two kinds of spruce" (Bell, 1897a:83a).

In another report he states that there were also beaver, muskrat, porcupine, lynx, wolverine, otter, skunk, fishers, marten, mink, foxes and wolves. These descriptions were paralleled by the observations of Henry O'Sullivan who visited the region a year or two later (1897:15-16).

The accounts of the animal populations at the turn of the century are significantly different from those made in the period of the next geological surveys, from 1912 to 1916. These surveys followed extensive forest fires (Appendix 11-2). The reports indicate the initial phases of the spread and increase of moose populations into the Waswanipi region. In 1912 moose were occurring throughout the region, and dense populations of moose occurred near the southern limits of the region. Austin Bancroft reported:

> "From a few miles to a distance of sixty or seventy miles north of the National Transcontinental Railway, moose are numerous, but farther north they are not so frequently seen. Signs of the presence of a few caribou were noticed northward from Matagami Lake... The black bear is abundant especially in the vicinity of Matagami, Olga and Gull Lakes... Fur bearing animals are not as plentiful as might be expected... Marten are fairly numerous... Beaver and otter are scarce and are reported to be rapidly disappearing" (Bancroft, 1913:146-7).

Bancroft reported lynx to be few, wolf few, groundhogs, rabbits, red squirrels and mice abundant and mink, fox, ermine and muskrat present (1913:146-7).

H.C. Cooke who surveyed the northern portions of the Waswanipi region at the same time, 1912, reported that moose were very uncommon, but apparently found in those areas, for example, along the Broadback River, east of Lake Evans (1914:338).

There are unfortunately no data on animal populations in published sources to my knowledge over the next decade and a half. Only with the geological surveys of 1929 to 1950, which included brief observations, are there again published records. The data from the period of the 1930's and 1940's indicate an abundance of moose and bears in most locations, with few fur-bearing animals and small game, and especially low beaver populations. These reports indicate that while in one or two local areas beaver populations continued, in general beaver were nearly extinct. All reports from this period come from the southern half of the region of our study (see bibliography in Appendix 11-2).

Two fairly representative reports from areas which in 1945 and 1946 had second growth forests after fires may serve to indicate the patterns. The first is from the area around Taibi Lake, on the Bell River, south of the site of Matagami, the second from the Iserhoff River area:

> "Les animaux à fourrure, principalement le castor, semblent avoir été à peu près exterminés. Les vieux ouvrages de castors sont très nombreux, mais les barrages et cabanes neuves ou rafraîchies sont rares" (René Béland, 1950: 5).
>
> "Nous avons vu de nombreuses pistes d'orignaux et d'ours, mais nous n'avons rencontré les animaux eux-mêmes qu'en deux ou trois occasions seulement.
> "Les castors, les rats musqués, la loutre, le renard et le liévre n'existent qu'en petit nombre. La perdrix et les autres oiseaux de chasse sont rares" (Jean Claveau, 1951:10).

The general trend of these reports indicates that between 1915 and 1950, the moose populations of the Waswanipi region had increased substantially, while beaver populations were low and declining during the time from 1930 to 1950. In a number of local areas the trends were not reported or at least ameliorated. Moose populations were lower in the one area for which we have no reports of fires (Imbault, 1954:7), and beaver populations were somewhat higher to the northwest of Lake Matagami in 1938-39 at just the time when the Nottaway Beaver reserve was established in this area (Longley, 1943: 5-6).

Two gaps exist in the data available from the geological reports, one is the timing of the changes that occurred in moose and beaver populations between 1916 and 1935, the other is the recent changes in moose populations. Information provided by Waswanipi informants closely parallels that given in the reports of geological explorations, and provides a basis for filling in the data for missing periods. A former chief at Waswanipi who was born in 1900 reports that the first moose in memory came into the area shortly before he was born. This moose was seen near the southern limits of the study area by his father's brother. He reported that this first time he saw a moose, his uncle was scared of it, so he went to get the informant's father and the two men together went back and killed the moose. Another moose was not seen until four years later when one was killed swimming across a bay in Pusticamica Lake. It was two years after this moose was killed that it was noted that moose were starting to move into the Waswanipi area from the south. This appears to have happened during the first decade of this century.

An informant who was growing up on a northern territory near Lake Evans estimated the date of arrival of moose in that area as not more than sixty years previous to 1970, or 1910. This suggests approximately a ten to twenty year difference in the time of arrival of the first moose in the southern and the northern limits of the region.

By 1912 to 1915 we know from the geological reports that dense moose populations were occurring near the southern limits of the area. The men who started hunting in the southern parts of the region about 1920, i.e., men born about 1905, suggest that when they started hunting there were many moose on those territories. Men hunting farther north still speak of the infrequency of moose kills when they started hunting during the early 1920's which indicates that dense populations in the northern sector may have been established between about 1925 and 1930. Once dense moose populations were established they were continuous throughout the period from 1920 to the mid-1950's.

Waswanipi hunters generally agree that the population densities of moose in the area slowly declined between the mid-1950's, and the late 1960's. The decline was not rapid, but it was apparently uniform over much of the region. Only in the area of the Miacasagi River, where moose populations were never high, are there reports that there have been no substantial changes in the populations over the past twenty years. I heard of no reports of increases in moose populations over substantial areas, i.e., whole hunting territories, in the last two decades, only in more limited areas that burned or have otherwise been disturbed.

The changes in the moose populations of the Waswanipi region correspond well with assumptions that can be drawn from the overall changes in the forests. It is clear that the entry of large numbers of moose into the Waswanipi region followed the period of extensive forest fires and was probably closely associated with the young stands of deciduous and later coniferous trees that followed the fires. The contemporary decline in moose population density is probably associated with the maturing of the forests. In the early stages of forest development the trees range from 6 to 15 feet in height and many are easily accessible to moose. From the reports of geologists working in the southern portion of the area in the 1940's it is clear that the young spruce and balsam fir on the sites burned in the early decades of the century were in the sapling stage. By approximately 1955 to 1970 these forest stands would have reached maturity, and would average over 30 feet in height, and less browse would be available for the moose. This suggests that moose would find a slow decline in available winter food sources in the maturing forests of the 1960's. However, the fires that have occurred in the more northerly sections in the 1920's and 1930's would have initiated new forest growth in those areas that would still be providing browse suitable for moose in some areas in the 1960's.

The data from Waswanipi informants provide an opportunity to make rough quantitative comparison of the density of moose during the period of high populations and the present day densities. Several informants reported that the main observable differences that have occurred since the mid-1950's has been a drop in the number of moose yarding together and in the number harvested per year by hunters. While men see two or three moose together now, and very occasionally four or five, hunters report that it was formerly common to find five moose together. One man reports that a long time ago he found twelve moose together at one spot and two other men found seven moose together on several occasions. This is not found today. I asked several hunters who were heads of families in the 1940's how many moose they would typically kill per year at that time. Reports ranged from 4 upwards. While these data are very limited, it suggests the possibility that the moose populations were approximately twice as high during the period of high densities, than they were at the end of the 1960's. The estimate of the population of moose of the Waswanipi region made for 1968 in Chapter 10, amounts to a density of 0.082 moose per square mile. The previous densities would then have risen from no moose about 1900 to approximately 0.164 moose per square mile in 1930, and would have declined to 0.082 moose per square mile from 1955 to 1970. The populations appear to have been relatively steady from 1968 to 1976, as reported in Chapter 10.

Data from Waswanipi informants also supplements knowledge of changes in beaver populations. The Waswanipi date the rapid decline in the beaver populations of the region, as well as of neighboring regions, to the late 1920's. They also report that during the five years previous to the coming of the first government Indian agents and beaver conservation officers, approximately 1938-1941, there were very few beaver caught in the Waswanipi area. All men report this drop, but to varying degrees. Some men, particularly on the northern grounds, report that they would catch a few beaver a winter, some as many as five or so. In the southern parts of the area, particularly the southeast, beaver were reported to have been virtually exterminated. Here men report there were no active beaver lodges on some hunting territories and the men stopped setting traps for beaver. Occasionally however a beaver would be caught in a trap set for otter. The significance of the distribution of the depletion of beaver in the Waswanipi region will be indicated below.

These events are paralleled by the unpublished data available on the sale of fur pelts at Waswanipi Hudson's Bay Company Post.[27,28] From the records it has been possible to determine the beaver pelt purchases for several periods prior to the 1920's. During the five years from 1886 to 1890 beaver pelt purchases varied from 442 to 820 pelts a year and averaged 581 pelts a year (Hudson's Bay Company Archives, D25/14, Inspection Reports, 1891). This appears to have been a relatively typical level of sales because in the "Report on Fur Trade for Year Ending 31 May 1893" for the Ruperts River District there is a comment that this "is one of the few Districts in which the Beaver is obtained in as large quantities as formerly..." (Hudson's Bay Company Archives, A.74-2). In 1916 and 1917, 682 and 685 beaver pelts were purchased at Waswanipi Post (Hudson's Bay Company Archives, D.FTR/8, Annual

Reports from the District Officers, Outfit 1917, James Bay District).

In 1925 and 1926, 703 and 764 beaver pelts were purchased at the Post, but from 1927 to 1938 the number purchased rapidly declined. In 1930 only 244 were purchased, in 1935 only 52, and in 1938 no beaver pelts were purchased. From 1940 to 1945, purchases varied from 79 to 161 beaver pelts per year (Table 11-35). The beaver populations then were probably at relatively stable levels throughout the last decades of the last century and the first two and a half decades of the present century, although Bancroft, quoted above, cites a decline about 1913. The populations began a long-term decline in the late 1920's and were reduced to extremely low levels after 1935. Recovery occurred after the program of beaver management operated by government agencies was established in conjunction with the Waswanipi band members, during the 1930's and 1940's and early 1950's, and levels have been relatively steady since the 1950's.[29]

In order to make a rough quantitative comparison between present beaver population levels and those which were characteristic of the pre-1927 period the average number of pelts sold per hunter can be compared. Cartledge's list includes a total of 36 Waswanipi hunters in 1915, and 682 beaver pelts were sold in 1916 at Waswanipi post, for an average of 19 beaver pelts per hunter. In 1968-69 and 1969-70 there were approximately 88 men at least partly active as hunters, that is, not former or inexperienced hunters, and they sold a recorded 2,848 and 2,225 beaver pelts, or 32 and 25 pelts per hunter. While such comparisons are subject to numerous complications, many of which are brought out in earlier discussions, I will simply assume that the beaver populations in the pre-1927 period were approximately two-thirds of what they are in the 1960's. As there were 0.36 beaver colonies per square mile in 1969-70, I will assume there were 0.24 colonies per square mile before 1927. After that date populations declined to a low in 1937, and then slowly increased to 1954. For 1938, the year of the lowest number of beaver pelt purchases at Waswanipi, and the year in which the Nottaway beaver reserve was established, the estimated density of beaver colonies would be

Table 11-35 Purchases of Beaver, Marten, Lynx, Otter and Mink Pelts by the Hudson's Bay Company Post at Waswanipi, All Available Years 1885 to 1945.

Year	Number of Pelts Purchased				
	Beaver	Marten	Lynx	Otter	Mink
1886	652	387	194	66	103
1887	456	510	225	41	104
1888	820	519	354	67	36
1889	442	251	308	61	32
1890	536	225	156	68	29
1916	682	247	287	45	73
1917	685	358	111	29	13
1925	703	220	207	39	158
1926	764	232	142	28	208
1927	479	371	57	52	69
1928	403	241	32	32	31
1929	284	111	18	37	39
1930	244	102	22	35	101
1931	249	64	17	50	126
1932	273	65	50	59	238
1933	165	98	109	26	319
1934	90	57	112	46	200
1935	52	54	207	39	334
1936	38	21	451	33	276
1937	35	69	381	19	50
1938	0	112	78	44	49
1939	5	112	50	41	52
1940	121	41	29	43	111
1941	161	26	11	37	175
1942	108	28	33	48	356
1943	85	39	55	41	593
1944	70	36	95	48	336
1945	79	21	58	46	95

0.005 per square mile. This is based on the estimate that there were 255 beaver on the newly created 11,030 square mile reserve in that year (Canada, 1944:154), and on the assumption of five beaver per colony (see Table 10-2).

The sharp decline in the beaver populations and densities that occurred in the period from 1928 to 1938 does not appear to be explained by any of the changes recorded in the forest composition or structure of the region. I have reviewed the relationship of beaver populations to the forests on which they depend in Appendix 9-5, and have indicated that untrapped beaver populations are comparatively stable because they utilize the forest near the shorelines of the streams on what amounts to a rotational basis. Therefore it is not likely that the decline of the beaver populations during the 1920's can be explained on the basis of the changes in the forests of the region, especially as the areas burned between 1900 and 1910 would have been young forests by the 1930's, and clearly suited for supporting beaver populations. The likely reasons for the decline will be discussed below.

b. Changes in Human Populations and Distributions

Whereas changes in the animal populations of the Waswanipi region have not been unidirectional, changes in the human population have generally been upwards in recent decades, although the period of increasing human populations was preceded by a period of variable but relatively stable populations.

The first official Indian Affairs Branch census figure for this century is 124 Waswanipi Indians in 1910 (Table 11-36). In 1924 there were 177 people censused. These figures may be compared to the estimate made in 1856 by the Hudson's Bay Company of 150 Indians at Waswanipi (Hudson's Bay Company, 1857). Other early population figures are 200 people in 1880 (Canada, 1880-1881) and 233 in 1889 (Carrière, 1964:422). Because of the opening and closing of subposts these figures are probably not directly comparable. In total, the available figures suggest that the Waswanipi population was roughly stable,

Table 11-36 Population of Waswanipi Band From Indian Affairs Branch Censuses

Year	Total Pop-ulation	Years of Age/Sex										
		0-6		7-16		17-21		22-65		65 plus		Not Stated
		M	F	M	F	M	F	M	F	M	F	
1910	124[1]	12	11	12	12	7	7	29	30	2	2	
1924	177											
1929	177[2]											
1934	172	10	8	21	31	6	9	39	42	3	3	
1939	216	24	27	22	25	18	17	31	40	7	5	
1944	312	30	31	40	46	17	21	54	61	5	7	
1949	313[3]	23	36	37	37	20	22	61	72	2	3	
1954	333[4]	28	27	35	45	18	19	73	77	4	7	
1959	416											
1965	507	79	78	47	59	17	26	101	83	7	10	12
1969	610	92	78	81	79	17	19	106	113	11	14	

Footnotes:

1. Estimated age distribution; classes: 0-5; 6-15; 16-20; 21-65; 65 plus.
2. It is not clear if this is the result of a new census or a repeat of the previous result.
3. Classes: 0-6; 7-15; 16-20; 21-70; 70 plus.
4. Classes: 0-6; 17-15; 16-20; 21-65; 65 plus.

or at least not growing steadily during the eighty years from the 1850's to the mid-1930's (Table 11-36).

However, from the 1934 census onward, there are clear indications of increases in the Waswanipi population such that by 1969 the total population of the band had increased three and one half times during the 35-year period from 1935, and over four times during the 54-year period from 1915.[30]

A striking feature of the available data however is that the number of people resident in the bush camps in winter on the hunting territories had not increased at a rate that is at comparable to the rate of growth in the population as a whole. This is the case, first, because the present population has a high percentage of school age children, and most of these were in residential schools for nine months a year, and second because some the adult men did not hunt from winter bush camps in the period from 1968 to 1970, as had been indicated previously. The result was that of the population studied only 197 people were identified as individuals who lived in winter bush camps during 1968 to 1970. If this total is projected to the total population of the Waswanipi band the bush population would be 226 during 1968 to 1970, or 37 percent of the official Waswanipi population of 1969. This population would be only 1.8 times the 1910 population, assuming everyone lived in winter bush camps in 1910. On the basis of the active hunters, in 1915 there were 37 hunters on Cartledge's list (Table 11-3), and in 1968-69 and 1969-70 there was an average of 64.5 in the study or an estimated 74 in the band in winter bush camps. The increase in winter bush camp hunters has therefore been just about two-fold since 1915.

The characteristics of the winter co-residential hunting groups have changed during the course of the present century. Cartledge listed a total of 37 hunters in 22 different locations or approximately 1.7 hunters per camp.[31] If the 1915 population is extrapolated from the 1910 and 1924 censused populations, assuming a steady increase in population over the fourteen year period, then the 1915 census is 143 people, or 6.5 people per camp. These figures may be compared to the present population distributions. The number of winter co-residential hunting groups has remained relatively stable, there were 18 in 1968-69 and 21 in 1969-70 (Tables 7-12 and 7-13). The number of hunters per camp, 3.5 in 1968-69 and 3.1 in 1969-70, is therefore approximately double the 1915 level, and the number of people per group is also approximately double, 10.4 in 1968-69 and 8.9 in 1969-70. Thus people are probably living in larger groups now than they were in 1915.

With respect to the distribution of people on the land there has also been a shift, due to the changes in the organization of the hunting territories. There are more hunting territories today than there were 60 years ago. In 1915 nineteen hunting territories were listed for the Waswanipi band (Table 11-3). In 1977 there were fifty hunting territories officially registered to members of the Waswanipi band. This shift has occurred despite the apparent general continuity of the outside boundaries of the official Waswanipi hunting territory area. There are no definite mapped boundaries to the Waswanipi area for 1915, because Cartledge only gave point locations and verbal descriptions for hunting territories. The boundaries indicated on Davidson's map (see Map 1-4) are actually the boundaries as reported by the surrounding bands for whom hunting territory maps had been drawn by Speck and Davidson (Davidson, 1928a). Even given this fact, the general area of the hunting territories has not changed much. There may have been some extension of the southern boundaries, and there was a definite addition of the area of hunting territory A53 and A53A, as mentioned previously, but in general the total area as well as the individual hunting territories have remained continuous.

This implies that the hunting territories have been getting smaller, and this is the case. Davidson estimated the average area of a hunting territory in 1915 to be between 600 and 800 square miles, basing himself on Cartledge's estimate of 14,000 square miles for the combined hunting territory area. In

1977 the area inside the outer limits of the hunting territories registered to men who were officially part of the Waswanipi band was 13,352 square miles or 267 square miles per hunting territory.

Since there were more but smaller hunting territories in 1968-70 than in 1915, and a similar number of hunting groups, many hunting territories were not in use in any one year was indicated previously. Summarizing the data previously presented I would note that of the total area of those Waswanipi hunting territories included in the field data gathered for the present study, that is 9235 square miles (Table 11-11), the hunting territories that were actually in use during 1968-69 and 1969-70 covered 6205 square miles (Table 11-13) or two-thirds of the total. One third of the total was therefore on a long-term fallow. Of the area used, 3779 square miles were actually hunted during 1968-69, or 61 percent, and 3092 square miles were actually hunted during 1969-70, or fifty percent.[32] This would mean that each of the areas in regular use would, on average, be able to be fallowed one out of every two years if there was no exchange with areas on long-term fallow, and fallow could be even more frequent as territories in long-term fallow changed.

While this fallow model is hypothetical, it suggests that a generalized picture is drawn of the present use of the land, there are no general indications of population pressure at the present time, despite a quadrupling of the total population, and a doubling of the bush camp population.

Although there are no comparable data on land use in 1915, or the intervening years, it is possible on the basis of the data presented to construct a very general model the relationship between human subsistence demand and subsistence foods available on a sustained yield basis from beaver and moose populations.

c. Changes in Subsistence Demand in Relation to Possible Food Harvests

The changes in the official total population of the Waswanipi band can be converted into a measure of subsistence demand by converting the population at each census report into adult consumption units, and assuming that each adult consumption unit requires 4,000 Calories per day, or 1,460,000 Calories per year. Assuming that over extended periods of time the people effectively use all the land in hunting territories registered to Waswanipi band members, that is 13,352 square miles, and that this area has been relatively stable throughout this century, then the total subsistence demand of the population can be converted into Calories required per square mile per year (Table 11-37).

However, not all the subsistence needs of all of the population were being met from locally harvested foods, and not all from beaver and moose. Several adjustments are therefore needed to estimate the subsistence needs of the Waswanipi which might normally have been supplied from beaver and moose harvests.

First, as has already been indicated, in 1968-70 more than one-half the adult male population, and approximately one-third of the total population went to live in winter bush camps. Many of the children were in residential schools nine months of the year, and most of the other adults lived in the settlements while working or receiving social aid. Those in the settlements subsisted on some bush foods they hunted locally primarily fish and small game, purchased foods, and gifts of food from those living in bush camps. For purposes of establishing subsistence demands on the animal populations of the hunting territories I will consider only the bush camp population, although this will somewhat underestimate demand. The population in the bush camps totalled 148 adult consumption units in 1968-69 and 147 in 1969-70. Projected for the total official band population this would be 208 adult consumption units in winter bush camps, or 48 percent of the total. The subsistence demand on the animal populations of the hunting territories in 1969 was therefore one-half the total subsistence demand. The same ratio will apply for 1965. I will assume that in 1959 90 percent of the total

Table 11-37 Estimated Total Subsistence Demand and Estimated Subsistence Demand for Beaver and Moose, for Census Years, 1910 to 1969

Year	Population of Waswanipi[1]	Adult Consumption Units Equivalent of Population[2]	Total Subsistence Demand Density Calories/Sq.Mi./Year[3]	Correction Factors Applied[4]	Subsistence Demand Density for Beaver and/or Moose Calories/Sq.Mi./Year
1910	124	99	10,791	B(.80),C(.90)	7,770
1924	171	140[5]	15,260[5]	B(.80),C(.90)	10,987
1929	177	140[5]	15,260[5]	B(.80),C(.90)	10,987
1934	172	140	15,260	B(.80),C(.90)	10,987
1939	216	162	17,658	B(.80),C(.90)	12,714
1944	312	231	25,179	B(.80),C(.90)	18,129
1949	313	247	26,923	B(.80),C(.80)	17,231
1954	333	266	28,994	B(.80),C(.80)	18,556
1959	416	312[6]	34,008	A(.90),B(.80),C(.70)	17,140
1965	507	373[7]	40,657	A(.50),B(.80),C(.70)	11,384
1969	610	435	47,415	A(.50),B(.80),C(.70)	13,276

Footnotes:

1. From Table 11-36.
2. Based on age structures reported on Table 11-36, and equivalents listed on Table 8-57, with some adjustments to the category boundaries necessitated by the available data.
3. Assumes 4,000 calories per adult consumption unit per day, and 13,352 square miles of land.
4. Three factors are considered, percentage of population living on hunting territories in winter (A), use of summer fish resources (B), and the use of "traditional" purchased foods (C), see text for discussion.
5. No age structure available, 1934 total used.
6. No age structure available, value interpolated from 1954 and 1965 figures.
7. Assumed people of unstated age were adults.

demand was demand on hunting territories, because about 10 percent of Waswanipi adult men had sought full-time jobs by the early 1960's. For 1954 and earlier I will assume that the total Waswanipi population was living on hunting territories, and primarily off subsistence resources.

The second adjustment I would make is for summer subsistence. Although some moose are caught in summer, and although preserved moose and beaver caught in winter are eaten during the rest of the year, fish has, from all evidence available, been the major source of summer subsistence throughout the course of this century. Assuming that summer fishing provided about one-half of locally provided subsistence needs during a five-month period each year, then fish would provide about 20 percent of subsistence needs on an annual basis and other resources would provide about eighty percent of total subsistence needs on an annual basis.

Finally, not all food needs of the people living in bush camps in winter are provided by animal foods. Starting in the period after 1914, when the Hudson's Bay Company Store started to be supplied from Senneterre instead of Rupert's House, purchased food supplies started to be of increasing importance. This use was significantly increased in the mid-1940's when family allowances began. The allowances were issued in northern Indian settlements as a ration of selected food items rather than as cash. While the actual level of use of purchased foods responds to the conditions of the animal populations on the hunting territories, and is therefore not independent of the harvests of animal resources, it has been noted that even hunting groups with very large bush food harvests utilized some purchased foods. That is, the use of at least some purchased foods has become "traditional". In the winter hunting group sample for 1968-69 the minimum level of purchased foods available, and presumably used, was 1,246 Calories per adult-day, or approximately 30 percent of the daily Caloric requirements of an adult consumption unit. On the basis of comments from the Waswanipi on how much purchased food they formerly took into the bush with them, I will assume that on an annual basis, the minimum "traditional" uses of purchased foods reduced subsistence needs from animal harvests to 90 percent of total caloric requirements from 1914 to 1949, that they reduced need to 80 percent of total requirements from 1949 to 1954 and that they reduced needs to 70 percent of requirements from 1959 to 1969.

Each of these three factors may then be used to convert the estimate of the total Waswanipi subsistence demand into an estimate of the demand that hunters would normally seek to supply from the beaver and/or the moose populations. This has been done on Table 11-37. The table shows that peak demands occurred in the 1940's and early 1950's when an increasing population was dependent mostly on bush food resources. The impact of the shift of a significant portion of the population away from bush camp hunting in the mid-1960's had a significant impact on the subsistence demand of bush camp hunters for moose and beaver, and effectively reduced those demands to levels which had previously not occurred since the 1920's and 1930's.

These levels of demand can now be compared to estimates of the sustainable yields of moose and beaver during the period from 1900 to 1970. I have estimated above the densities of the beaver and moose populations of the Waswanipi region for selected years during this century. Assuming a sustainable annual yield of 1.5 beaver per lodge, and a sustainable annual yield of 20 percent of the moose populations, I have calculated the sustainable food harvest as Calories harvestable per square mile per year (Table 11-38). I have then graphed the food harvests for those selected years, and assumed lineal relationships between the harvest levels for successive estimations (Figure 11-1). While this assumption is clearly false, given the growth potential of the populations, it is adopted here for its simplicity, and because it should give a conservative estimate most of the time. Beaver harvests are only allowed to rise after 1945, when hunting began on the Nottaway reserve. The cumulative harvestable food is graphed at every five-year interval. Figure 11-1 provides a rough model of the changes that have occurred to sustainable harvests from the moose and beaver populations during the course of the present century.

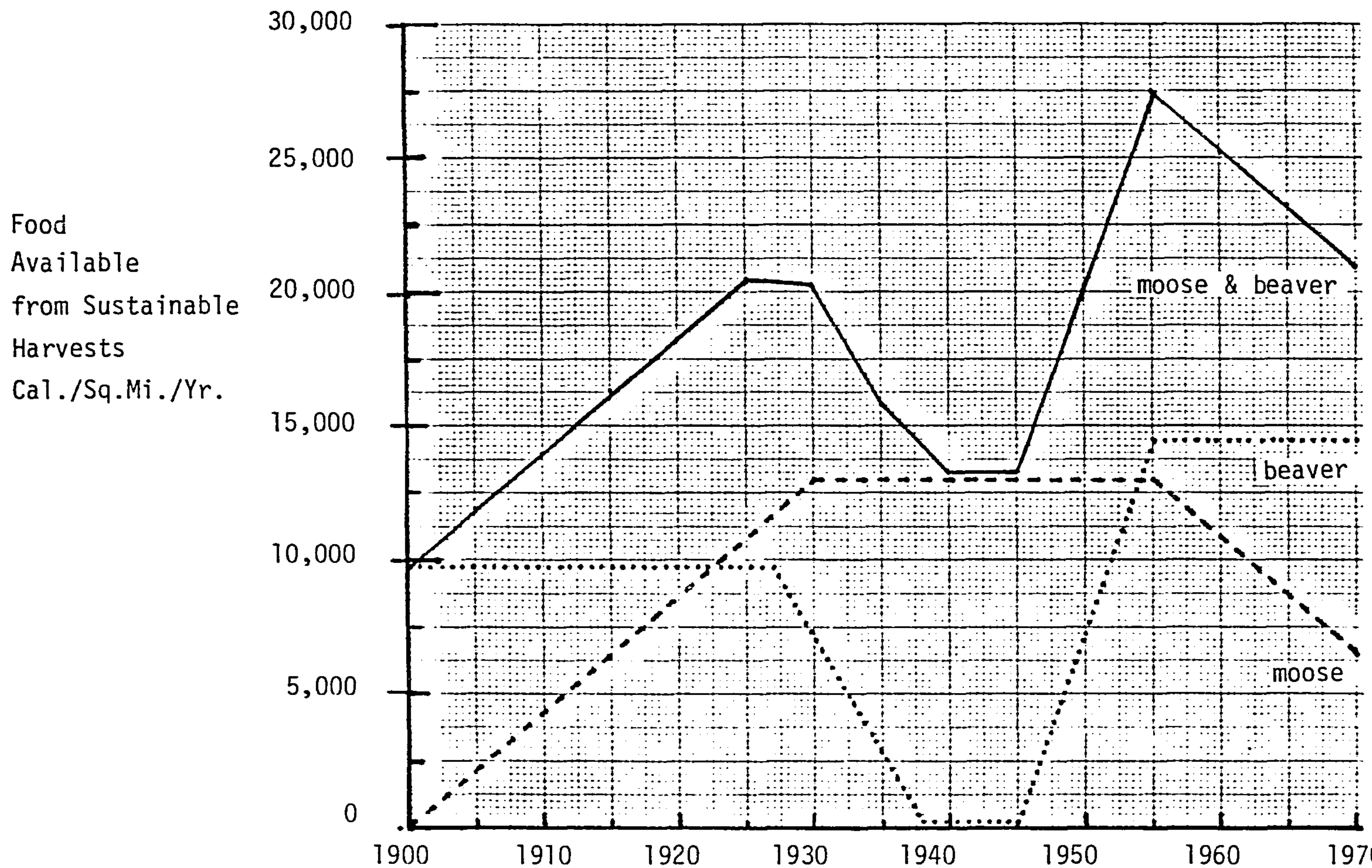
Table 11-38 Estimated Beaver and Moose Populations and Estimates of Subsistence Food Harvests Possible on a Sustained Yield Basis, for Selected Years, 1900 to 1970.

Beaver			Moose		
Year	Estimated Number of Beaver Colonies Per Square Mile	Estimated Subsistence Food Harvest Sustainable, Calories Per Square Mile Per Year[1]	Year	Estimated Number of Moose Per Square Mile	Estimated Subsistence Food Harvest Sustainable, Calories Per Square Mile Per Year[2]
1900	0.24	9,650	1900	0	0
1927	0.24	9,650			
			1930	0.164	12,970
1938	0.005	200			
1955	0.36	14,480	1955	0.164	12,970
1970	0.36	14,480	1970	0.082	6,490

Footnotes:

1. Assumes a sustainable yield of 1.5 beaver per colony per year.
2. Assumes a sustainable yield of 20 percent of the population per year.

Figure 11-1. Estimated Calories of Food Available Per Square Mile Per Year From Sustained Yield Harvests of Beaver and Moose From 1900 to 1970

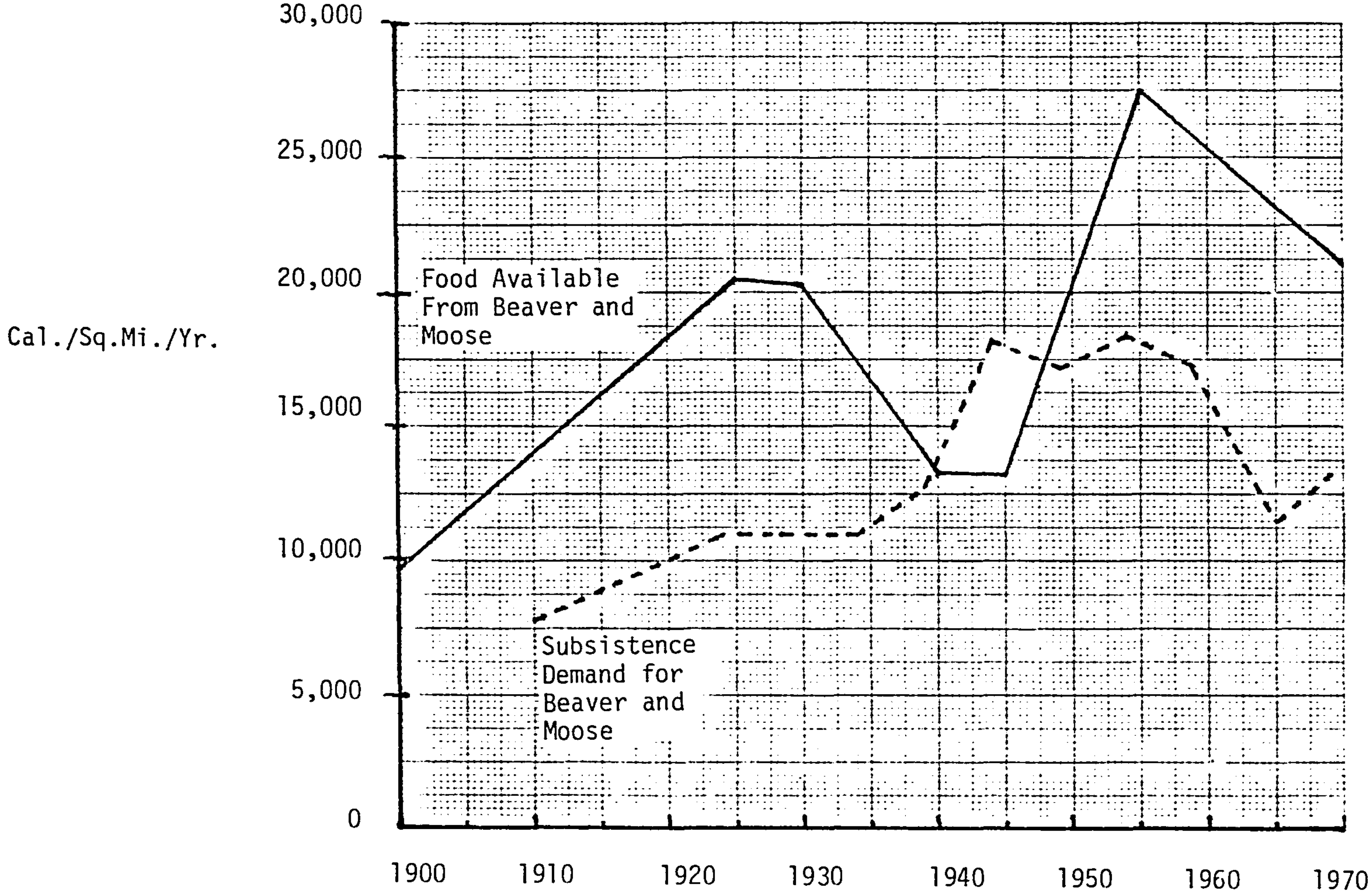


These levels can now be compared with the changing levels of subsistence demand which hunters would normally seek to supply from beaver and moose harvests. The two estimates are graphed on Figure 11-2. The figure indicates that there was no general shortage of beaver and moose resources during the period immediately prior to the declines in the beaver populations. In fact, the appearance of large moose populations would appear to have provided a relative abundance of beaver and moose relative to the subsistence demand. The declines in beaver populations cannot be attributed to subsistence demand.

It was, in fact, the decline in the beaver population, in conjunction with the rising human populations in the 1930's that created the period in which demand for beaver and moose generally exceeded sustainable yields, from 1939 to 1948. This shortage is indicated by the white portion on Figure 11-2. Presumably this difference was met by increased use of fish and small game. When weather conditions prevented moose hunting, and/or when hare populations were low, food could have been in short supply. There are indications that this is the case. Several notes in The Beaver, the magazine of the Hudson's Bay Company, in 1939 and 1940 indicate that "wild food" was scarce throughout the Waswanipi area (Hudson's Bay Company, 1939:56; 1940:57).

With respect to the situation in the 1950's and 1960's, the re-established beaver populations combined with the available moose have exceeded demand by a substantial amount. However, the difference is somewhat less than is indicated on the graph in the 1960's, because the demand level does not take account of settlement based population, nor of the sport moose hunters. However, averaged over the entire territory the sport moose harvests of 1969 and 1970 amount to just over 1,500 Calories per square mile per year, as compared with a difference between demand and available resources of approximately 7750 Calories per square mile in 1969-70. On the other hand if the entire Waswanipi population were to return to winter bush camp hunting, then subsistence demand would roughly double, and would exceed sustain-

Figure 11-2. Comparison of Estimated Subsistence Demand for Moose and Beaver with Estimated Food Available From Sustained Yield Harvests of Those Species, 1900 to 1970



able moose and beaver yields. That is, under this hypothetical condition other animal resources would have to be used more intensively.

ii) Depletion of the Beaver, 1928 to 1938: The Breakdown of Long-Term Management

a) The Nature of the Decline

A shortage of the most highly valued subsistence resources was not therefore the cause of the decline in beaver populations in the 1920's and 1930's, it was the result of the decline. As a first step towards an explanation of the breakdown of Waswanipi beaver management I will examine the data available on the nature of the decline of beaver populations.

During the 1920's, beaver was the most important fur pelt in commercial as well as food value. From the available data on fur pelt purchases and average prices paid for pelts by the Hudson's Bay Company store at Waswanipi in 1925, the relative cash value of the different species sold by the Waswanipi in the mid-1920's can be determined (Table 11-39). Beaver pelt sales accounted for nearly half of the total fur incomes the Waswanipi derived from sales to this store. Marten and lynx each accounted for approximately one-fifth of fur incomes, and mink and otter each accounted for about five percent.

From the available data on fur pelt sales of the five most important species it would appear that some declines in beaver may have begun in 1926 and in marten in 1927 (Table 11-35). A clear trend in sales figures is established in 1929 when the total sales of pelts of both species drop below any level recorded formerly in the data available (Table 11-35). From 1928 to 1938 a relatively consistent downward trend occurs in the number of pelts sold of both species.

The patterns of the numbers of pelts sold annually of other species differ from those of beaver and marten. The numbers of lynx pelts sold annually

Table 11-39 Relative Importance of Various Pelts in Fur Sales Incomes, Based on the Hudson's Bay Company's Waswanipi Post Operations for 1924-25.

Species	Number of Pelts Purchased[1,3]	Average Price Paid at Waswanipi[2]	Total Paid	Percentage of All Fur Sales Income
Beaver	703	$11.40	$ 8,014.20	46
Marten	220	16.63	3,658.60	21
Lynx	207	14.07	2,912.49	17
Mink	158	5.31	838.98	5
Otter	39	21.37	833.43	5
Muskrat	720	0.63	453.60	3
Black Bear	43	5.08	218.44	1
Fox, Cross	8	21.75	174.00	1
Red	19	8.59	163.21	1
Silver	0	-	-	0
Fisher	3	33.67	101.01	1
Skunk	17	0.93	15.81	0
Weasel, "Ermine"	11	0.36	3.96	0
Wolf	-	-	-	-
All			$17,387.73	101

Footnotes:

1. Hudson's Bay Company, Winnipeg, Northern Stores Department.
2. Hudson's Bay Company, D.FTR/21. Annual Reports from District Officers, Outfit 255(1925), James Bay District.
3. Other fur sales income derived from sales to itinerant fur traders, to the Hudson's Bay Company at other locations, and to fur traders in towns along the rail line are not included.

vary from year to year in a pattern with periodic highs and lows. Highs appear to have occurred in 1888, before 1916, and before 1925, and in 1936. Mink harvests are more difficult to interpret, but also appear to show a pattern of sequential highs and lows, with highs in 1926, 1933-35 and 1943. Again there is no long-term trend towards depletion. In contrast to each of these four species, otter harvests appear to have been relatively stable, without patterned variations or trends during the periods covered by these data.

The interesting features of this pattern in the sales of different fur pelts is that declines occurred in two of the three most commercially valuable species, and in the two species that are most easy to over-harvest, beaver and marten. Lynx and mink, because of their highly variable population levels, which are probably related to the variable populations of their prey species (see Appendix 9-7), are not generally depleted in the long-term by over-trapping. Otter, on the other hand, is potentially over-harvestable, but otter are relatively difficult to locate and trap, whereas beaver and marten are easily located and easily captured, and therefore easily depleted.

The second feature of the data is that sales of both species appear to have begun serious declines in the same year 1929, and presumably, given the trends that followed, the populations of these species followed a similar pattern. Finally, it is clear that while the onset of the decline was rapid, the decline continued over a ten-year period from approximately 1928 to 1938.

There are therefore two questions which arise. First, why did the decline begin? And, why did it continue until the beaver and marten were near extermination?

The conditions under which the decline began were conditions of relatively high fur prices. The decade of the 1920's and preceding decade had generally high prices than in the succeeding decade. Beaver pelts sold for an average of $22.67 a pelt during the decade from 1920 to 1929, whereas they averaged about $13.93 in the following decade (Table 11-40). Declines also occurred in the average prices for lynx, mink and otter. Only the average prices for marten rose during the latter decade, but in fact they declined from 1931-32 to 1934-35 and rose to a high in 1939-40. The decade of the 1920's was one of record high prices for otter, and the varieties of red foxes and the white fox (Tremblay, 1970:5).

Thus the declines in the beaver and marten populations began under conditions of relatively high fur prices, but the declines continued through a period of lower prices particularly in the case of beaver which was at its lowest price in this century in 1934-35 (Tremblay, 1970:5).

As a result of both changes in fur sales and fur prices over this period the actual incomes of Waswanipi hunters from the sales of fur pelts varied considerably (Table 11-41; Appendix 11-3). The total payments for furs between 1915 and 1925, and estimates for the period from 1925 to 1940 indicate generally higher incomes from 1918 to 1928. The significant increase from 1917 to 1918 cannot be explained with certainty from the data available, but it probably reflects a real increase in world prices, plus a decision to increase in the schedule of rates paid for furs at Waswanipi. The rate change was presumably in response to the increasing access of Waswanipi hunters to alternative fur buyers at the town sites along the railway. After 1928 fur incomes generally decline reflecting declines in both prices and harvests of key species, although the total cash incomes reflect cyclical trends in populations, such as the 1936-37 peak in lynx harvests.

The high fur incomes for 1918 to 1928 suggest relatively high harvests during the entire period from 1917 to 1925 when no fur sales records are available (Table 11-35), probably at levels comparable to the harvest levels reported from 1926 to 1928. There is no indication however of a significant change in conditions immediately prior to the commencement of the decline

Table 11-40 Average Prices for Fur Pelts in Quebec, 1920-21 to 1929-30 and 1930-31 to 1939-40

	Average Price Per Pelt[1]	
Species	1920-21 to 1929-30	1930-31 to 1939-40
Beaver	$22.67	$13.93
Marten	24.83	30.30
Lynx	30.67	25.75
Mink	19.16	14.22
Otter	32.89	23.17

Footnote:

1. In Quebec, Minville, et al., 1946: 554-555, see Appendix 11-3.

Table 11-41 Annual Fur Income From the Sale of Furs, 1915 to 1940

Year	Annual Fur Income[1]	Estimated Annual Fur Income[2]
1915	$ 5,208	
1916	8,407	
1917	7,777	
1918	13,687	
1919	19,131	
1923	15,647	
1924	17,967	
1925	17,415	$ 17,448
1926		17,130
1927		19,766
1928		20,094
1929		12,181
1930		8,909
1931		8,815
1932		11,332
1933		8,839
1934		4,896
1935		8,891
1936		13,923
1937		16,031
1938		8,995
1939		8,457
1940		7,689

Footnotes:

1. Annual amount paid for furs at Waswanipi Post, from Hudson's Bay Company Archives, D.FTR/7 to D.FTR/11, Annual Reports from District Officers, James Bay District.

2. Based on fur pelt sales from Hudson's Bay Company, Northern Stores Department, and adjustments to Quebec average fur pelt prices at auction, see Appendix 11-3.

in beaver and/or marten populations.

The Waswanipi hunters who were active during the 1920's agree on the proximate cause of the declines in marten and beaver populations, but cite a large variety of less proximate causes. Hunters agree that beaver populations declined over a period of several years, and that it was apparent to them that the populations were declining. The Waswanipi say that this continued over a period of approximately four or five years.

A point of almost complete agreement among the Waswanipi hunters is that beaver populations declined because the Waswanipi over-hunted the populations.

> "Killed beaver until not too many. People hunted every year in the same place. Killed small ones too. [Hudson's Bay] Company did not do it, just people themselves, killing them at same rate" (Interview Notes #2).

> "Keep killing small beaver, were not any young beaver [left]. 'Our grandfather' could not keep up" (Interview Notes #14).

Men also say explicitly that it was not disease or other natural declimating factors that caused the decline. Thus, the common thread in responses to the question "Why were there no beaver at the time the reserves were set up?" is that it is because the Waswanipi killed too many.

Follow-up questioning of the Waswanipi hunters provides a wide range of explanations for why people would desire to hunt out the beaver. In the words of two hunters they:

> "just killed all they could get, used dogs, cleaned out a whole pond... the beaver had no chance to grow - too many trappers at that time... because of money, no help from government [then]... didn't waste meat, no store food, dried meat, bones and dry meat keep it a long time" (Interview Notes, #3).

> "killed a lot of beaver because they were paid lots. Didn't eat it all, would dry it... didn't throw it away... give it to other people, their friends" (Interview Notes, #52).

Each respondent offers several explanations, prices, numbers of hunters and the need for food. But, while all of these are motivations for intensive hunting, none explains why long-term harvests were sacrificed for short-term needs. The factors behind that decision must be considered in the context of other events of that period.

b. The Conditions Which Led to Hunting-out the Beaver

Declines in beaver populations in the 1920's and 1930's have been reported from almost all areas of northern Quebec and Ontario. The initiating condition must therefore be widespread, and it is generally agreed that most of the over-hunting was directly or indirectly the result of the high prices for fur pelts that prevailed during the period. The Hudson's Bay Company district manager for the James Bay district, which included Waswanipi during the 1920's, J.W. Anderson, wrote:

> "The principal cause of the present scarcity of beaver has been intensive trapping following boom prices in the period 1922-29" (Anderson, 1937:8).

Exactly how this impact was felt, however, varied from region to region. To the south and east of Waswanipi, close to the railways large numbers of non-Indians began trapping as a means of livelihood, including many farmers who took up the activity (Burgesse, 1945:13). Accounts of the presence and activities of these trappers occur throughout the ethnographic literature on the area from the 1920's and 1930's. Reports on the Grand Lake Victoria, Tête-de-Boule and Abitibi and Lake St.John peoples all include discussions of the extent of this new presence and the problems it was creating.

D.S. Davidson reporting on the Grand Lake Victoria band, and what is today the Maniwaki band, said:

> "Throughout the domain of the Grand Lake Victoria and Lake Barrière Indians the trapping operations of the whitemen are yearly becoming more serious. The alarm felt by the Indians may well be realized when we learn from one hunter that as many as twelve whitemen were trapping on his own

> territory in the winter of 1925-26. Other Indians report the presence of any number between two and six and Not One Indian reported that his territory had not been invaded sometime during the season" (1928c:73-74; italics in original).

Davidson reported similar encroachments by trappers along the Tête-de-Boule (1928e:32), Jenkins reported the same problem among the Abitibi band (1939:13) and Lips and Burgesse reported it among the Lake St.John Montagnais (Lips, 1947:434; Burgesse, 1945:12-13). The bands from which these reports come were all directly accessible from railroads or highways.

Near the railway the impact of this influx was to wipe out the fur-bearing populations, and especially beaver populations, over ever increasing areas. The best documentation of these events comes from an Englishman, Archibald Belaney, and his Indian wife, Anaharo, who trapped from the railway stops along the Transcontinental line south of Waswanipi from 1925 to 1928:

> "I had travelled nearly two thousand miles by canoe through a reputed beaver country to find only here and there a thinly populated colony, or odd survivors living alone. I had sat in council with other bands from Grand Lake Victoria, Waswanipis from Megiskan, Ojibuwans from the head of the St.Maurice, wide ranging half-breeds from far off Peribonika, they all carried the same tale. The beaver were going fast; in large areas they were already gone" (Belaney, 1968 [1935]:47-48).

Belaney and his wife were moved by these events to publicly speak out for new conservation measures, and they became widely known in Canada and abroad for their cause, he by claiming to be an Indian, "Grey Owl", and she by her Iroquois name. Their popularized versions of these events, and of their popular and somewhat successful publicity campaign, were promoted in a series of books published mainly from 1931 to 1936 (Belaney, 1968, 1972a, 1972b, 1973; Anahero, 1940; Moltke, 1972; Dickson, 1939, 1973). The theme cited in the quote is repeated in story after story in his writings and those of his wife and his publisher. The Waswanipi cited in the above quote are probably a group of Waswanipi, who formerly lived near

Senneterre at a Hudson's Bay Company sub-post, Megiskan. When this post was closed in 1893 most of this group then joined the Obidjuan band of Tête-de-Boule. Belaney appears to have trapped on their hunting territories for some years.

Belaney's accounts and maps indicate that he and other trappers operating from the railway towns rarely went more than 100 miles from the rail line in winter, except in the area of Chapais and Chibougamau, where extensive mineral exploration provided an added incentive for summer activities, and except along the Bell River, where transportation available because of the commercial fisheries at Matagami and Gull Lakes, made somewhat longer trips worthwhile (Belaney, 1972a:10; Moltke, 1972:78-79; Dickson, 1939:200; Dickson, 1973:133, 148, 149).

Thus, the impact of the higher prices in the areas near the railways was to bring an influx of non-Indian trappers who successively trapped out an area in one winter, and then moved to another area the next, cleaning out area after area, and depleting the fur-bearing animal populations up to 100 or more miles from settlements and transportation routes.

Further north the impact was also felt, but it was much less intense. John Anderson, an Anglican Bishop who visited Waswanipi, Mistassini, Nemiscau, Rupert House and other posts in 1926 along with Rev. Harry Cartledge reported that between the missions they:

> "met with all sorts and conditions of men - Indian and sometimes white trappers and others..." (Anderson, 1928:25).

Two Swedish trappers were reported hunting inland at Fort George, up the James Bay coast from Rupert House, in 1928 and 1929. Their presence was reported to the department of Indian Affairs by S.D. Coward, General Manager of Revillon Freres Trading Company Limited which had fur trading posts along the James Bay Coast and at Nemiscau.[33] There is a report from the Royal Canadian Mounted Police constable stationed at Moose Factory of several plane loads of Canadian and Scandinavian trappers who were financed by a fur trader to fly to sites inland of Eastmain Post, along the James Bay Coast north of Rupert's House, in order to trap in 1931.[33]

Thus, there was some penetration of non-Indian trappers far to the north of the settled areas, but few individuals would have found it worthwhile to spend so much for the transportation, and organized groups such as this one appear not to have been numerous. A.J. Kerr who did research at Rupert's House in 1947-48 wrote that in the two decades prior "some white men are known to have spent several seasons trapping on the east side of the Bay" (Kerr, 1950:118). And, Burgesse similarly indicates there was relatively limited disturbance experienced by "those Indians whose territories are fairly remote" (Burgesse, 1945:13).

Waswanipi lies somewhere between these two circumstances. The southern portions of the Waswanipi area appear to have been encroached upon by numbers of non-Indian trappers, the northern portions appear to have experienced relatively few intrusions. The situation at Waswanipi was described by Harry Cartledge in the summer of 1927 in a petition he wrote for the band to the Department of Indian Affairs. I will quote it at length:

> "55 Chesterfield Avenue
> Montreal, P.Q.
> Oct. 29 - 1927
>
> "D.C. Scott, Esq.,
> Department of Indian Affairs,
> Ottawa. Ont.
>
> "Dear Sir:
> "At the request of the Chief, the councillers, and the Indians living at Waswanipi in Northern Quebec I desire to bring to your notice a serious situation which is arising in the regions of Waswanipi and Mistassini owing to the advent of numbers of white trappers. The Indians are growing anxious about this matter, and before I left Waswanipi last month, they urged to draw this matter to the attention of the Department.
> "Until very recently the only hunters in these territories were Indians, and they, realizing that hunting was their only means of livelihood, hunted diligently but intelligently. By this I mean, each man divided his lands into sections and

hunted on the sections alternate winters, and in this manner conserved the fur-bearing animals because they realized that they had to return to the same territory another year. The result has been that these bands of Indians are self supporting and are an asset to the Dominion. In recent years the "Quebec Fisheries Ltd.," of Senneterre, P.Q. have had large gangs of men working along the Nottaway river and Lake Mattagami, and these men engage in trapping, more or less, and have practically killed most of the fur bearing animals along these waterways. Besides this company's employees there are many other white men, some whom I known to be citizens of the U.S.A. who are encroaching on the lands of the Waswanipi Indians. The chief said that last winter there were ten white trappers hunting on his territory and that wherever they go they kill everything, especially the beaver, therefore leaving nothing to breed for future winters hunting. The chief also says these men use a great deal of poison and that it is unsafe to allow his dogs to run loose any longer. The white men, having killed all fur-bearing animals in one region always move to another Indian's hunting land the following year, while the unfortunate Indian, still clinging to his old custom, does not encroach on his neighbour's territory but returns to his own land. This matter is really very serious and needs prompt attention.

"I could also remind you that within very recent times the Provincial Government of Ontario passed laws which forbid white men to trap beaver and otter in that province, the result has been, and I am now speaking from my own personal knowledge, that scores of these white hunters have moved from Ontario and are now trapping in the trapping in the territory of the Indians north of the Can. Nat. Ry in the Province of Quebec.

"As I have said before, the people of Waswanipi and Mistassini are virile, self supporting and self respecting bands of Indians, and an asset to the country, but I am afraid that unless steps are taken immediately to safeguard their only means of earning their living, which is hunting, that they will have to be supported entirely by the Government. Commending this matter to the careful attention of the Department of Indian Affairs,

I beg to remain
Your obedient servant
Harry G. Cartledge
(Missionary)."

This letter[33] clearly outlines the general problem which was created for the Waswanipi by non-Indian trappers, and it implies that the main areas of intrusion were along the southern transportation routes. The Chief referred to in the document trapped in the area of Souscamica Lake, just to the north of Matagami Lake. Other evidence of heavy hunting along the Bell River in 1925 or 1926 is given by Davidson who noted that the Grand Lake Victoria Indians, one of whom had some years before received a hunting territory from a Waswanipi Indian as a gift, could not use it because it had been hunted upon by many non-Indians in the previous winter. The territory extended between from Bell River towards the east to within approximately ten miles of Pusticamica Lake (Davidson, 1928c).

The problems the Waswanipi were facing not only arose from the non-Indian trappers. The Indian peoples who lived along the railway also sought to use Waswanipi hunting territories, both with permission or without. John Cooper's fieldnotes on Ojidjuan Indians say of one man that he:

> "has left his own hunting grounds. Six white trappers went into them and took out beaver, stripping the grounds. /He/ has gotten land to hunt from some Waswanipi Indians. Paul gave them provisions in consideration of their letting him hunt on their land" (John M. Cooper, fieldnotes "Family Hunting Grounds. Tête-de-Boule, Obidjuan Band. Data Gathered in June 1926"; cf., Cooper, 1939:68).

The Waswanipi then experienced serious intrusions on their lands from at least 1925 on and this was clearly having an impact on their hunting. This was indicated again in the summer of 1928, the year after Cartledge left Waswanipi and wrote the petition to the Department of Indian Affairs, when the man who replaced him for a summer, a Mr. Alexander, wrote "most of the Indians having made such small hunts last winter, will be unable to pay their debts to the Hudson's Bay Company" (quoted in Anonymous, 1928: 294).[34] And, in the summer of 1928 a surveyor who traversed the area from Opawica River south to the railway reported that "beaver, here as elsewhere, is rapidly disappearing... " (Roy, 1929:85-86).

c. The Initial Waswanipi Response to the Perceived Crisis

The reasons for these declines can now be considered. The available evidence indicates that non-Waswanipi trappers were present throughout the area, but that they were generally more common in the southern areas, and that they were only dense in the areas immediately adjacent to the infrastructures built to facilitate use of other commercial resources, the Bell River transportation route from Senneterre to Lake Matagami and a winter road from the railway to the Chapais-Chibougamau area. Therefore, in the Waswanipi area, the depletion of the beaver and marten populations across the entire region, and indeed in the areas further north, cannot be solely, or even generally, attributed to the direct trapping activities of non-Indian trappers and those Indians from other bands who hunted on Waswanipi hunting territories. When Waswanipi today are asked directly if the intruding trappers actually killed off most of the beaver, they deny that they did.

It would thus appear, as the Waswanipi say today, that they themselves trapped out the beaver. However, the conditions under which they did so are now clear, and it is possible to hypothesize why they did so. With the incursions of non-Waswanipi trappers who would clean out an area one year, and then move to another area the next, the Waswanipi long-term wildlife management practices would be rendered ineffective. That the Waswanipi were practicing management during this period is confirmed in John Cooper's fieldnotes from a man who hunted at Obidjuan but who was a former Hudson's Bay Company employee, who had grown up and learned how to hunt at Waswanipi around the turn of the century. He said of the Waswanipi that they:

> "Do not kill all animals but leave beaver to breed: if they see 3 or 4 cabins in a lake, say 'we will leave them to breed this year... Count and know no. of beaver on land but do not count no. of mink, otter, etc. as this cannot be done" (John Cooper, Field Notes:June 5, 1925:33).

The long-term implications of the intrusions were clear to the Waswanipi as Cartledge's petition indicates, their means of livelihood and self-sufficiency were being undermined. No amount of good management on the part of the Waswanipi could remedy the situation in the areas hunted by the intruders; so long as the intrusions continued their own responses would be ineffective to reverse or remedy the situation. That this was realized is suggested by the fact that the petition sent by Cartledge in the name of the Chief, the councillors and the Waswanipi and Mistassini people was the first time the Waswanipi ever asked directly for assistance from a government agency. According to Ignatius LaRusic who has examined the Indian Affairs Branch files in the National Archives of Canada, Cartledge's letter is the first item filed under "Waswanipi"; and it was accompanied by a memo from the Geological Survey of Canada, responding to a request from an Indian Affairs personnel in Ottawa, giving a description of where Waswanipi is located. Faced with an intrusion which was beyond their own means of control, the Waswanipi sought outside assistance, with the help of a trusted friend. What would come of this request must have been far from clear to the Waswanipi.

The Waswanipi thought that the intrusions would continue and that they would expand, because of the work of Reverend Cartledge. From 1915 to 1927, Cartledge had directed his educational and pastoral work explicitly towards preparing the Waswanipi for the intrusion of white men he expected would come, only he expected farmers (Pers. Comm. Harry Cartledge). Faced with the prospect that as the intrusions expanded it would be impossible to continue to manage the beaver populations towards the long-term goals of maintaining populations and maintaining relatively high sustainable yields, it would appear that the Waswanipi adopted short-term goals, and attempted to cut their anticipated losses to the extent possible. The Waswanipi decided to hunt out the beavers on their hunting territories before others did it.

The Waswanipi do not appear to have gone out to kill everything in a year or two. Significantly, there were no big increases in reported sales of fur pelts. Instead, the fur pelt records simply indicate declines in beaver and marten sales starting in 1927 to 1929. The implication is that as the more or less normal course of hunting led to some declines in the populations, the Waswanipi simply no longer responded by using the various techniques available to them to reduce their harvests and permit the trend to reverse itself. In short, they simply kept on hunting, getting less and less, and slowly driving the populations of beaver and marten downward. This is what some Waswanipi today say of these events, that they just kept hunting in an area year after year, eventually taking all the young beaver. Given the general expectation that they would soon be no longer able to achieve long-term goals, the Waswanipi took the rational course that remained clear under the circumstances; over the course of several years they harvested the animals that would otherwise be lost to them.

d. Finding a Long-Term Solution

This interpretation of events appears to be supported by what followed. As the governments recognized the seriousness of the situation that was developing they first protected the northern areas of the province of Quebec from most non-Indian trapping, and then, at Rupert House, the governments supported an experiment conceived by the local Hudson's Bay manager to recognize the hunting territory system and to fully protect the area from all trappers who were not members of the band. When the Waswanipi became aware of these responses they took the initiative themselves, possibly with support from local Hudson's Bay Company personnel, to revert to their own long-term management practices and to get similar external support for exclusion of non-Waswanipi trappers. That is, as soon as a means of accomplishing long-term management goals became apparent they adopted it.

The seriousness of the situation in this region, and in the northern Quebec region as a whole, with respect to the incursions of non-Indian trappers was recognized by the authorities between 1928 and 1930. Federal Indian Affairs authorities were concerned by 1930 with the growing dependence of the Indians on welfare (see D.C. Scott quoted in Lips, 1947:434-435). In 1929 two Orders in Council were passed by Quebec to deal with the situation. The first was passed to give effect to a ministerial memorandum issued in

1928 creating two small beaver reserves "in favor of the Indians" on which only they could hunt fur-bearing animals. One of these reserves, set up for the Abitibi band, was located just beyond Waswanipi hunting territories, to the west of Lake Matagami between the 49°N and 50°N latitudes and between the 78th line of longitude and the Quebec and Ontario border" (Quebec Official Gazette, 61 (13):1012-1013). The second Order in Council, recognizing "that beaver have decreased considerably within the last few years" prohibited all killing of beaver in the Province of Quebec, with the exception of Indians living north of a demarcated line. In the western portion of the province this line was the Transcontinental railway (Quebec Official Gazette, 62 (33):1854-1855). This second Order in Council had the effect of making the Waswanipi area, among others, legally exclusive to the Indian people. This prohibition was extended in 1932 and 1935 (Quebec Official Gazette, 65 (45):4342-4343; 67 (75):787-788). And, in the summer of 1937, the prohibition was made universal and extended to Indians (Quebec Official Gazette, 69 (27):2452).

In practice however there was little or no policing power in the area to enforce such legal restrictions. Thus in 1930 two surveyors reported a post of trappers at the foot of Gull Lake (Joncas and Malouin, 1931:101). And, the fur trader who had been identified as the organizer of the team of airborne trappers illegally taking fur inland from Eastmain in 1931, was reported to be in Miacasagi River area at Waswanipi in 1937 (Hudson's Bay Archives, B, 227/a/66). However, the Order in Councils not only made killing of beaver illegal, it also made possession of untagged pelts and possession by anyone but Indians and licensed fur traders illegal. As a result, it must in practice have become increasingly difficult for independent non-Native trappers to transport and dispose of beaver pelts, and the number of intrusions were very likely reduced. Probably, only those with a "cover" as licensed fur traders could continue to operate effectively.

The Waswanipi, after they learned of the closed season, reserving the north for Indian hunters, and after also learning of the beginning of the

Rupert's House Beaver Reserve established in 1932, saw a way out of their situation. First, they agreed among themselves to stop hunting beaver, and then they again petitioned Indian Affairs, this time for Departmental support for an Indian reserve and for exclusive use of their lands. In a memo dated August 3, 1936 from the Chief they outlined what they had done and among other requests that they wanted support to set up a beaver reserve of their own:

> "Our idea is that the season for Beaver should be closed altogether, as in these days there are practically no Beaver on our lands, as the total number of Beaver caught by the Waswanipi Band last year, only amounted to 38, which is not enough to keep one family of Indians for one winter, so we think it would be best if the Beaver hunting was forbidden altogether, at least for three years, in fact we of the Waswanipi Band, have decided to protect the Beaver on our lands, as far as we can, and as we called a meeting among the Waswanipi Indians to this effect all the Indians were agreeable, so all we ask is if the Department will honor our move, and give us authority to keep any outsiders off the said lands which we are determin (sic) to protect as far as the Beavers are concerned, what we mean by outsiders, are Indians from other Posts." (Typescript on memo paper, signed by Chief Joseph Saganash, Counselor Diom Blacksmith, and Counselor Samuel Gull).[33]

Two years later, in 1938, the Nottaway beaver reserve was set up. It included those Rupert House lands that had not been included in the original Rupert's House Beaver Reserve, plus the northwestern group of Waswanipi hunting territories, those on which the most beaver were left. Ten years later, when beaver had recovered in that area, the rest of Waswanipi hunting territories and those of the neighboring Mistassini band, were formed into a new beaver reserve. At that time the Waswanipi whose hunting territories were in the Nottaway Reserve agreed to live trap beaver on their hunting territories and to let government agents relocate them to the southern Waswanipi traplines, those south of the Miacasagi River, where the Waswanipi say that the beaver was almost completely exterminated. Live beaver were also relocated to Mistassini and other beaver reserves to the east. Today, the owners of the hunting territories from which beaver were taken say that they were asked by government agents if they would do this with their beaver, and they agreed because other people had none, and they agreed on the understanding that people elsewhere would help to assure everyone had beaver in the future.

iii) The Interaction of Environmental Conditions, Belief and Practice

The events both before and after 1928 indicate that the basic features of contemporary Waswanipi animal resource use and management practices have existed throughout the present century. Hunting territories, owners who control access through rights and privileges, rotational use of sections of hunting territories, and intermittent use of hunting territories, have all been demonstrated to exist prior to the introduction of government support for management practices. However, unlike the contemporary situation in which the decisions and activities directed by individual hunting territory owners generate a community-wide pattern of conservation of animal populations, the historical record indicates that this is not always the case. Between 1928 and 1937 the community-wide pattern was not one of conservation, but one of depletion of specific resources.

Thus, despite the fact that the principles for managing wildlife appear to have been known throughout the course of this century, the actual practice of the Waswanipi has varied significantly. For example, changes in practice between 1928 and 1937, were not the direct result of changes in the principles of wildlife management, specific resources were depleted because of the changes in the perceived situational conditions within which decisions were made and actions were taken. The new practice reflected decisions and actions which were still consistent with some of the principles of hunting management, but only with those which hunters still continued to perceive as attainable.

On the other hand, however, the change in the actual conditions of the Waswanipi environment would not be sufficient to understand what happened between 1928 and 1937. There was a very real and new exploitation of the animal resources of the Waswanipi region during this period, but most of the depletion of animal resources which occurred was not physically caused by intruding trappers. Physically, the major cause of the depletions were the practices of the Waswanipi themselves. And, one can only understand the change in Waswanipi practices by recognizing the complex set of perceptions, anticipations and goals which resulted in changes in Waswanipi hunting activities. The Waswanipi responses can only be understood by noting that the Waswanipi perceived the intrusion; anticipated long-term effects of the intrusion; anticipated the impact of those consequences on their own long-term management goals; identified those goals which they could reasonably anticipate achieving under the altered conditions; altered performance to seek those achievable goals; and, sought new means by which they hoped to again be able to achieve those goals which the new conditions had made unattainable for the time being. Waswanipi management principles and the goals of hunting were not simply abandoned. Those principles and goals which could be pursued were, for example maintaining the presence and resilience of animal populations that can be managed, such as moose. And, those which were perceived to be unattainable e.g. maintaining beaver populations, were sought by new means which it was hoped would recreate conditions for accomplishing long-term goals.

It is important to note the two-fold character of the Waswanipi responses, namely hunting out some resources, combined with seeking external help to re-establish local control of the long-term conditions of those same resources.

Both are responses to changes in conditions as these conditions were perceived and interpreted in relation to their impacts on Waswanipi beliefs about animal populations and the goals of hunting.

Thus, a considerable range of differences in performance occurred without fundamental alterations in the cultural models, and the explanation of the effects of performances must ultimately refer to cultural rules, to perceptions of situational conditions which are culturally ordered and to culturally informed innovation. Over the historical period considered, and in a wide range of present activities, it is clear that Waswanipi resource use and management has been highly consistent with Waswanipi beliefs and decision models. Nevertheless, there were times and situations that are not foreseen in established strategies, and at these times the consistency of performance with belief required innovation as well as interpretation. The Waswanipi willfully and creatively seek and make such linkages. This may be seen both in the way they have responded to the events of the 1920's and 1930's, and by the way they use the history of those events today.

The Waswanipi themselves have and continue to use the events of the 1920's to 1940's as a learning device. Today the Waswanipi speak of those events as if it were a lesson to those who lived through them, and to those who have taken up hunting since. What they say about the reasons for those events focusses more on their own responsibility for the declines in beaver populations than on any single set of reasons for their actions. The lesson for hunters today is that they are responsible as hunters for what they do. The events of that period show what they can expect will happen if those responsibilities are not fulfilled. The references to the many possible causes of those events, and particularly to too many hunters and to needs for cash and foods, emphasize to a new generation of hunters that any of these factors can be a motivation to breach those responsibilities, to abandon long-term goals in favor of short-term gains. The Waswanipi are not so much concerned with explaining what happened several decades ago, so much as they are concerned with learning from those events and enhancing the current commitment to what they know to be responsible decisions and actions.

Footnotes for Chapter 11

1. I have encountered occasions when a hunting territory was said to have been used by a hunter who did not ask the owner for permission, and these cases were always talked about in the context indicating an effort to mobilize public opinion against the transgressor.

2. Confusion on this point can be found in the earliest writings of Frank Speck. In a 1915 paper Speck defines the family hunting group as "a kinship group composed of folks united by blood or marriage, having the right to hunt, trap, and fish in a certain inherited district" (1915a:290; 1915c:182) and he uses the same phrase in some later articles (1928a:327). However, in 1918 the family group is described as comprising "the individuals of one family who hunt together as a herd within the confines of a certain tract of country" (Speck, 1917a:85). In the former case it is the "rights" which define the group in the latter co-use. I am not aware of any place in which this difference in definition, or more precisely in the meanings which Speck gave his usage of the term "family group" or "family hunting group" is explicitly noted by Speck. However, his data make clear that these two usages would not normally lead to identification of the same social grouping if applied in a given community. He repeatedly stressed that an exchange of the privilege of hunting on a territory could be made by an individual with rights in the territory and such exchanges were common occurrences (1915b:4; 1917a:91, 94; 1923:458-459; 1927:390; 1931:578; 1933:585). Speck makes a claim that this practice was not haphazard, but was rather an institutionalized response to ecological conditions of sub-arctic hunting. Of the Timiskaming he wrote:

   > "Permission, however, could be obtained by a man to hunt in another's territory. This happened frequently as an exchange of courtesies between families when the game supply of one or the other had become impoverished" (Speck, 1915b:4; cf., also Speck, 1927:390).

   Furthermore, Speck also provides evidence that this understanding of the practice of exchanging privileges was shared by at least some of his informants. He cited a detailed report of one instance of exchange given by Aleck Paul of Timagami (Speck, 1915b:17) and quoted a general statement attributed to the same informant that:

   > "Sometimes an owner would give permission for strangers to hunt for a certain time on a certain tract. This was often done for friends or when neighbors had a poor season. Later the favor might be returned" (Aleck Paul in Speck, 1915a:295).

3. Some hunting territories are numbered with roman numerals plus letters, which indicate hunting territories that were used jointly during 1968-69 or 1969-70. The dashed lines within each territory indicate areas used separately. These features will be described later when the actual patterns of use of the hunting territories are described.

4. The total of the areas within the individual Waswanipi hunting territories is 9235 square miles compared to 9759 square miles for the area enclosed by the outer boundaries of the Waswanipi hunting territory bloc. The difference is caused by three factors. Areas not included in any individual hunting territory are included in the latter area. When computing the areas of hunting territories several large lakes that fell within the boundaries of a hunting territory were excluded so that the hunting territory areas include the land mass and only small and medium sized water bodies. Large water bodies are included in the area of the hunting territory bloc. Finally, areas that were claimed by two owners were calculated in the area of each individual hunting territory, but were only included once in the hunting territory bloc area. The difference between 9235 and 9759 square miles is the result of the sum of the first two factors listed, minus the effect of the latter factor.

5. When comparing the maps it should be noted that because I did not include in the present study the Waswanipi living at Chapais and Senneterre, some Waswanipi hunting territories were not included in the map I collected: W10, W10A, W12, W22, W16, W24, W23B, W23A, W27, W26 and W25B (Map 11-3). In addition, because I included non-Waswanipi living at Matagami, I included some hunting territories that did not belong officially to Waswanipi band members: XXI, VII, IV and XXXI (Map 11-1).

6. The question of the origin of the hunting territory systems, is beyond the scope of the present study, although the perspective adopted in this study has implications for the question of the pre-historical presence of such systems. These will have to be developed elsewhere.

7. I am indebted to Ignatius LaRusic for a copy of this memo which is in the files of the Geological Survey of Canada.

8. This correspondence is from the files of the Department of Indian Affairs now on file in the National Archives, Ottawa. I am indebted to Ignatius LaRusic for calling my attention to it, and providing me with a copy.

9. Letter dated February 22, 1928 in Frank G. Speck papers at the Library of the American Philosophical Society, Philadelphia. This is listed as part of item 2508 in John F. Freeman's guide to the manuscripts at the Library (Freeman, 1966).

10. Includes hunting territories: I, IIA, IIB, V, VI, VIII, XA, XII, XIII, XIV, XV, XVIB, XVIII, XIX, XXII, XXIV, XXVI, XXVII, XXVIII, XXIX and XXX.

11. The remaining seven territories for which there are insufficient data are: III, IV, VII, XH, XX, XXXI and XXXII.

12. Includes hunting territories: IX, XI, XVIA, XVII, XXI, XXIII.

13. Includes hunting territories: XC, XD, XE, XF, XG, XXV.

14. Because all cases of shifts in hunting territories are cases where data are incomplete, the possibility that more complete data would indicate that a shift had not occurred probably should not be excluded, although it is unlikely that this could ever be fully tested.

15. The extent to which this process reflects human population pressure on the land will be discussed below.

16. One clear example of this appears in the 1915 report. Peter Nayahsett hunted in a group with two sons, one married and one unmarried. An older son hunted from a separate camp location, and a son-in-law and his step-father from two other locations. But all these locations and the land used by the hunters were "owned" by Peter Nayahsett (Davidson, 1928a:58).

17. Both governments subsidized the beaver pelt marketing system. Quebec covered the costs of sorting and grading the pelts for auction. Canada provided funds and the accounting and administrative costs for advances to hunters. The hunters thus received a portion of the value of the pelt within weeks of the date it was shipped, and the balance after it was sold. In 1968 they were to receive 60 percent of the estimated value as an advance (Emond, 1968). The advances were necessary to partially offset the major disadvantage of the government run marketing system, namely that final payments were only made after the furs were sold at auctions, which are only held several times a year. Furs the hunter sells to independent fur traders are paid for immediately.

18. While this prohibition was not completely effective, as I have indicated above, it did eliminate any extensive hunting by non-Natives as had occurred in previous decades.

19. It should be noted that some of these ten territories that were not used by hunters operating from winter bush camps between 1965-66 and 1969-70 were used during summer fishing and waterfowling periods, and for fall moose hunting during these years. Thus, at least five of the ten territories were being used regularly during the summers and falls from 1965 to 1970. One, near a settlement, was also being used regularly by settlement based hunters in winter. Thus, for a territory not to be occupied by hunters living in bush camps during a series of years does not necessarily imply that no use is being made of the wildlife resources of the area.

20. It will be recalled that the period from 1965-66 to 1967-68 was one of disruption of hunting patterns and this may have affected the patterns of use outlined here. This would appear to be the case for 1965-66 when only 16 hunting territories were used (Table 11-7). In the following years the numbers of territories used varies little. As I have indicated pre-

viously, the geographical distribution of the hunting territories being used was especially skewed towards those easily and cheaply accessible from the town sites in 1965-66 and in several following years. This readjustment is not apparent from the total number of hunting territories in use after 1965-66.

21. These were the owners of hunting territories I, III, IV, V, VI, VII, and IX, although the owners of territories IV and V indicated that they did not follow the rotation in 1969-70.

22. Adult months are used in the first step in this analysis and they were converted to adult days by multiplying by 30. As a result, some small variations exist between the calculations presented here and those in Chapter 8.

23. It may be worth noting that the sub-division of hunting territories among owners does appear to be limited, mainly by patterns of land usage. In Appendix 9-9 I have indicated that the area around a camp that is relatively efficient to harvest extends for approximately six miles, and that the actual areas used from a single camp are averaging 67 to 85 square miles. This corresponds to the size of the smallest hunting territory, XIII, with 91 square miles of land (Table 11-11).

24. Although eleven hunting territories were used in both years comparative interpretations must be qualified by noting that the areas used were not always the same in both years. In four of the eleven cases the section used was different, (territories I, VII, IX, and XVII); in three cases most of the area used in 1969-70 was the same as the area used in 1968-69, but part was different (territories X, XVI, and XXI); and in four cases the same geographical area was used (territories IV, XIV, XVa, and XX). Because of these differences in the areas used in 1968-69 and 1969-70 I will use the comparative densities of the human populations in each of the two years as an indicator of changes.

25. The combined harvests changed less than ten percent on territories XVa and XXI, and went up on three territories VII, X and XIV.

26. An increase in the beaver harvest density occurred on hunting territory XXI but the levels were still below average. This territory was reported to have had low numbers of beaver for several years.

27. I am indebted to Ms. Shirlee Anne Smith, Archivist, for arranging and guiding access to the Hudson's Bay Company Archives, and to Mr. Lee Stuesser for extracting the relevant data from the Archives in Winnipeg.

28. The Hudson's Bay Company records include occasional statements on forest fires in the region around the Post that are consistent with the published data reviewed in Appendix 11-2.

29. The changes in beaver populations of the Waswanipi region following the formation of the beaver preserves, and during the period of trapping since the early 1960's has been reviewed earlier. It is a period of rapidly increasing populations followed by hunted populations that vary on a territory by territory basis, but that remained generally high.

30. Some of the increases which are indicated for the five year periods between censuses can not be explained as naturally occurring increases in a population unaffected by migration (Wilson, 1974). This indicates the difficulties of assuring a completely comparable population and geographical area for comparative analysis. For present purposes I will simply assume that the definition of the Waswanipi band in the censuses, and the boundaries of the hunting territory area are comparable over the sixty years covered by these data.

31. Cartledge lists 23 locations, but in his notes he indicates that one hunting territory was not being used and the owner was residing with another hunter. He attributes the shift to pressure from the Hudson's Bay Company manager.

32. Thus in any one year 40 to 33 percent of the total area of the Waswanipi hunting territories was actually being hunted.

33. I am indebted to Ignatius LaRusic for providing a copy of these documents from the National Archives of Canada.

34. It should be mentioned that leaving debts unpaid was not an uncommon occurrence, indeed, it was a traditional feature of the fur trade in the Hudson's Bay Company posts of the James Bay District. While the amounts of unpaid debts at Waswanipi were considerably lower than in some other posts of the district they were still common. Unpaid debts on advances to the Indians amount to: $1,278 in 1915, $772 in 1917, $1,731 in 1918, $2,139 in 1920, $7 in 1921, $5,251 in 1923 on advances of $28,000, $0 in 1924 on advances of $24,130; $1,654 in 1925, $1,394 in 1925 on advances of $23,042, and $1,428 in 1927 on advances of $19,774 (Hudson's Bay Company Archives, D.FTR/7, 8, 15, 17, 21, and A.74-34, 40, and 41). Unfortunately the 1928 figure is not available, but it is worth noting D.H. Learmonth's comment on the 1923 loss, that the district inspector:

> "seems quite satisfied. $5000.00 loss on Indian debts evidently a matter of little moment in this District. Policy evidently accepted on James Bay 'buy furs at a big margin of profit then lose it all again in Indian debts and expenses.' Fear I must be an old timer with conservative stick-in-the-mud ideas" (Hudson's Bay Company Archives, B227/a/57.

CHAPTER 12 - CONCLUSIONS - BELIEF, ACTION, ENVIRONMENT AND EXPLANATION

What I try to show in the present study is that the belief system of a human population can incorporate both distinct cultural orderings and also "realistic" models and principles of environmental phenomena, so that action informed by those beliefs can be effective in the world and also alter the environment in conformity with the cultural projects of the population. The implication I have developed in the concluding chapters of the study is that human beings can rationally, that is in a culturally informed manner, identify choices and take decisions that effectively provide for their own needs both in the short and long-term, and that give them some degree of conscious and effective control over their environment.

While numerous secondary issues have been considered in the course of this analysis, the main thematic conclusions have been: 1. Waswanipi beliefs are organized by a cultural logic that is based on ultimate propositions and values; 2. Waswanipi beliefs and principles are biologically and ecologically realistic and extensive; 3. Waswanipi beliefs include a moral order linked to specific models, recipes, plans and programs for action; 4. that the Waswanipi do in fact act in ways that generally are informed by their beliefs, but the beliefs inform rather than determine action because action is always situationally located; 5. that Waswanipi action is effective in their environment, controlling in part animal populations, and the distribution of the human population and subsistence, but this is not a sufficient explanation of that behavior; 6. that the actions of the Waswanipi alter aspects of their environment to create conformity with their culturally encoded goals; 7. that key decisions in the action system are taken by socially located individual decision-makers, and that system outcome is a result of rational and largely conscious choices by those decision-makers.

The critical interactions between belief and action can be described here by examining the organization of decision-making. I have argued that the system of hunting territories, reported widely in the literature on the northeastern

Algonkians over the last six decades, is in effect a culturally defined organization of socially recognized rights and duties which allocate specific types of decisions to specific socially located individuals. The rights and duties the "owners", or stewards, of the hunting territories have with respect to the intensive harvesting of animal resources amount to a decision-making authority over the management of the populations of intensively used animals. And I argue the strategies available to exercise such management are effective means of regulating aspects of those populations consistent with the culturally defined goals of the actors.

The system of hunting territories and stewardship has been shown to be defined by beliefs concerning the personal and power relationships between human beings and the specific animal and spirit beings which inhabit or are associated with the geographical area of a territory. The inheritance of hunting territories has been shown to place owners in a multi-generational chain of past and future owners and to emphasize their long-term responsibilities and goals. This long-term managerial focus is manifest in the actual long-term continuity of the hunting territories which were shown to generally have been located in approximately the same geographical areas over the last sixty years and to have existed for over a century and a half.

The emphasis on the long-term responsibilities of stewardship links the resource use decisions of stewards to the ultimate Waswanipi models of and for the world, which articulate a specific series of appropriate relationships between human beings and other powerful beings who comprise the dynamic components of the Waswanipi world or reality.

While it is not appropriate to recall here the entire scope of the analysis of the belief system, it may be appropriate to briefly identify four key elements of that analysis. The first is the proposition of a personal causality in the world, which implies that interactions with the beings of the world are communicative exchanges with willful beings which are generally benevolent but morally insistent. Such a world is contingent but partially predictable and men are clearly able to relate to, but are also dependent on, the actions of other beings. The second is the concept of hunting as a cyclical alternation of gifts, or harvests, and of growth, or fallows, which implies a variability in interactions with world and which puts men under a sense of obligation to only harvest what is given to them, and therefore to regulate their own hunting activities in keeping with the changes in the conditions of the animal beings. The third is the concept of power which defines the hierarchical organization of beings in the world, and provides a model by which men can respectfully participate in the power of the world by being given, and acting upon, knowledge of what will occur in the future. And fourth, the positive valuation of those individuals who through their active but balanced participation in the world of powerful beings moderate the cycles of 'luck' and 'no luck' and bring long-term success and prestige to themselves. These culturally distinctive beliefs form an ordered and integrated system of belief of and for the world.

Waswanipi belief systems have been shown to not only encode the basic concepts and propositions for experiencing and knowing the world, but also to include models and values for action including highly specific models, strategies and tactics for hunting consistent with basic principles. For example, I have analyzed a set of models for choosing the times, places and methods for harvesting various animals, and especially moose and beaver, on the basis of explicit statements by Waswanipi individuals. On the other hand, I have also shown that there is a set of strategies and tactics for the management of hunting territories.

The culturally encoded principles for management amount, in a more etic terminology, to a set of rules for regulating both the hunters' harvesting activities and the distribution and reproduction of the animal populations which are intensively harvested, so that harvests are maintained at or below long-term sustained yields; and so that the level of sustained yields maintained is one that moderates, to the extent possible, the variability first of the animal populations, and second of the hunters' harvests of those populations.

So stated it is clear that Waswanipi beliefs are related to environmental realities and to ecological principles as recognized by scientists, but it is also clear that the basic ordering of Waswanipi beliefs is cultural. Thus, while any of several possible animal population densities will be compatible with sustained yield harvests in the long run, the Waswanipi value less variable over more variable harvests, and recognize skill and accord prestige on the basis of differences in the degree of variability of harvests.

The detailed analysis of performance has indicated a very widespread correspondence between behavior and belief, but not a determination of action by belief. For example, I have indicated how the times, locations and methods of hunting correspond to a significant degree with the recipes for action, but also how action is situationally located so that moose are caught at times and places not foreseen in recipes for action. Alternatively the models for beaver hunting include a series of conditions and consequences which are characteristic of each method, but the actual choice depends on the situational conditions and on the priorities of the hunter.

With respect to the management of hunting territories I have indicated how the cultural ordering of rights and obligations provides a basis for action, and how a set of widely recognized strategies and tactics are articulated and used to fulfill those stewardship obligations. By deciding on whether a hunting territory or a section thereof shall be used, by deciding how many people shall use the territory, by deciding where they shall hunt, and by deciding how much they shall try to get of each kind of animal the steward of a hunting territory effectively exercises control over the hunters, the harvest, and some control over the animals. Decisions are taken in response to a series of basic cues of the condition of the animal populations being harvested, in order to allow declining populations to increase or to reduce excessively high populations. Strategies include intermittent use of hunting territories of sections thereof, which has been shown to be an effective means of permitting animals to grow. Harvest levels have been shown to be consciously adjusted to the recent history of use of a territory and of harvests of the animal populations. Mechanisms other than intermittent use are also used under conditions of population pressure to reduce harvests of declining animals. These include the seeking and granting privileges of access to other hunting territories in order to reduce the human population using a territory, and thereby to reduce the harvest of animals; and the more intensive use of animal resources other than those most intensively harvested, along with additional purchased food supplies. These strategies have been shown to be effective means of regulating animal populations, such that variations are generally limited and such that more extended variations can be effectively controlled through extended fallowing. The general principles and strategies for management are a system of highly flexible rules and guides for defining environmental situations that require action and for choosing among effective means of regulating variations in animal populations the means that are appropriate to the actual social and environmental context and consistent with the specific goals of the steward. The stewards use management principles and strategies to respond in a flexible and generally conscious way to the environmental conditions with which they must deal. The animal populations are effectively regulated to minimize variability under a wide variety of environmental conditions, and under a wide variety of social conditions, particularly variable demands for hunting generated by demographic change and the system of rights and privileges of access to hunting territories.

I have shown in detail that the harvesting behavior regulated by the decisions of individual stewards of hunting territories generates a community-wide pattern that effectively keeps the populations of the most intensively harvested animals, moose and beaver, to relatively stable levels over a period of years. Harvests too remain relatively stable at the community level of aggregation. Individual variations in the success stewards have regulating animal populations have been noted and related to differences in the recognized skill of individual owners.

I have also shown in detail that the community-wide pattern of harvesting behavior effectively meets subsistence requirements with high but acceptable levels of work. Hunters in bush camps on the hunting territories produce more food than they require to meet their immediate subsistence needs, and they provide considerable food to the settlement based population that does not engage in intensive hunting. Nevertheless, the harvests from bush camps provide considerably less than would be required to feed the entire population, including those who live in the settlements.

The greatest percentage of food is produced from only two species in winter, moose and beaver, and on an annual basis from three harvests, moose, beaver and fish. Other resources are used to diversify the diet, and possibly unconsciously to provide needed micronutrients. The analysis shows however that energy is the most limited of the major nutritional resources provided primarily from bush foods.

The actual mix of types of animals harvested is related to the maximization of the energy efficiency of hunting, and to the reproductive potentials of the populations. Moose are harvested in preference to beaver and beaver in preference to fish, which corresponds to the relative efficiency of the alternative activities measured as the ratio of the output of energy from the food produced relative to the input of energy to the harvesting activity.

The actual mix of harvests, however, is not simply a function of efficiency, and the levels of harvesting have been compared to the sustainable yields of the populations. It is shown that fish are the most productive resource followed by beaver and then moose. The most efficiently harvestable resources therefore are in this case the least productive. The harvesting strategy is therefore to use the more efficiently harvestable resources at levels consistent with the principles of maintaining relatively stable populations and not exceeding sustainable yields. Moose are harvested at or near sustainable yields, beaver are harvested at approximately one-half to three-quarters of sustainable yields, and harvests of fish amount to less than twenty percent of sustainable yields. Thus, although the Waswanipi are capable of killing more moose, beaver and fish, they limit their harvests.

Analysis of data on the condition of the most intensively used animal populations confirms that hunting activities control some of the critical dimensions of the distribution and reproduction of the animal populations which are harvested intensively. In the case of moose populations I have shown that there is evidence that the management practices of the Waswanipi are maintaining moose populations at a relatively high level of productivity, given the capabilities of the species. And, there is evidence for both moose and beaver populations that the Waswanipi were maintaining populations at relatively stable levels with cycles of limited amplitude. In the case of the moose productivity was probably being maximized in so far as it was consistent with moderating variations. In the case of beaver intentionally creating moderate variations may stabilize populations against the disruptive impacts of the harvesting activities themselves.

I argue that these community-wide patterns of resource use and management, which result in high productivity of the animal populations harvested intensively, with moderately variable population levels, and relatively high but sustainable and moderately variable harvests for the hunters, is itself the result of mostly conscious management decisions made by the stewards of the hunting territories who are able to effectively accomplish the goals encoded in Waswanipi beliefs. And, I argue that this success depends in part on the ecologically "realistic" concepts, propositions and values shared by the Waswanipi.

This system of decision-making by stewards of hunting territories indicates that the community-wide pattern of resource use management is the result of the resource management decisions being taken by approximately thirty owners of hunting territories, each acting with respect to a specific and generally exclusive geographical area. The community-wide pattern does not therefore come into being independent of the conscious choices and decisions made by the Waswanipi, nor through a single authoritative decision-maker or decision-making mechanism at the community level, but as the result of the specific decisions of men acting without formal coordination.

What gives the decisions of those men some degree of uniformity, and what is critical to the wider pattern is that each of these men's experiences and decisions is informed by a system of cultural beliefs which has a distinctive logic and structure, which is ecologically realistic, which is morally powerful, and which is encoded not only in general propositions and values but in specific recipes and strategies for acting.

An example of the links between belief, action and outcome is the correspondence between the model for hunting and the structure of animal populations over time. The model for hunting is based on the concept of power, which is interpreted so as to require a sensitive and delicately balanced action in a willful environment, and it is based on the value of moderation in the variability of action and outcome. Independent analysis of animal populations at the community-wide level suggests, as I have indicated above, that in fact variations in the population densities of the most intensively species are being controlled in part and that they are being kept with a moderate range of variation; while analysis of the annual harvests at the community-wide level similarly indicates relatively high and relatively stable harvests of those animals. Thus, the general goal in the structure of Waswanipi model for hunting is being accomplished in hunting practice.

Regulating the population variations of the animal populations involves some control of the reproductive features of the resource populations which the Waswanipi harvest. Thus, Waswanipi hunting activities, while in balance with the environment are in fact a means of transforming the patterns of natural variability towards a pattern of moderate cycling of animal populations, which is controlled in part by the Waswanipi themselves. Thus, the Waswanipi transform some aspects of their environment to conform to the logic of their beliefs. And, while the analysis of belief concludes with the finding that beliefs are in some important respects environmentally realistic, without being reducible to the structure of those realities, the analysis of the consequences of action concludes in the finding that the environment is being made to conform in some respects to the cultural beliefs, without the structure or functioning of the environment being degraded by human actions.

Waswanipi hunting territory stewards are therefore able by a number of means to effectively control and moderate the variability of the populations on which they depend, and these means depend on conscious processes of situationally located culturally ordered decision-making.

These formulations of Waswanipi beliefs and practices that comprise relationships between the Waswanipi and their environment have significant implications for existing analytical models in ecological anthropology. Many of the implications for ethnoecological studies have been discussed and summarized in the concluding sections of Chapters 3 and 6 in Part II of this study. In this conclusion I will briefly focus on the implications for the functional systems analysis paradigm of cultural ecology.

The analysis presented here conflicts at numerous points with the functional systems analysis of the hunting system of the northeastern Algonkians made by Rolf Knight. Knight's study was based on field research at Rupert House a Cree community on James Bay, the hunting territories of which are adjacent to Waswanipi hunting territories on the northwest. He claims his results apply generally to the eastern Canadian sub-arctic.

Knight argues that relatively harsh climatic conditions in the sub-arctic lead to relatively simple plant and animal communities which are noted for their fluctuating character. As a consequence, the densities of animals on family hunting territory sized tracts of land vary considerably from tract to tract at any given time, and they vary over time on any one area (Knight, 1965:31).

He explicitly challenges the "assumption" that proper organization of resource use could mitigate hunting insecurity through exploiting beaver on a sustained yield basis (Knight, 1965:31-32). Even if beaver could be maintained at stable population densities, men could not be maintained at stable densities. Differential reproduction in family sized groups and the impact of disease would result over a period of time in some territories having few hunters and others being relatively over-populated (Knight, 1965:34).

However, he claims that probably the most important factor creating fluctuations is that the management of harvests and game cannot always be successful, and "unplanned or unavoidable overhunting and overtrapping can easily break a tenuous stability which takes years to re-establish" (Knight, 1965:31).

Knight's conclusion is that it was functionally impossible for sub-arctic hunters to effectively conserve resources until recent decades because of the dynamic nature of the systems variables involving wildlife populations and densities and uneven human population increases. He argues that hunting territories, even if they existed during prior periods, could not have been maintained, because they were dysfunctional with respect to providing adequate subsistence for the human population from available game resources. Only when alternative sources and means of subsistence became available in the 1930's and 1940's could hunting territories be maintained.

In short, he claims that his "findings indicate that animals could not be conserved" (1968:11) and that "personal control and restricted use of strategic resources [was] unfeasible and unadaptive" (Knight, 1965:40, brackets mine).

Knight's formulation of a generalized claim to have described conditions typical of the eastern Canadian sub-arctic clearly conflicts with the evidence presented in this study. I have demonstrated that there is today, and that there has been throughout this century at Waswanipi, a conscious culturally encoded system for effectively dealing with demographic changes in human populations, and some variations in animal populations, and for consciously adjusting subsistence resource mixes to changing conditions of the resources, some of which are controlled by the hunters themselves. And, I have demonstrated that this system of resource management is based on decisions by stewards of hunting territories who have personal rights to regulate the intensive use of resources on restricted tracts of land, and that this territorial system has existed with considerable continuity since 1915, and at least since the beginning of the nineteenth century.

Examining the differences in the two studies to find the basis for the radically different conclusions, the striking feature is that Knight's account of the environmental variables and my own account of environmental features are not very different. And, Knight's account of the actual behavioral practices of the Rupert House Cree, while less detailed than my own, is also not very different.

For example, Knight provides record of the various behavioral practices the Rupert House people use to alter their hunting in response to changing conditions in their environment, and in their own demographic structure. He indicates: that individual men have hunted on many parts of the community's lands over the course of their lifetimes; that different groups lived on the same area over a period of years; that hunters sometimes only decided where they would stay after leaving the settlement, and presumably, after surveying alternative areas; that some groups trapped an area in fall and then decided to move to another area and possibly to join another hunting group; and that some hunted wherever they were caught by freeze-up (Knight, 1965:32). These Knight calls "pragmatic adjustments", and these patterns coincide well with some of the ways that Waswanipi hunters also pragmatically respond to changing or unanticipated situations.

The difference between our studies is that I not only gathered behavioral and environmental data, I gathered data on beliefs, and the data on beliefs were used to order and suggest directions for the analysis of the behavioral data and its environmental consequences. I took peoples' models and strategies for action and studied if behavior conformed to them, and whether the consequences of that behavior were intended, and how those consequences were interpreted, and how that experience informed new action.

In contrast, Knight's description of Rupert House Cree hunters' behavior refers that behavior entirely to the environmental, demographic and technological conditions of the activity, and ignores the relationship between action and belief. I would argue that it is because of Knight's failure to systematically describe and analyze the belief system and thefore his failure to describe the intentions of the hunters themselves, that his account appears from the perspective of the present study to fail to identify what the behavior he describes really accomplishes; that is it fails to note that to a limited but real extent the hunting territory system is a means of rationally and consciously managing the populations of some animals, and the harvests and subsistence of the hunters.

The behaviors Knight has described are, from the perspective of the present study, the strategies and tactics used by hunters precisely in order to manage resources, to plan resource use, to alter the distribution of people over the land, and to reduce or effectively respond to the variability of their environment

I would emphasize that without consideration of the belief system, Knight's account of the behavioral system tells us nothing more than that people respond pragmatically to conditions. If there are not enough animals they move, if an area is depleted they hunt somewhere else. But not only does this not explain, it is not an adequate account of behavior because it does not distinguish, for example, whether they moved because they recognized unanticipated declines in the animal populations or because they intentionally hunted out the area, or if they fallowed the area as part of a regular rotation. And these things we have to know in order to adequately judge the relationships between those actions and the environment. For example, the effect of the behavior on the environment will be quite different in each of these cases.

Thus, Knight implicitly assumes that all movement is a sign of a failure of resources and of unplanned or unavoidable over-hunting. But this need not be the case. A man who fallows his territory may in fact be carefully regulating the animal populations of his territory and the move may be part of a long-term ongoing planning process. The man who traps out his territory is also responding to conditions which he planned for and created. I do not want to argue here that there are no unplanned environmental conditions, quite the opposite, I have indicated that there are structured responses available for many unplanned conditions, and there are culturally informed innovations that occur on other occasions. The point is that it is essential to be able to distinguish significantly different actions, otherwise one cannot test assumptions about the relationships between behavior and environment systematically. In order to be able to distinguish different actions, the researcher requires a knowledge of behavior from the actor's point of view, an analysis of beliefs.

I have argued that Waswanipi stewards intentionally manage the animal resources on which they depend. How wildlife populations are managed depends on the goals of the manager and in practice the only way to see these goals through data on the flux of situational variation and through variations in the degrees of success different stewards achieve is to discover the manager's goals through analyses of his statements and beliefs.

Once these goals are clear, however, the pattern of action is not only analyzable, but whole new sectors of behavior become the focus for analyses that would otherwise have escaped attention. The analysis of behavior is often informed by the analysts' assumptions of the goals of the actors, or of the system in which they act, and I would argue that analysis is improved if the belief system is analyzed and the analysts' assumptions tested.

Thus, in order to study men's behavior in relation to the environment it is important to also study it in relation to belief, just as in order to study the relationship of belief to environment, one must study action. Cultural ecological studies must include systematic analyses of belief, action and environment, and must use and integrate some of the methods of ecosystems analysis and ethnoecology with an integrating analysis of decision-making.

APPENDICES

APPENDIX 2-1 ESTIMATE OF CASH INCOMES OF THE WASWANIPI COMMUNITY

A gross estimate of the cash incomes of the members of the Waswanipi band can be made on the basis of the data collected and that available from various sources.

A - Transfer Payments

The major transfer payments received by Waswanipi band members in 1968-69 and 1969-70 were old age pensions, federal and provincial family allowances, and welfare payments. A few men also received Unemployment Insurance payments.

The basic federal old age security pension was $76.50 in 1968, $78.00 in 1969 and $79.58 in 1970. The income supplements were $30.60, $31.20, and $31.83 respectively. Weighted average annual payments for October 1968 to September 1969, and for October 1969 to September 1970 would be $1,304 and $1,331 respectively. Not taking into consideration the marital status of the pensioners, there were 29 Waswanipi band members over 65 years of age and eligible for a pension in December 1968 and 25 band members eligible in December 1969 according to the official band list. Using December population figures creates some error in the calculations, but it is not considered too great relative to the accuracy of the estimations made in other parts of the calculations. The population covered by this study is 71 percent of the band membership so it is estimated that there were 21 eligible pensioners in 1968-69 and 18 in 1969-70. Of those who were eligible, only one couple indicated during the fieldwork period that they were not receiving pension. The estimated pensioners are therefore reduced by two. The total pensions estimated to have been paid during the periods are therefore $24,776 in 1968-69 and $21,296 in 1969-70.

Federal family allowances during these years were paid at the rate of $8 per month for children 10 years of age or older, and $6 per month for children up to but not including 10 years of age. The Waswanipi band comprised 215 children under 10 years of age in December 1968, and 225 in December 1969 and 81 children between 10 and 16 in December 1968, and 98 in December 1969 according to the official band list. Taking 71 percent of these totals the estimated family allowance payments are $16,584 for 1968-69 and $18,240 for 1969-70. Actual payments were probably somewhat less than this because payments were supposed to depend on school attendance, and because there may have been some under-registration, especially of younger children, although this may have been true of the band list data as well. No adjustment is made for these errors.

Quebec family allowances were paid on the basis of family size and age of children. The rates for children under 12 years of age were $10 less per year than the rates for children between 12 and 15 years of age, for all family sizes. Family size was taken into account by changing payments by rank of the child. The first child in a family, under 12 years of age, brought a payment of $30 per year, the second child $35, the third $40, and for the fourth, fifth, and sixth or more $50, $60 and $70 respectively. Because rank is more significant than age an average figure for age is used, $33 for the first child irrespective of age, and $38, $43, $53, $63, and $73 for other ranks up to sixth and higher, irrespective of ages. In December 1968 there were 64 Waswanipi families considered in this study, with offspring eligible for family allowances, 14 families with one child under 16 years of age, 10 with 2 children, 10 with 3, 7 with 4, 11 with 5, 2 with 6, 5 with 7, 1 with 8, 3 with 9, and 1 family with 10 children. Estimated Quebec family allowance payments would total $10,501 in 1968-69. In December 1969, there were 11 families with 1 child under sixteen years of age, 12 with 2 children, 14 with 3, 6 with 4, 11 with 5, 4 with 6, 3 with 7, 2 with 8, 2 with 9 and 1 with 10, for an estimated Quebec family allowance payment of $10,092.

Welfare payments were administered by the Waswanipi band, with funds provided through the Canada Department of Indian Affairs and Northern Development.

The payments to the population under study were $26,525 in 1968-69 and $23,890 in 1969-70 according to band records.

Unemployment insurance payments were not regularly utilized by Waswanipi from 1968 to 1970 and it is estimated from field data that only two men received payments for extended periods each year, averaging about $3,200 each.

The estimated total cash income to the band through transfer payments was $84,785 in 1968-69 and $79,918 in 1969-70.

B - Employment Income

As reported in the main text of this study, a total of 31 and 37 men were employed during the summers of 1969 and 1970 respectively, and an additional 34 and 40 men worked during all seasons in 1968-69 and 1969-70 respectively.

For those men who worked in summer only, data on the types of employment engaged in are only available for the summer of 1970. During that summer 13 men worked in commercial fishing (7 fishing and 6 in the fish plant), 12 men worked forest cutting, 5 worked regularly as sport fishing and hunting guides, 4 worked in surveying/mineral exploration, and 3 worked at other jobs.

Those who worked at commercial fishing, on the lakes and in the fish plants earned a total of $9,928.98 according to the official records. The fishery closed down permanently at the end of 1970, and these men also received bonuses totalling $6,740.96. However, this was not paid in cash, but as skidoos, gasoline and miscellaneous trapping equipment, purchased and delivered by an employee of the Department of Indian and Northern Affairs. These were purchased and delivered without the knowledge of the fishermen themselves, that is until they received the "cargo" in their winter bush camps. The delivery was after the 1969-70 year and will not be included in income in this calculation.

The men who worked forest cutting say they earn about $15 per day, although they can range from $10 to $25 per day of work. Those who worked the summer period only worked about 12 weeks, and earned an estimated $10,800.

Guiding was paying $20 per day in 1970, plus tips, but a guide is not able to work every day. Tips are about 25 percent (LaRusic, 1968:25), and in a previous summer at Mistassini guides had averaged about 10.5 man-weeks of work throughout the summer (calculated from LaRusic, 1970: Tables V and VII, B-25 and B-27). On this basis the total earnings from guiding were $8,268.75

Surveying and mineral exploration were mainly done for two Indian contractors, who were paying $20 to $40 a day, average about $25 per day. Exploration work however is intermittent, a job may last a few days or a few months, but then there are periods of unemployment waiting for a new job. In the summer of 1970 the men working summer only worked for three months in exploration, giving a total income of $6,500.

Two men worked at a sawmill, one for only two weeks, and one worked on a road repair crew. Their estimated incomes are $120 per week for a total of 28 man-weeks of work or $3,360.

The estimated total incomes of men who worked summers only is $38,858.

Of the 40 men who worked all year, 9 held permanent full-time jobs, 3 in mines, one in a sawmill, and 5 in other laboring jobs. The reported salaries for laboring and sawmill work ran from $4,000 to $6,000, with a best estimate of $4,500. Work in the mines was reported to pay $5,000 to $8,000 per year, with $6,000 as a best estimate. The nine permanently employed men are estimated to have earned $45,000.

Of the 31 men employed part-time during all seasons of the year, 20 worked in exploration, 11 in forest cutting. The exploration work paid the same as for those who worked summers only, except for one of the Indian sub-contractors who had several crews out working for him at one time, and who earned more than a regular member of the crew. During the year impressionistic data indicates that about half of the potential man-weeks were spent in employment. This would give an estimated income for the 31 men of $71,750.

The 11 men working in forest cutting generally worked for eight months, for an estimated total income of $28,875.

The estimated total income of men working part-time during all seasons is $100,625, and the estimated total income of Waswanipi men from employment in 1969-70 is $184,483.

A proportional estimate for 1968-69 would be $32,557 in summer only work income, $30,000 in permanent employment income, and $90,887 in part-time work, for a total annual estimate of $153,444.

APPENDIX 2-2 COMPARISON OF TOTAL CASH INCOME, EMPLOYMENT INCOME AND TRANSFER PAYMENT INCOME AMONG JAMES BAY CREE COMMUNITIES, 1947-48 TO 1973-74.

This appendix lists all available data, without regard for differences in the methods and assumptions of different studies, the intensity of coverage, and the sources of the data analysed.

Table A2.2-1 Cash Income Per Capita in James Bay Cree Communities

	Periods and Years								
	Before 1960	1960-1964			1965-1969	1970-1974			
Community	1947-48	1960-61	1962-63	1964-65	1968-69	1970-71	1971-72	1972-73	1973-74
Fort George					$955[5]		$1190[8]	$1631[9]	$1476[10]
Paint Hills							$ 695[8]	$ 750[9]	
Eastmain		$207[2]					$ 479[8]	$ 952[9]	
Rupert House	$245[1]	$225[2]		$176[11]				$ 625[9]	
Mistassini			$429[3]	$341[11]				$ 799[9]	
Waswanipi				$329[4]	$681[6]			($ 301[9])[12]	
All						$340[7]		$ 918[9]	

Footnotes:

1. Kerr, cited in Knight, 1968.
2. Knight, 1968.
3. Williamson, 1964.
4. Samson, 1966a.
5. IAB, 1970.
6. Present study.
7. Salisbury, *et al.*, 1972a.
8. Salisbury, *et al.*, 1972b.
9. SDBJ-SEBJ, 1974.
10. GCCQ, unpublished data.
11. Hawthorne, 1966.
12. Incomplete employment income data.

Table A2.2-2 Employment Income Per Capita in James Bay Cree Communities

	Periods and Years								
	Before 1960	1960-1964			1965-1969	1970-1974			
Community	1947-48	1960-61	1962-63	1964-65	1968-69	1970-71	1971-72	1972-73	1973-74
Fort George					$271[5]		$726[8]	$1197[9]	$983[10]
Paint Hills							$125[8]	$ 307[9]	
Eastmain		$96[2]					$ 53[8]	$ 430[9]	
Rupert House	$21[1]	$90[2]						$ 275[9]	
Mistassini			$154[3]					$ 364[9]	
Waswanipi				$151[4]	$382[6]				
All						$169[7]		$ 513[9]	

Footnotes:

1. Kerr, cited in Knight, 1968.
2. Knight, 1968.
3. Williamson, 1964.
4. Samson, 1966a.
5. IAB, 1970.
6. Present study.
7. Salisbury et al., 1972a.
8. Salisbury et al., 1972b.
9. JBEC, JBDC, 1974.
10. GCCQ, unpublished.

Table A2.2-3 Transfer Payment Income Per Capita in James Bay Cree Communities

	Periods and Years								
	Before 1960	1960-1964			1965-1969	1970-1974			
Community	1947-48	1960-61	1962-63	1964-65	1968-69	1970-71	1971-72	1972-73	1973-74
Fort George					$640[5]		$142[8]	$418[9]	$493[10]
Paint Hills							$340[8]	$417[9]	
Eastmain		$34[2]					$244[8]	$474[9]	
Rupert House	$36[1]	$84[2]		$87[11]				$624[9]	
Mistassini			$120[3]	$138[11]				$799[9]	
Waswanipi				$118[4]	$211[6]			$301[9]	
All						$118[7]		$919[9]	

Footnotes:

1. Kerr, cited in Knight, 1968.
2. Knight, 1968.
3. Williamson, 1964.
4. Samson, 1966a.
5. IAB, 1970.
6. Present study.
7. Salisbury, et al., 1972a.
8. Salisbury, et al., 1972b.
9. JBEC, JBDC, 1974.
10. GCCQ, unpublished.
11. Hawthorne, 1966.

APPENDIX 4-1 INVENTORIES OF THE FAUNA OF THE WASWANIPI REGION

A - Mammals

The mammals of the Waswanipi region have not been intensively inventoried in the field. Lists of species probably present must therefore be made on the basis of distributional data. Studies from surrounding areas include: Mistassini (Austin W. Cameron and William A. Morris, 1951), headwaters of the Nemiscau River (partial list by J.L. Véronneau cited in Francis Harper, 1961), Clova for small mammals only (C.F. MacLeod and Cameron, 1961) and Lake Abitibi (Snyder, 1928). General distributional data, much of it unpublished, is summarized in maps for each species in Randolf L. Peterson (1966) and A.W.F. Banfield (1974). The presence of the big mammals and of the fur-bearing animals is confirmed by many observations and the fur trade records. The presence of some of the smaller mammals is confirmed by published reports of specimens collected at Waswanipi,[1] apparently by local employees of the Hudson's Bay Company. Some of the shrews, mice, voles and lemmings are uncertain residents on distributional grounds and Austin W. Cameron has offered advice on the likelihood of various species presence, although he has not seen the final list presented here. The list generally omits species the individuals of which may occasionally occur in the area, but that are not regular residents. Two exceptions are the white-tailed deer, which is not now found in the region, and caribou which is uncommon at the present.

The total list of probable mammals comprises thirty-six species (Table A4-1, 1).

B - Fishes

Studies of the fishes of the Waswanipi region were begun as early as 1954, and extensive surveys and studies were made in the early 1960's under the auspices of the Quebec Department of Tourism, Fish and Game. The studies were motivated, in part, by the need to assess the impact of the ongoing commercial fisheries on the fish resources of the territory, and the potential for expanded fishing operations. The major reports of these studies are two inventories of the fishes of the Waswanipi region (Etienne Magnin, 1964 and Roger LeJeune, 1965).[2] The inventory includes twenty-one species of fish known to occur in the territory, plus seven others that probably occur on the basis of distributional evidence,[3] (Table A4-1.2).

C - Birds

The birds of the Waswanipi region were studied as early as 1914, when Carnegie Museum Expedition No. 6, with W.E. Clyde Todd and Olaus J. Murie, canoed from Senneterre down the Bell River to Lake Matagami and then up to Nemiscau Post via Waswanipi, Miacasagi, Kenonisca and Evans Lakes (Todd, 1963). The region was again visited to study the avifauna in 1954, when W. John Smith accompanied W.K.W. Baldwin on his botanical excursion. They travelled from the O'Sullivan River to Lakes Waswanipi and Matagami, and then down the Bell River to where it crossed the road at Rapides-des-Cèdres (Smith, 1957). In 1969 Henri Ouellet made avifaunal observations in the region as part of a larger study. He has graciously commented on the list I prepared from the reports of Todd and Smith, and the list I present incorporates many of his comments, although he has not seen the final list. Broad comparative data is available in Godfrey (1966).

The avifauna of the Waswanipi region are listed on Table A4-1.3, and other species for which there are records of exceptional occurrence in the region are listed on Table A4-1.4.

D - Amphibians and Reptiles

No studies have been made at Waswanipi of the amphibians and reptiles, but a list of species has been made on the basis of distributional evidence, summarized by J. Sherman Bleakney (1958), and appended by C.J. McCoy and C.J. Durden (1965), Table A4-1.5. Of general significance are E.B.S. Logier and G.C. Toner (1961), and Harper (1956). In addition to the garter snake there are only ten species of amphibians; three of salamanders and seven toads and frogs. There are no turtles or lizards.

E - Insects

Extensive surveys of the insects of the Canadian Arctic and Sub-arctic regions have been made by the Canadian Northern Insect Survey, whose work has been reviewed by J.W. Freeman (1958b). A review of Canadian regions as environments for insects has been published by Eugene Munroe (1956). Among the stations at which specimens were collected were Rupert House, Mistassini Post, and Lake Abitibi.[4] Table A4-1.6 lists some of the more common and/or abundant species collected from stations near the Waswanipi region and believed to occur in the region on the basis of distributional evidence.

Footnotes for Appendix 4-1.

1. Rudolph Martin Anderson, 1939, 1945, 1946; Cameron, 1950; and Cameron and Phillip A. Orkin, 1950. My search for occasional references may not be complete.

2. Other reports include: George Roussow, 1957; LeJeune, 1964a; Gérard Beaulieu and Etienne Corbeil, 1964; Magnin, 1965, 1966a and b; and, Magnin and V. Legendre, 1964. For the neighboring Mistassini region see: L.R. Richardson, 1944; Magella Dufour, 1964; and LeJeune, 1964b.

3. General surveys and items of relevance include: W.B. Scott and E.J. Crossman, 1973; Scott, 1967; E. Juchereau-Duchesnay, 1964; V.C. Wynne-Edwards, 1952; Erhard Rostlund, 1952; and, Legendre, 1954.

4. Studies from neighboring regions that are of interest are W. Earl Godfrey, 1949; Godfrey and A.L. Wilk, 1948; Harold C. Hanson, Murray Rogers and Edward S. Rogers, 1949; and Steven G. Curtis, 1973a.

5. Reviews of some of the findings for mosquitoes have been summarized by Dale W. Jenkins (1958), for black flies by G.E. Shewell (1958), for fleas by George P. Holland (1958), and for butterflies by J.N. Freeman (1958a).

Table A4.1-1 Mammals of the Waswanipi Region

Common Name	Scientific Name	Sources
Masked Shrew	Sorex cinereus Kerr	1,2,4,6,7
American Water Shrew	Sorex palustris Richardson	1,2,4,6
Arctic Shrew	Sorex arcticus Kerr	1
Pygmy Shrew	Microsex hoyi (Baird)	1,2,6,7
Star-nosed Mole	Condylura cristatata (Linnaeus)	1,2,4,6
Little Brown Bat	Myotis lucifugus (LeConte)	1,2,4,7
Snowshoe Hare	Lepus americanus Erxleben	1,2,3,4,5,7
Eastern Chipmunk	Tamias striatus (Linnaeus)	1,2,4,6,7,9
Woodchuck	Marmota monax (Linnaeus)	1,2,3,4,7
American Red Squirrel	Tamias ciurus hudsonicus (Erxleben)	1,2,3,4,5,6,7,8
Northern Flying Squirrel	Glaucomys sabrinus (Shaw)	1,2,4,5,7,10
American Beaver	Castor canadensis Kuhl	1,2,3,4,5,7
Deer Mouse	Peromyscus maniculatus (Wagner)	1,2,4,6,7
Gapper's Red-Backed Vole	Clethrionomys gapperi (Vigors)	1,2,4,6,7
Southern Bog Lemming	Synaptomys cooperi Baird	1,2,4,6
Heather Vole	Phenacomys intermedius Merriam	1,2,6,7
Muskrat	Ondatra zibethicus (Linnaeus)	1,2,3,4,7
Meadow Vole	Microtus pennsylvanicus (Ord)	1,2,6,7
Meadow Jumping Mouse	Zapus hudsonius (Zimmermann)	1,2,4,6,7
Woodland Jumping Mouse	Napacozapus insignis (Miller)	1,2,4,6,7
Porcupine	Erathizon dorsatum (Linnaeus)	1,2,4,7
Wolf	Canus lupus Linnaeus	1,2,3,4,7
Red Fox	Vulpes vulpes (Linnaeus)	1,2,3,4,5,7
American Black Bear	Ursus americanus Pallas	1,2,3,4,7
American Marten	Martes americana (Turton)	1,2,3,4,7
Fisher	Martes pennanti (Erxleben)	1,2,7,
Ermine	Mustela erminea Linnaeus	1,2,3,4,5,7
Least Weasel	Mustela nivalis Linnaeus	1,2,3,4,5,7
American Mink	Mustela vison Schreber	1,2,3,4,5,7,11
Wolverine	Gulo gulo (Linnaeus)	1,2,7,

(CONTINUED)

Table A4.1-1 Mammals of the Waswanipi Region (Continued)

Common Name	Scientific Name	Sources
Striped Skunk	*Mephitis mephitis* (Schreber)	1,2,4,7
River Otter	*Loutra canadensis* (Schreber)	1,2,3,4,5,7
Lynx	*Lynx lynx* (Linnaeus)	1,2,3,4,5,7
Caribou	*Rangifer tarandus* (Linnaeus)	1,2,3,4,7
White-tailed Deer	*Odocoileus virginianus* (Zimmermann)	1,2,7
Moose	*Alces alces* (Linnaeus)	1,2,3,4,5,7

Footnotes:

1. Banfield, 1974.
2. Peterson, 1966.
3. Bancroft, 1913.
4. Cameron and Morris, 1951.
5. J.L. Véronneau, cited in Harper, 1961.
6. MacLeod and Cameron, 1961.
7. Snyder, 1928.
8. Specimen from the Waswanipi region reported in Anderson, 1946 and Cameron and Orkin, 1950.
9. Specimen from the Waswanipi region reported in Anderson, 1939 and Cameron, 1950.
10. Specimen from the Waswanipi region reported in Cameron and Orkin, 1950.
11. Specimen from the Waswanipi region reported in Anderson, 1945.

Table A4.1-2 Fishes of the Waswanipi Region

Common Name[6]	Scientific Name[6]	Sources
Lake Sturgeon	*Acipenser fulvescens* Rafinesque	1,2,3,4,5
Mooneye	*Hiodon tergisus* Lesueur	1,2,3
Goldeye	*Hiodon alosoides* (Rafinesque)	1,2,3,4
Brook Trout	*Salvelinus fontinalis* (Mitchill)	1,2,3
Lake Whitefish	*Coregonus clupeaformis* (Mitchill)	1,2,3,4,5
Cisco; Lake Herring	*Coregonus artedii* LeSueur	1,2,3
White Sucker	*Catostomus commersoni* (Lacépède)	1,2,3,4,5
Longnose Sucker	*Catostomus catostomus* (Forster)	1,2,3,4,5
Fallfish	*Semotilus corporalis* (Mitchill)	1,2,3
Creek Chub	*Semotilus atromaculatus* (Mitchill)	2,4,5
Spottail Shiner	*Notropis hudsonius* (Clinton)	1,2
Lake Chub	*Couesius plumbeus* (Agassiz)	2,3,4,5
Northern Pike	*Esox lucius* (Linnaeus)	1,2,3,4,5
Burbot	*Lota lota* (Linnaeus)	1,2,3,4
Trout-Perch	*Percopsis omiscomaycus* (Walbaum)	2,3
Walleye	*Stizostedion vitreum* (Mitchill)	1,2,3,4,5
Sauger	*Stizostedion canadense* (Smith)	1,2,3
Yellow Perch	*Perca flavescens* (Mitchill)	1,2,3
Logperch	*Percina caprodes* (Rafinesque)	2
Mottled Sculpin	*Cottus bairdi* Girard	1,2,3
Slimy Sculpin	*Cottus cognatus* Richardson	3
Spoonhead Sculpin	*Cottus ricei* (Nelson)	3
Ninespine Stickleback	*Pungitius pungitius* (Linnaeus)	1,2,3
Brook Stickleback	*Culaea inconstans* (Kirtland)	3
Longnose Dace	*Rhinichthys cataractae* (Valenciennes)	3
Pearl Dace	*Semotilus margarita* (Cope)	3

Footnotes:

1. Magnin, 1964.
2. LeJeune, 1965.
3. Scott and Crossman, 1973.
4. Bell, 1897a:83A.
5. Bancroft, 1913:147.
6. After Scott and Crossman, 1973.

Table A4.1-3 Birds of the Waswanipi Region[1]

Common Name[2]	Scientific Name[2]	Presence[3]	Specific Records	Comments
Common Loon	Gavia immer (Brünnich)	N	4	
American Bittern	Botaurus lentiginosus (Rackett)	N		
Canada Goose	Branta canadensis (Linnaeus)	M	5	
Brant	Branta bernicla (Linnaeus)	M		
Snow Goose	Chen caerulescens (Linnaeus)	M		Ouellet: uncommon
Black Duck	Anas rubripes Brewster	N	4,5	
Pintail	Anas acuta Linnaeus	N		
Green-winged Teal	Anas carolinensis Gmelin	N		
Blue-winged Teal	Anas discors Linnaeus	N		
Ring-necked Duck	Aythya collaris (Donovan)	N		
Greater Scaup	Aythya marila (Linnaeus)	M		
Lesser Scaup	Aythya affinis (Eyton)	M		
Common Goldeneye	Bucephala clangula (Linnaeus)	N	4,5	Ouellet: common
Common Merganser	Mergus merganser Linneaus	N	5	
Goshawk	Accipiter gentills (Linnaeus)	N,R?		
Sharp-shinned Hawk	Accipiter striatus Vieillot	N	5	Smith: well distributed
Red-tailed Hawk	Buteo jamaicensis (Gmelin)	N	4,5	Smith: not uncommon
Broad-winged Hawk	Buteo platypterus (Vieillot)	N	4,5	Smith: common
Golden Eagle	Aquila chrysaetos (Linnaeus)	M(N?)		Ouellet: very rare

(CONTINUED)

Table A4.1-3 Birds of the Waswanipi Region[1] (Continued)

Common Name[2]	Scientific Name[2]	Presence	Specific Records	Comments
Bald Eagle	Haliacetus leucocephalus (Linnaeus)	M(N?)	5	Ouellet: very rare
Marsh Hawk	Circus cyaneus (Linnaeus)	?		Smith: not seen around Waswanipi
Osprey	Pandion haliaetus (Linnaeus)	N	4,5	
Pigeon Hawk	Falco columbarius Linnaeus	N		Ouellet: rare
Sparrow Hawk	Falco sparverius Linnaeus	N	5	Ouellet: rare
Spruce Grouse	Canachites canadensis (Linnaeus)	N		Ouellet: uncommon
Ruffed Grouse	Bonasa umbellus (Linnaeus)	N	4	Smith: common
Willow Ptarmigan	Lagopus lagopus (Linnaeus)	W		
Sharp-tailed Grouse	Pedioecetes phasianellus (Linnaeus)	-	4	Ouellet: rare in winter
Virginia Rail	Rallus limicola Vieillot	N		
Sora	Porzana carolina (Linnaeus)	N		Ouellet: rare
American Coot	Fulica americana Gmelin	-		Ouellet: rare (accidental?)
Semipalmated Plover	Charadrius semipalmatus Bonaparte	M		
Killdeer	Charadrius vociferus Linnaeus	-		Ouellet: uncommon
American Golden Plover	Pluvialis dominica (Müller)	M		
Black-bellied Plover	Squatarola squatarola (Linnaeus)	M		
Common Snipe	Capella gallinago (Linnaeus)	N		
Spotted Sandpiper	Actitis macularia (Linnaeus)	N	4,5	Smith: common

(CONTINUED)

Table A4.1-3 Birds of the Waswanipi Region[1] (Continued)

Common Name[2]	Scientific Name[2]	Presence[3]	Specific Records	Comments
Solitary Sandpiper	Tringa solitaria Wilson	M		
Greater Yellowlegs	Totanus melanoleucus (Gmelin)	M		
Lesser Yellowlegs	Totanus flavipes (Gmelin)	M		
Pectoral Sandpiper	Erolia melanotos (Vieillot)	M		
Least Sandpiper	Erolia minutilla (Vieillot)	M		
Semipalmated Sandpiper	Ereunetes pusillus (Linnaeus)	M		
Herring Gull	Larus argentatus Pontoppidan	N	4	Smith: common
Bonaparte's Gull	Larus philadelphia (Ord)	M	4	
Common Tern	Sterna hirundo Linnaeus	N	4	
Mourning Dove	Zenaidura macroura (Linnaeus)	M		
Great Horned Owl	Bubo virginianus (Gmelin)	N,R		
Hawk Owl	Surnia ulula (Linnaeus)	M,R		
Great Gray Owl	Strix nebulosa Forster	M,R		
Common Nighthawk	Chordeiles minor (Forster)	-	4	
Belted Kingfisher	Megaceryle alcyon (Linnaeus)	N	4	Smith: common
Yellow-shafted Flicker	Colaptes auratus (Linnaeus)	N		Smith: common
Yellow-bellied Sapsucker	Sphyrapicus varius (Linnaeus)	N	4	Smith: fairly common

(CONTINUED)

Table A4.1-3 Birds of the Waswanipi Region[1] (Continued)

Common Name[2]	Scientific Name[2]	Presence[3]	Specific Records	Comments
Hairy Woodpecker	Dendrocopos villosus (Linnaeus)	N,R?	4	
Downy Woodpecker	Dendrocopos pubescens (Linnaeus)	N,R	4	
Black-backed Three-toed Woodpecker	Picoïdes arcticus (Swainson)	N,R	4,5	
Northern Three-toed Woodpecker	Picoïdes tridactylus (Linnaeus)	N,R	4	
Eastern Kingbird	Tyrannus tyrannus (Linnaeus)		4	
Yellow-bellied Flycatcher	Empidonox flaviventris (Baird and Baird)	N	4,5	
Traill's Flycatcher	Empidonox traillii (Audubon)	N	4	
Least Flycatcher	Empidonox minimus (Baird and Baird)	N	4	
Olive-sided Flycatcher	Nuttallornis borealis (Swainson)	N	4	
Tree Swallow	Iridoprocne bicolor (Vieillot)	N	4	Smith: very common
Bank Swallow	Riparia riparia (Linnaeus)	N		
Barn Swallow	Hirundo rustica Linnaeus	N	5	
Gray Jay	Perisoreus canadensis (Linnaeus)	N,R	4	
Common Raven	Corvus corax Linnaeus	N,R	4	Smith: common although not numerous
Common Crow	Corvus brachyrhynchos Brehm	N	5	

(CONTINUED)

Table A4.1-3 Birds of the Waswanipi Region[1] (Continued)

Common Name[2]	Scientific Name[2]	Presence[3]	Specific Records	Comments
Black-capped Chickadee	Parus atricapillus Linnaeus	N,R?		
Boreal Chickadee	Parus hudsonicus Forster	N,R	5	
Red-breasted Nuthatch	Sitta canadensis Linnaeus	N,R	4	
Brown Creeper	Certhia familiaris Linnaeus	N		
Winter Wren	Troglodytes troglodytes (Linnaeus)	N	4	Smith: common
American Robin	Turdus migratorius Linnaeus	N		Smith: common
Hermit Thrush	Hylocichla guttata (Pallas)	N	4	Smith: common
Swainson's Thrush	Hylocichla ustulata (Nuttall)	N	4	
Eastern Bluebird	Sialia sialis (Linnaeus)	-		
Golden-crowned Kinglet	Regulus satrapa Lichtenstein	N	4,5	Smith: not common
Ruby-crowned Kinglet	Regulus calendula (Linnaeus)	N	4	
Cedar Waxwing	Bombycilla cendrorum Vieillot	N	4	Smith: common
Northern Shrike	Lanius excubitor Linnaeus	M		
Common Starling	Sturnus vulgaris Linnaeus	-		
Solitary Vireo	Vireo solitarius (Wilson)	N	5	Smith: uncommon
Red-eyed Vireo	Vireo olivaceus (Linnaeus)	N		Smith: common
Philadelphia Vireo	Vireo philadelphicus (Cassin)	N	5	

(CONTINUED)

Table A4.1-3 Birds of the Waswanipi Region[1] (Continued)

Common Name[2]	Scientific Name[2]	Presence[3]	Specific Records	Comments
Black-and-White Warbler	*Mniotila varia* (Linnaeus)	N		
Tennessee Warbler	*Vermivora peregrina* (Wilson)	N		Smith: not uncommon
Nashville Warbler	*Vermivora ruficapilla* (Wilson)	N	4	Smith: common
Parula Warbler	*Parula americana* (Linnaeus)	N	5	Smith: uncommon
Yellow Warbler	*Dendroica petechia* (Linnaeus)	N	4	Smith: common
Magnolia Warbler	*Dendroica magnolia* (Wilson)	N	4	Smith: common
Cape May Warbler	*Dendroica tigrina* (Gmelin)	N	4	
Black-throated Blue Warbler	*Dendroica caerulescens* (Gmelin)	N	4,6	Smith: uncommon
Myrtle Warbler	*Dendroica coronata* (Linnaeus)	N	4	Smith: common
Black-throated Green Warbler	*Dendroica virens* (Gmelin)	N	4	Smith: common
Blackburnian Warbler	*Dendroica fusca* (Müller)	N	5	Smith: uncommon
Bay-breasted Warbler	*Dendroica castanea* (Wilson)	N		Smith: not uncommon
Blackpoll Warbler	*Dendroica striata* (Forster)	N	4	
Palm Warbler	*Dendroica palmarum* (Gmelin)	N	5	
Ovenbird	*Seiurus aurocapillus* (Linnaeus)	N	4	Smith: common
Northern Waterthrush	*Seiurus noveboracensis* (Gmelin)	N	4	Smith: common
Connecticut Warbler	*Oporornis agilis* (Wilson)	N	5	Smith: rare

(CONTINUED)

Table A4.1-3 Birds of the Waswanipi Region[1] (Continued)

Common Name[2]	Scientific Name[2]	Presence[3]	Specific Records	Comments
Mourning Warbler	Oporornis philadelphia (Wilson)	N		Smith: not common
Common Yellowthroat	Geothlypis trichas (Linnaeus)	N		Smith: common
Wilson's Warbler	Wilsonia pusilla (Wilson)	N	4	
Canada Warbler	Wilsonia canadensis (Linnaeus)	N	4	Smith: not uncommon
American Redstart	Setophaga ruticilla (Linnaeus)	N		Smith: fairly common
Bobolink	Dolichonyx oryzivorus (Linnaeus)	N		
Red-winged Blackbird	Agelaius phoeniceus (Linnaeus)	N		Ouellet: uncommon
Rusty Blackbird	Euphagus carolinus (Müller)	N	4	
Common Grackle	Quiscalus quiscula (Linnaeus)	N		Smith: fairly common
Brown-headed Cowbird	Molothrus ater (Boddaert)	-		
Evening Grosbeak	Hesperiphona vespertina (Cooper)	M(N?)		
Purple Finch	Carpodacus purpureus (Gmelin)	N	4	Smith: very common
Pine Grosbeak	Pinicola enucleator (Linnaeus)	N,R		
Common Redpoll	Acanthis flammea (Linnaeus)	M		
Pine Siskin	Spinus pinus (Wilson)	N		
American Goldfinch	Spinus tristis (Linnaeus)	N		
White-winged Crossbill	Loxia leucoptera Gmelin	N	5	Smith: uncommon

(CONTINUED)

Table A4.1-3 Birds of the Waswanipi Region[1] (Continued)

Common Name[2]	Scientific Name[2]	Presence[3]	Specific Records	Comments
Savannah Sparrow	*Passerculus sandwichensis* (Gmelin)	N	5	
Vesper Sparrow	*Pooecetes gramineus* (Gmelin)	N		
Slate-colored Junco	*Junco hyemalis* (Linnaeus)	N		Smith: common
Tree Sparrow	*Spizella arborea* (Wilson)	M		
Chipping Sparrow	*Spizella passerina* (Bechstein)	N		
White-crowned Sparrow	*Zonotrichia leucophrys* (Forster)	M		
White-throated Sparrow	*Zonotrichia albicollis* (Gmelin)	N	4	
Fox Sparrow	*Passerella iliaca* (Merrem)	M	4	
Lincoln's Sparrow	*Melospiza lincolnii* (Audubon)	N	4	
Swamp Sparrow	*Melospiza georgiana* (Latham)	N	4	
Song Sparrow	*Melospiza melodia* (Wilson)	N	5	Smith: common
Snow Bunting	*Plectrophenax nivalis* (Linneaus)	M		

Footnotes:

1. List prepared from Godfrey (1966),Todd (1963),Smith (1957)with comments from Ouellet (1970) pers. comm.
2. After Godfrey (1966).

(CONTINUED)

Table A4.1-3 Birds of the Waswanipi Region[1] (Continued)

Footnotes (Cont'd):

3. N = Nesting, M = Migrant, R = Resident all year, W = Winter only resident, ? = uncertain. After Ouellet (1970) pers. comm. and Godfrey (1966).
4. Reports of sightings by Todd or Murie between the mouth of the Wedding River at the Bell River and Evans Lake, inclusive, between June 1, 1914 and June 17, 1914 (Todd, 1963).
5. Reports of sightings or hearings by Smith from the O'Sullivan River through Lakes Waswanipi, Gull, Olga and Matagami, and down the Bell River to a few miles above Rapide des Cèdres, plus sightings referred to only as "in the Waswanipi-Bell River area".
6. The location of this sighting is uncertain because the location-date combination cited does not match the itinerary.

Table A4.1-4 Supplementary List: Birds Recorded for the Waswanipi Region but not Considered Part of the Regular Avifauna of the Region

Common Name	Scientific Name	Source of Record	Comments
Arctic Tern	*Sterna paradisaea* Pontoppidan	1	specimen
Barred Owl	*Strix varia* Barton	2	uncertain identification
Pileated Woodpecker	*Dryocopus pileatus* (Linnaeus)	2	heard
Long-tailed Jaeger	*Stercorarius longicaudus* Vieillot	1	"injured"
Orange-crowned Warbler	*Vermivora celata* (Say)	1	
Passenger Pigeon	*Ectopistes migratorius* (Linnaeus)	1	extinct
Heron ?	?	3	sighted

Footnotes:

1. From: Todd (1963).
2. From: Smith (1957).
3. From: Bancroft (1913:143).

Table A4.1-5 Amphibians and Reptiles of the Waswanipi Region[1]

Common Name	Scientific Name	Other Sources
Jefferson's Salamander	*Ambystoma jeffersonianum* Green	
Red-backed Salamander	*Plethodon cinereus cinereus* Green	2
Two-lined Salamander	*Eurycea bislineata bislineata* Green	2
Common Toad	*Bufo americanus* Holbrook	2
Spring Peeper	*Hyla crucifer crucifer* Wied	3
Green Frog	*Rana clamitans* Latreille	
Mink Frog	*Rana septentrionalis* Baird	2
Wood Frog	*Rana sylvatica* LeConte	2
Leopard Frog	*Rana pipiens pipiens* Schreber	2
Pickerel Frog	*Rana palustris* LeConte	4
Eastern Garter Snake	*Thamnophis sirtalis sirtalis*	2

Footnotes:

1. Based on distributional evidence in Bleakney (1958).
2. Reported for James Bay Lowland by McCoy and Durden (1965).
3. Reported for lower Harracinaw River by McCoy and Durden (1965).
4. Considered uncertain by Bleakney (1958). Reported for James Bay Lowland by McCoy and Durden (1965).

Table A4.1-6 Some Common Insects of the Waswanipi Region

Mosquitoes[1]

Aedes punctor
Aedes communis
Aedes excrucians
Culiseta

Black Flies[2]

Cnephia (Cnephia) dacotensis
Simulium (Schonbaveria) furculatum

Fleas[3]

Peromysscopsylla hamifer
Megabothris asio
Megabothris quirini
Corrodopsylla curvata curvata

Butterflies[4]

Plebeius aquilo lacustris
Boloria freija freija
Oeneis jutta
Boloria titania bosduvalii

Footnotes:

1. From Jenkins, 1958.
2. From Shewell, 1958.
3. From Holland, 1958.
4. From Freeman, 1958a.

APPENDIX 4-2 NOTES ON THE IDENTIFICATIONS OF LIVING BEINGS ELICITED WITH ILLUSTRATIONS OF MAMMALS

The results of the identifications of mammals are presented on Tables 4-1 and 4-2 in the main text. The purpose of the present notes is to explain and consider anomalous and missing identifications.

The identifications of the eastern mole and the silver-haired bat were anomalous and were probably related to ambiguities in the illustrations, both being made by informants who did not identify the illustration of the mole and bat that do occur in the region. Both were verbally labelled with the same term as other informants used for the illustration of the appropriate species. Similarly, informants had definite trouble with the illustration of the snowshoe hare, several examined other illustrations of lagomorpha before deciding on the snowshoe illustration. Two informants each chose another illustration although using the same verbal label.

Most Waswanipi informants examined the illustrations of the six species of long-tailed shrews which appeared on a single page in Peterson (1966) and identified them as a group. One informant however indicated that there were three kinds and the illustrations he identified, the masked, water and pygmy shrews, all conform to the list of mammals. The distinction among the illustrations was not clear to me.

Responses to the illustrations of rats, mice, voles, and jumping mice were few. The illustrations may have been difficult to identify. One informant indicated that there were three kinds of kaosotaopikošiš, one of which he identified with the illustration of the meadow jumping mouse. Among the rats, mice, voles and jumping mice only the muskrat was readily identified by most informants. It is the culturally most important of the rats, mice and voles found in the area. Considered as a group, four of the eight rats, mice and voles, on the mammals list were identified by informants. Only eleven identifications were made by the six informants who examined the illustrations, and all of the eleven identifications agreed with the mammals list. This suggests to me a cautious approach to a set of identifications informants found difficult. While there is some evidence the difficulty resided more in the illustrations than in a failure to culturally distinguish among some of the animals, the latter cannot be entirely ruled out. Unfortunately, this is a case where the use of specimens from a collection was probably necessary to arrive at a definitive interpretation. I did not realize this possibility at the beginning of the research. Some uncertainty therefore exists concerning the data I have on Waswanipi distinctions among rats, mice and voles.

Informants identified arctic fox as an animal they knew, and had a name for, but which was "not here". I heard reports that one was killed in the Waswanipi region in recent decades and this coincides with the fact that there is a number of reported extra-limital occurrences of this animal at some distance from its usual range (Banfield, 1974:297, map 131). Polar bear was similarly reported as known, named, but not occurring in the territory. No reports of polar bear being found in the Waswanipi region were recorded, although there is an account from the neighboring Mistassini region to the east and there is an extra-limital record for the Lake St. Jean region to the east of Mistassini (Banfield, 1974:312, map 137). Seals were identified by three informants as "known" but "not here". All three chose the first seal illustration in the book, but one that was preceded by an illustration of a walrus that was not selected. Later data indicated that the walrus was also known, labelled wepič. None of the informants identified the illustration of the least weasel as an animal they knew. The least weasel is small, in fact it is the smallest carnivore in the world. More relevant to the present context, it is also the rarest mammal in Eastern Canada, except for the wolverine. The actual distribution of least weasel is therefore spotty and discontinuous (Burns, 1965:25), although the geographical extent of the distribution is circumpolar (Banfield, 1974:327), and specimens have been caught in most of the studies of small mammals from the regions around the Waswanipi area (see sources in Appendix 4-1). What may be relevant here is that the pelt of the least weasel is not recognized as a distinct item of trade (Ruttle, 1968:53-57). Although some least weasels may be caught in ermine traps, the pelts may be sold as immature ermines (Peterson, 1966:241). The occurrence of least weasel in the Waswanipi area is therefore likely but uncertain, and Waswanipi informants did not identify it, despite what appears to be clear differences in the illustrations. I conclude that it is classed with weasel by the Waswanipi and that no difference is recognized. It remains an open question whether this classification is related to the fur trade.

White-tailed deer was reported by informants, and formerly occurred in the region, but has not been seen recently in the area.

One surprise identification was of racoon. One informant reported that he had killed one in 1968, and he produced the mask and tail of the animal which he had preserved. There is little doubt of his identification. Extra-limital records for racoons comparable to this record have been reported in Ontario (Banfield, 1974:314, map 138), but this appears to be a significant record. A second surprising identification was of the illustration of the pygmy sperm whale, which one informant said was "like" a "fish" that is found in Lake Matagami. The illustration is without much detail, it has no shading, the upper half and tail are black and the belly white, and the tail can be interpreted as being horizontal or vertical. The reference he was making was unclear to me at the time, but it appears to have referred to a spirit being discussed in Chapter 4.

APPENDIX 4-3 NOTES ON THE IDENTIFICATIONS OF LIVING THINGS ELICITED WITH ILLUSTRATIONS OF FISHES

These notes provide comments on ambiguous identifications and lack of identifications of illustrations of fish which have been recorded or are thought to occur in the Waswanipi region. The results are summarized on Tables 4-3 and 4-4 in the main text of Chapter 4.

Unexpectedly no informants identified the illustration of the sauger, a close relative of the walleye during the eliciting sessions. In various contexts however Waswanipi indicated the existence of two kinds of 'walleye'. During examination of the illustrations, one informant tentatively identified a second illustration of a sub-species of walleye, the blue walleye, in an effort to find an adequate illustration of this second kind of 'walleye'. The blue walleye is clearly a mis-identification, but the illustration of the sauger was explicitly rejected. The lack of identification of the illustration of the sauger has therefore been treated as a problem of inadequate illustrations, and the identification of the sauger noted on Table 4-3. I did not collect a distinctive monoleximic name for the sauger, which probably indicates that although it is distinguished it is treated as a kind of <u>ocaš</u>, 'walleye'. Similar problems of identification occurred in the cases of <u>aotuso</u> and the <u>iutenemek</u>. The illustrations of fallfish, common shiner, and various chubs were all identified and labelled <u>aotuso</u> although only the fallfish is likely to be found in the region. The fallfish was identified by three informants, two informants identified the common shiner including one of those who had identified the fallfish, and one informant who had identified the common shiner also identified a pair of pictures of chubs. The multiple selections made reflected the difficulty informants had finding an illustration they could identify without ambiguity. 'Fallfish' was finally identified as a proper gloss for <u>aotuso</u> on the basis of examination of specimens.

Identification <u>iutenemek</u> remains uncertain. Informants variously identified golden shiner, goldfish, carp, whitefish and cisco as <u>iutenemek</u>. Informants searched for an appropriate illustration once they had found one that was "like iutenemek", and the identifications of whitefish and cisco were made as approximations to the iutenemek not as definitive identifications. Informants did not find a satisfactory illustration. They call iutenemek the "windfish" because it "jumps and makes waves". The fish is said to be commonly twelve inches long and to occur in most lakes although it is infrequent in all lakes except Olga Lake where it is more common, and possibly also Pusticamica Lake. One informant used the English phrase "round whitefish" but the illustration of round whitefish was rejected to describe it. Of all these possible identifications the golden shiner can be eliminated because of its size, and so probably can goldfish. This leaves carp and round whitefish as possible identifications. Unfortunately, I did not ask questions that might distinguish between these two possible identifications at the time this work was done, I hoped to examine specimens. The iutenemek was sufficiently rare that no specimens appeared; one sixty-odd year old informant reported that although he had heard of the iutenemek he had never seen it. Interestingly enough, one of the fisheries biologists who worked in the region some years earlier, Bonneville, reported that he caught a fish like the round whitefish, but not a round whitefish, on his first day fishing on Lake Olga in 1964; but it was not preserved because he anticipated catching more later. Eighteen days later he had not caught another and had to move camp (LeJeune, 1965:71-72). The round whitefish has not been reported from either the Nottaway or the Broadback River drainages, but it is known in the Rupert River drainage and other drainages to the east and north of the Waswanipi region. Alternatively, carp behavior during spawning is most compatible with the descriptive name "windfish", but the occurrence of carp has not been noted, and its presence would only be possible if it were introduced into the territory. The most likely identification is round whitefish. Identification of the pygmy sperm whale in the mammal illustrations was referred to as iutenemek.

Of the remaining identifications listed on Table 4-3, five were clear misidentifications, golden shiner for cisco as well as iutenemek, northern redhorse for longnose sucker, bluegill for yellow perch, deep water sculpin for one of the other sculpins, blacknose shiner probably for spottail shiner. Lake trout was identified as known but not present in the Waswanipi region.

The illustrations of ten other species on the list of fishes of the Waswanipi region were not identified by informants. All are very small fish that are not normally caught in the gill nets used by the Waswanipi, however occasions to observe these fish occur. Of the ten fishes, three are included on the list of fishes on the basis of distributional evidence, but specimens have not been caught in the scientific studies to date: slimy sculpin, brook stickleback and longnose dace. Three others have been identified on the basis of only one other specimen: trout perch, logperch and ninespine stickleback. The Waswanipi recognize there are several kinds of these fishes but a general term, glossed by an informant as 'small fish', was used for them. Natural situations involving these animals were rare, and data is insufficient to indicate the existence or extent of an explicit categorization by Waswanipi of the small fishes.

APPENDIX 4-4 NOTES ON THE IDENTIFICATIONS OF LIVING THINGS ELICITED WITH ILLUSTRATIONS OF BIRDS

Tables 4-5 and 4-6 summarize the results of the eliciting sessions using illustrations of birds, the present notes comment on those identifications which appear to be problematic.

Red-necked and horned grebe identified in the illustrations by informants, and labelled, are probable migrants through the Waswanipi region. The illustration of the great blue heron was identified, the animal named, and there are records of herons wandering as far north as James Bay in summer (Godfrey, 1966:37). The illustration of the shoveler duck was identified, but the name provided was a variation on that used for the illustration of the black duck, so that mis-identification is possible. Alternatively, the shoveler has been reported in summer on James Bay (Godfrey, 1966:64), and if it does occur in the Waswanipi region it may be classed with the black duck. Mallard and buffleheads are recorded near Amos and the Quebec-Ontario border respectively (Godfrey:1966:55 and 72) and were identified in illustrations. 'Old squaw' is a regular spring migrant according to informants. Three scoter illustrations were identified by informants. Surf scoters are common migrants at Lake Mistassini (Godfrey, 1966:80), white-winged scoters summer commonly in Eastern Canada (Godfrey, 1966:79), and common scoters may wander or migrate through the region. Red-breasted mergansers breed at Lake Mistassini (Godfrey, 1966:84), The illustration of the hooded merganser was also identified by informants, and although Godfrey reports it may perhaps be distributed north to Mistassini post (Godfrey, 1966:82), the illustration was considered to be of a "smaller" 'goldeye' by the informant, so it is tentatively considered to be classed as a <u>mišikuško</u>, along with common goldeye. The identification of the peregrine falcon and the gryfalcon illustrations may be plausible because the former could occur in migration the later as a wanderer (Godfrey, 1966:101). However, the failure of informants to identify illustrations of several common hawks suggests possible ambiguities with the illustrations of these birds. This is particularly the case with the peregrine falcon, the illustration chosen being of an immature bird. The gryfalcon is sufficiently distinctive that mis-identification probably should be considered the less likely of the two possibilities. Rock ptarmigan may either be a mis-identification or it may occasionally occur and be classed with the willow ptarmigan.

Rails, coots and shorebirds were not adequately identified during the present study. Informants had trouble with the illustrations, the number of identifications was low and many illustrations which would have been expected to be selected were not identified. The impression I was left with was that these illustrations were too numerous, and spread over several plates in the book, so that ready comparison and selection was difficult for informants. This implies also, although there is no direct evidence, that the Waswanipi classification of rails, coots and shorebirds was sufficiently different from the classification used to cluster illustrations on the plates, that Wawanipi found comparative identification difficult. The problem could however, just be one of ambiguous individual illustrations. In total, three species of rails, coots and shorebirds not on the birds of the Waswanipi region list were identified, at least two of which were mis-identifications, nine illustrations on the list were not identified, and illustrations of nine birds on the list were identified.

Arctic tern may be a rare migrant in the area, the Caspian tern may also be a rare migrant, but is more likely to be a mis-identification.

'Snowy owl' occurs in winter according to informants and 'boreal owl' is common also, Godfrey reports the latter as resident on Lake Mistassini (1966:22). It should be noted that the barred owl, Strix varia Barton, is reported for Lake Waswanipi (Godfrey, 1966:217) but is not on the list of birds and was not identified by informants from the illustrations.

Identification of the illustration of the red-headed woodpecker, because of its distinctive appearance, suggests this bird may exceptionally occur in the region. It should be noted, however, that the pileated woodpecker, Dryocopus pileatus (Linnaeus), with his distinctive red-crown, has been reported breeding at Waswanipi (Godfrey, 1966:240), but is neither on the list nor in the identifications of illustrations. The illustration of the black-billed magpie was also definitely identified by an informant, and this distinctive bird has been reported as a casual visitor in Eastern Quebec at Eastmain (Godfrey, 1966:274). The identification of the illustration of the "unmistakable" American dipper, Cinclus mexicanus Swainson, must however be a mis-identification.

The illustration of the baltimore oriole, Icterus galbula (Linnaeus), was identified and this bird is reported to be casual in south-central Quebec (Godfrey, 1966:357) and may occur at Waswanipi. The illustration of the red crossbill, Loxia curvirostra Linnaeus, was identified by informants and this bird is reported to wander as far north as Great Whale River (Godfrey, 1966:379).

In the case of the warblers, and sparrows and related birds, illustration difficulties similar to those encountered with shorebirds occurred. Only seven and two identifications were made respectively, while the list includes some twenty odd and nine birds respectively.

APPENDIX 4-5 WASWANIPI CLASSIFICATIONS OF 'LIVING BEINGS' FROM ILLUSTRATIONS OF PLANTS AND VEGETATION

A comprehensive listing of 'trees' was elicited from Waswanipi informants in addition to incomplete lists of 'living beings' based on Waswanipi word lists of some plants. The more common categories and labels reported have been confirmed in everyday conversations, but not through repeated structured eliciting. The lists however are incomplete.

Table A4.5-1 Waswanipi Cree Names and Identifications of 'Living Things' Elicited With Illustrations of Trees

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure No. (Brockman, 1968 (B) and Canada, 1966 (C))	Nos. of Informants	English Gloss	Comments
osček (osčiska)	cone: oaskoačus	26(B)	2,93,114	Jackpine	
oakanakan (oačinakan)		37(B)	2,93,114	Tamarack	
sisakatuk (stakuanatuk, inatik)		39(B)	2,93,114	Black Spruce	Inatik = wood of black spruce
minaik		39(B)	2,93	White Spruce	
inašt (inasta)		47(B)	2,93,114	Balsam Fir	
masčisks (masčisk, masčiska)	cone: ošeškoačus	55(B)	2,93,114	White Cedar	

(CONTINUED)

Table A4.5-1 Waswanipi Cree Names and Identifications of 'Living Things' Elicited With Illustrations of Trees (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure No. (Brockman, 1968 (B) and Canada, 1966 (C))	Nos. of Informants	English Gloss	Comments
oikupiatik		63(B)	93	?	Identification uncertain Picture of junipers
nipši (nipisi)		79(B)	93,114	Willow and Alder Shrubs	Picture of willows
		143(C)	93		Picture of alder
atopi (atospi(?))		81(B)	93,114	Pussy Willow	
mitus		87(B)	2,93,114	Balsam Poplar	
		89(B)	93		Picture of quaking aspen
masčmitus	"small-crippled" mitus	89(B)	2,114	Quaking Aspen	
oaškueatuk (oašoi)		103(B)	2,93,114	Paper Birch	

(CONTINUED)

Table A4.5-1 Waswanipi Cree Names and Identifications of 'Living Things' Elicited With Illustrations of Trees (Continued)

Names in Cree (Less Common or Specific in Parentheses)	Informants' Comments	Figure No. (Brockman, 1968 (B) and Canada, 1966 (C))	Nos. of Informants	English Gloss	Comments
maskominan	"bear berries"	165(B)	93,114	Mountain Ash	Identification uncertain
kaoiminan atek (koiminan)	"choke cherries tree"	167(B)	93,114	Choke Cherry (includes Pincherry?)	Picture of choke cherry
		167(B)	93		Picture of pin cherry
atomin		175(B)	2	?	Picture of hawthorn; identification uncertain
		173(B)	93		Picture of service berry
opatek		211(B)		?	Picture of maple; identification uncertain
šašakominan		237(B)	2	Dogwood	Picture of dogwood

Footnote:

1. Information from informant no. 114 was elicited without illustrations.

Table A4.5-2 Waswanipi Cree Names and Identifications of Some 'Living Things' that "Grow in Place" from One Informant

Names in Cree	Informants' Comments	No. of Informant	English Gloss	Comments
oteiminan	"heart berries"	114	Strawberry	
mekomin		114	Raspberry	
iniminan		114	Blueberry	
atosiminan		114		Unidentified
anekočasiminan	"squirrel" berries	114		Unidentified
šapomen	"goose" berries	114	Gooseberry	
musčekominan	"like cranberries"	114		Unidentified
pieominan	"partridge berries"	114		Unidentified
oapamin	"white cluster high on shrub"	114		Unidentified
kačičepakuatek	"in winter velvety under"	114	Labrador Tea	Identification uncertain

(CONTINUED)

Table A4.5-2 Waswanipi Cree Names and Identifications of Some 'Living Things' that "Grow in Place" from One Informant (Continued)

Names in Cree	Informants' Comments	No. of Informant	English Gloss	Comments
mistekuč	"trees"	114	Tree	General term
maskošeo	"grass"	114	Grass	
oapikoun	"flower"	114	Flower	No more specific names
asči	"moss"	114	Moss	General term
ospaskamek	"white moss"	114	Lichens	Identification uncertain
awaseskamek	"baby moss", "green-brown, wet"	114	Moss(type?)	Used as diaper
iekiskamuk	"toad under in winter", "tan-green dry"	114	Moss(type?)	
oaeačesk	"fungus on trees"	114	Fungus(type?)	
miniša	"berries"	114	Berries	General Term

(CONTINUED)

Table A4.5-2 Waswanipi Cree Names and Identifications of Some 'Living Things' that"Grow in Place" from One Informant (Continued)

Names in Cree	Informants' Comments	No. of Informant	English Gloss	Comments
oesačipok		114		Type of ledum?
kaočiašiatik	"thistle"	114		

APPENDIX 4-6 GROUPINGS FORMED IN PICTURE SORTING TESTS

The results of the picture sorting tests are summarized on Table 4-13 in the main text. The present appendix provides a commentary on the groupings identified in that text, and a record of the original responses (Table A4-6.1) which were analysed to identify groupings.

Grouping A consists of drawings of 'owl', 'goose', 'crow', 'loon', and 'duck'. It was labelled pieššutč by the informant who gave the larger grouping. In the second run this same informant formed group B of 'ptarmigan' and 'ruffed grouse' and similarly labelled it. These two groupings together correspond to part of the general membership of the category 'big birds'. This grouping corresponding to A plus B itself includes three smaller sub-groupings Ai, 'goose' and 'duck', Aii, 'owl' and 'crow', and B forms a third sub-group. Two of these groupings were recorded three and four times each in the five exercises and the reasons given for these two sub-groupings by informants were similar. The first sub-grouping consists of birds that feed at the water and usually in the water near the shore, glossed 'waterfowl', and the second consists of birds that eat twigs on the land at the shoreline. The term pioaitč, locally translated into English as "partridge", glossed 'grouse', refers to the last category. The distinction between these two sub-categories is both a difference of food and a difference of habitat. The former are associated with habitats called kaakotičasči, 'marsh' and possibly masčekopi 'flats', the latter with satčikopao, 'shoreline thickets', see Appendix 4-5. A third sub-grouping identified by only one informant, is alike because the members steal the food men store in the bush and is glossed 'scavengers'; it consists of 'owl' and 'crow'. Grouping 'C' corresponds to the 'small birds' category.

The next grouping (D) consists of 'beaver', 'mink', 'otter', and 'muskrat'. This grouping was identified by a single informant and labelled nipiaoesišuč, 'water animals'. There are two sub-groupings, Di and Dii, 'mink' and 'otter' together and 'beaver' and 'muskrat' together. Each group was identified in three of the five exercises, and one identified a fourth time but with the addition of 'porcupine' (Diii). 'Mink' and 'otter' are grouped because of an association with water, but also because they both eat fish. 'Beaver' and 'muskrat' are grouped because they live together at beaver ponds (i.e., in and near water), and because they both eat poplar and tree bark. The 'water animals' grouping is united by habitat and is split into two sub-groups on the basis of the food habits of the member animals. As indicated elsewhere, the category 'water animals' includes other animals as well.

The next grouping (E) consists of 'fisher', 'fox', 'wolf', 'lynx', and possibly 'skunk'. No clear sub-divisions appear in this grouping, the combination of the first four animals occurred twice in the five exercises, with similar reasons being on both occasions: they eat the same things, namely small game. The combination of 'fox' and 'lynx' occurred on an additional occasion (Fii), with a separate reason for the grouping, shyness, and the combination of 'fox', 'wolf', and 'lynx' occurred once, but with an anomalous inclusion of 'caribou'.

Grouping F consists of 'fisher', 'weasel' and 'marten', and partly overlaps with the former grouping. This grouping was reported once fully, and once partially and with differing explanations for the grouping. The grouping probably should be treated only as a possible grouping given the weak evidence. Similarly, grouping G, 'porcupine' and 'skunk' is supported by only one identification. This grouping overlaps with E and it also overlaps with Diii which is itself a somewhat anomalous grouping within D, because it is based on similarity of eating habits, but 'porcupine' is not claimed to be a water animal. It is possible that the overlaps are the results of more inclusive groupings, but there is only weak evidence in support of this from the exercises.

Groupings H, I, J, K, L, and M, all only occurred once in the tests. The first of these groupings was called "big game" by the informant, and all of the succeeding categories except M includes one of moose or bear. Moose and bear occurred in the same run in three of the five exercises but they were only grouped once. Caribou was only included in a group once, group Eiii, for which no reasons for the grouping were given; it is clearly not so sorted on the basis of eating small game, the major criteria for the grouping. The tests therefore did not provide adequate opportunity to establish a consistent core of a "big game" grouping. The groupings I, J, K, L, however give no evidence of a classification of "big game". The reasons given for these groupings are diverse and mainly serve to indicate the range of criteria that may be used to classify 'animals'.

Groupings N and O overlap fifty percent of their members, and groupings N+Oi and N+Oii each combine members included in N and O. I have therefore merged groupings N and O into a combined grouping N+O which was not so grouped by any single informant. The size of this grouping would have made it impossible to occur naturally because of the format of dividing the illustrations into two separate runs. This combined grouping comprises dore, white sucker, sturgeon, goldeye, burbot, and pike and also includes whitefish on the basis of its inclusion in sub-groups Oi and N+Oi. Groupings P and Q would then become subcategories of N+O, and grouping R would become a marginal, but potentially includable case. In short, the extensive overlaps between grouping N, O, P and Q suggest that at one level there is a single grouping of 'fish'. This is further suggested by the comments made by some informants labelling the smaller sub-groupings as "fish" or as "all day in water-fish" or "around in water" (see comments for Ni, O, and N+Oi). The other comments suggest a possible subgrouping of fish into fish that "eat other fish" (see comments for N, Nii) and fish that eat "weeds" or "insects" or "sand" (see comments for N, P, Q). The former sub-grouping would appear to include at least 'burbot', 'pike' and possibly 'goldeye', and the latter 'sturgeon', 'whitefish' and 'white sucker'.

Table A4.6-1 Record of Responses to Picture Sorting Tests

Informant #55	Run 1:	Comments:[1]
	- #8 (skunk)[2], #13 bear	hibernate all winter
	- #17 sturgeon; #35 (whitefish)	eat same, insects at surface
	- #27 mink, #29 otter	both go in water to eat fish
	- #37 crow, #20 owl	eat food you kill-they rob you
	- #15 whitefish; #16 white sucker	eat water flies
	- #19 burbot; #36 pike	eat other fish
	- #39 black duck; #24 Canada goose	eat grass along shore
	- #26 beaver; #30 muskrat	eat same food-that tree [poplar] (stays in beaver dam)
	Run 2:	**Comments:**
	- #10 marten, #9 weasel	eat our meat on a platform
	- #2 ptarmigan, #71 grouse	in winter eat twigs along the shore
	- #28 lynx; #25 wolf; #23 fox, #7 fisher	hunt almost the same-rabbit, partridge

Informant #56	Run 1:	Comments:
	- #4 robin; #15 whitefish	eat same food, flies on water
	- #29 otter; #14 dore; #38 loon	eat fish
	- #20 owl; #9 weasel; #10 marten	eat rabbit, partridge
	- #37 crow; #6 gray jay	eat meat stored on a platform
	- #24 goose; #39 duck	eat grass along shore

(CONTINUED)

Table A4.6-1 Record of Responses to Picture Sorting Tests (Continued)

Informant	Run	Comments
Informant #56	Run 1: (Continued)	Comments:
	- #26 beaver; #30 muskrat	eat poplar
	- #2 ptarmigan; #11 grouse	eat twigs along shore
	Run 2:	Comments:
	- #13 bear; #31 porcupine	they do things slowly
	- #23 fox; #28 lynx	scared away easily
	- #18 goldeye; #19 burbot	around in water
Informant #114	Run 1:	Comments:
	- #2 ptarmigan; #11 ruffed grouse	piešutč)
	- #6 gray jay, #4 robin, #5 woodpecker	) birds
	- #1 kingfisher	piešisatč)
	- #9 weasel, #7 fisher, #10 marten	pelts sold) aoešisatč-"animals"
	- #12 moose, #13 bear	big game-meat is good)
	- #14 dore, #15 whitefish, # 17 sturgeon	best kind to eat) nemesatč-"fish"
	- #19 burbot, #18 goldeye, #16 white sucker	eat them sometimes)
	Run 2:	Comments:
	- #35 trout, #36 pike	nemesatč
	- #24 goose, #38 loon, #39 duck, #20 owl, #37 crow	piesutč
	- #27 mink, #26 beaver, #30 muskrat, #29 otter	nipiaoesisuč "water animals"

(CONTINUED)

Table A4.6-1 Record of Responses to Picture Sorting Tests (Continued)

Informant #114	Run 2: (Continued)	Comments
	- #34 skunk, #31 porcupine	have similar names kauk and šikauk
	- #25 wolf, #28 lynx, #23 fox, #33 caribou	
	- #21 squirrel, #22 hare	

Informant #71	Run 1:	Comments:
	- #27 mink, #29 otter	both eat fish
	- #10 marten; #20 owl	both eat rabbit
	- #39 duck; #24 goose	both get something to eat under the water
	- #9 weasel; #37 crow; #6 gray jay	eat moose meat that people and other animals killed
	- #31 porcupine; #30 muskrat; #26 beaver	eat bark off a tree
	- #36 pike; #19 burbot; #18 goldeye, #17 sturgeon	eat other fish, (except sturgeon) eat weeds
	- #13 bear	eats blueberries
	- #8 wolverine	eats beaver

	Run 2:	Comments:
	- #2 ptarmigan; #11 ruffed grouse	doesn't know-about the same
	- #15 whitefish, #16 white sucker	eat same thing, sand
	- #28 lynx, #25 wolf, #23 fox, #7 fisher, #34 skunk	eat same things-rabbit

(CONTINUED)

Table A4.6-1 Record of Responses to Picture Sorting Tests (Continued)

Informant #71	Run 2: (Continued)	Comments:
	- #14 dore, #38 loon	eat fish
	- #12 moose, #22 hare	eat leaves and twigs
	- #4 robin, #5 woodpecker	eat flies and worms
Informant #116	**Run 1:**	**Comments:**
	- #15 whitefish; #18 goldeye; #19 burbot	fish
	- #25 wolf; #13 bear	when hungry, not scared at all
	- #30 muskrat; #26 beaver	same when winter comes, gather up things for winter
Informant #68[3]	**Run 2 :**	**Comments:**
	- #27 mink; #29 otter	both always hang around beaver houses
	- #33 (moose) ; #12 moose	
	- #4 robin; #5 woodpecker	
	- #36 pike; #17 sturgeon; #14 dore# #16 sucker	all stay in water-fish

(CONTINUED)

Table A4.6-1 Record of Responses to Picture Sorting Tests (Continued)

Footnotes:

1. Comments of informants.
2. Names are in parentheses when the name given the drawing by the informant differs from the artists' intended referent animal.
3. Residual pictures from run 1, informant #116.

APPENDIX 6-1 SOME WASWANIPI NAMED CATEGORIES FOR GEOGRAPHICAL FEATURES

A brief account of some of the basic geographical and vegetational landscape categories frequently used is given in the two tables in this Appendix. The first table simply lists a series of terms collected from one individual and checked with usage in natural settings. The second table lists names and identifying comments on vegetational landscapes elicited with the use of illustrations. The tables are separated because the data available vary with the eliciting technique used. However, the Waswanipi make no distinction between all the items on one list versus all those on the other. Thus sasapiskao, on the second list, a place on a lake where the bottom of the lake is weedy contrasts in discussions of fishing activities with asiniskao and iekaoan, from the first list, places on a lake where the bottom is rocky and sandy respectively. Also, iekaoan appears on both lists, and may occur in contexts where it refers to a sand blow-out in a forest, a sandy shore, or a place on a lake with a sandy bottom. Context would clarify the meaning. Finally, it should be noted that the definition and structure of the domain have not been examined, the data are simply elicited lists and identifications.

Table A6.1-1 Waswanipi Cree Names and Identifications of Geographical Features Elicited With Illustrations of Vegetational Landscapes

Names in Cree (Less Common or Specific in Parentheses	Informants' Comments	Plate No. (Baldwin, 1958)	Nos. of Informants	English Gloss	Comments
šipaiao (šipeao, šipaou, šipaeoasči, sipao)	"opening", "clearing", "no trees"	IVA	2,114	Open Ground, or Clearing, or Open Forest?)	Picture of field
		VB	52		Picture of boggy black spruce forest open
		IV	2		Picture of jackpine forest open
		IVA	114		Picture of sedge meadow
masčeko (musčeko, mastček mastčekokuskego)	"muskeg"	VA	114	Bog or Boggy Forest	Picture of open bog
		VB	2		Picture of boggy black spruce forest
	"muskeg plus trees"	VB	114		Picture of boggy black spruce forest
kaakotičasči	"asci-land, at bottom-ground is underwater	IXB	114	Marsh	Picture of aquatic and marsh vegetation

(CONTINUED)

Table A6.1-1 Waswanipi Cree Names and Identifications of Geographical Features Elicited With Illustrations of Vegetational Landscapes (Continued)

Names in Cree (Less Common or Specific in Parentheses	Informants' Comments	Plate No. (Baldwin, 1958)	Nos. of Informants	English Gloss	Comments
masčekopi (oisčipeao, musčipeo)		IXB	2	Bog?	Picture of aquatic and marsh vegetation
	"swamp", like a cup	XIA	114		Picture of floating bog
	"water gets low see plants"	XIB	2		Picture of willow thickets at shore; should all these be part of masčeko? see below
iokopiotastan (iekaoin, ieka)	"blows around, covers things up"	XB	2,114,93	Sand Blow-out	Picture of sand blow-out
satčikopao (sakao, sakatokao)	"thick willows"	XIB	114	Shoreline Thickets	Picture of willow thickets at shore

(CONTINUED)

Table A6.1-1 Waswanipi Cree Names and Identifications of Geographical Features Elicited With Illustrations of Vegetational Landscapes (Continued)

Names in Cree (Less Common or Specific in Parentheses	Informants' Comments	Plate No. (Baldwin, 1958)	Nos. of Informants	English Gloss	Comments
sipetaoko (sipetakao, sipiapiškao)	"ground is hard rock", clear hill tops", no trees on rocks"	XIIA	2,114	Rocky Habitat	Picture of rocky habitat on mountain
kaooastčeoin (kaostčeu, itčistan)	"trees are fallen"	XIIB	2,52,114	Blown-down	Picture of opening caused by wind
oipuskao (oopskao, oepisko)	"burn", "black logs"	XIIIB	2,52,114	Burn, large	Picture of severe fire
sasapiskao	"place with many weeds in the water"	none	114	Place where bottom of lake is weedy	Contrasts with terms for rock and sandy bottoms in Table A6-1.2
nitamatek	"near the bush; grass in shallow water, when water goes down can walk on it"	none	114	Foreshore Flats	Part of former category?

Table A6.1-2 Listing of Names for Geographical Features by One Individual[1]

Waswanipi Name of Geographical Features	English Gloss
sipi	river
šipiš	small river
šikapiši	stream
ičitauou	fork in river
sakahikan	lake
wašihou	bay
pasčeou	arm
tačekamapo	cold water
čišakamiteoapo	hot water
meništic	island
ministakoapisko	small rocky island
mačiteweiou	point
iekaoan	sandy beach, or location in lake with sandy bottom[2]
asiniskao	rocky shore, or location in lake with rocky bottom
čištakamic	mainland
paostiko	rapids, falls
takotatsioan	just above the rapids
nitatsioan	just below the rapids
kapatakan	portage
tapitaoao	level, flat land, plain
papeskoskamakao	rolling hills
wači	hills, mountains
wačiš	small hills
sasčio	mud
iekao	sand
assini	rocks
assiniamsk	pebbles

Footnotes:

1. Interview Notes, #114.
2. See same term on Table A6-1.1.

APPENDIX 8-1 DETERMINATION OF FOOD WEIGHTS FOR ANIMALS AND GROUPS OF ANIMALS

A - Introduction

This appendix provides the background data for the determination of the average weight of food that can be butchered from each specific kind of animal or animal group.

The estimates of food weight values used in this study are uniformly calculated by estimating:

a) the average whole weight of individual animals of a given group,

b) the percentage of the whole weight that can be converted into food for human consumption upon butchering.

The food weight values used in the main text are the product of these two estimates.

In the determination of the average whole weights I have given priority to weight data that are: for populations in the Waswanipi region, the James Bay territory, Quebec, and the sub-arctic region, in that order; for individuals harvested by techniques most closely approximating those used by Cree (especially for fish); and based on the largest number of observations.

In the determination of the percentage of whole weight usable for human consumption I have given special consideration to Waswanipi butchering and dietary practices. In general, the Waswanipi consider more of the organs and parts of the animals they harvest as edible, and often desirable, than would commercial or non-Native domestic butchers, and when adopting the values I have taken this into account.

Butchered animals are almost completely consumed, except for the bones, either by human beings or by dogs. For example, beaver heads, hearts and feet are all eaten by men, and the fat of the tail is considered a delicacy. Liver and other internal organs are considered edible as are the intestines. Marrow may be eaten, but bones are not given to dogs. Pelts are removed carefully so that as little fat as possible adheres to the skin. Blood is saved and cooked. The butchered moose is also carefully used. Fish are generally consumed almost completely except for viscera and bone. The head and tail flesh are cooked and eaten. In general considerable skill and care are taken when butchering animals and wastage is minimized.

Examination of data on the percentage of the whole weight that can become food products indicates that for some animals, especially closely related animals, but also some animal groups, the percentage distribution of the whole weight of the body into individual weights for the various body components was generally consistent among animals with similar body form (see White, 1953; Spector, 1956; and Watt and Merrill, 1963). Therefore, I used as relevant information not only data for the given animal but where necessary and available I used information from closely related species.

In general, I considered the potential overall importance of each animal or animal group to the harvest of food by the Waswanipi hunting groups and concentrated my efforts on those species that were potentially most important. On this basis I chose to emphasize moose and beaver and to give secondary emphasis to fish, hare and grouses. These priorities were reflected both in the extent of effort made to find relevant data and in the rigorousness with which the criteria cited above were applied.

For the two large and most important species, moose and beaver, average weights were calculated from data for various age and sex classes. I also derive separate values for meat and fat as a proportion of the live weight. This is done because in many arctic and sub-arctic animals the fat is predominantly in sub-cutaneous deposits rather than marbled through the meat as is characteristic of domestic fattened animals. This has been reported by the United States Interdepartmental Committee on Nutrition for National Defense. The Committee compared the percentages of protein in fat in northern animal flesh and in domestic animal flesh and found that caribou and moose meats had 27 and 26 grams of protein and 1.2 and 1.1 grams of fat respectively per 100 grams of raw edible portion, whereas pork side, lamb side and beef roast had 12, 16 and 17 grams of protein and 45, 28 and 23 grams of fat respectively per 100 grams of raw edible portion in their meat (1959:92-93). This lower fat value for the flesh reflects the fact that fat in sub-arctic and arctic animals is often not in the muscle tissue, but in separate locations, such as under the skin. It should be noted that the Committee's findings indicated that beaver meat was more like the domesticated animals than the moose in that there was a higher fat content marbled in the meat. Nevertheless, the beaver also has a high percentage of fat in sub-cutaneous and other fatty deposits in its body (see studies cited below). Because of the considerable difference in nutrient composition of lean meat and fat, separate meat and fat portions were calculated for moose and beaver.

In addition, wherever possible a separate value has been derived for edible organs, but where this was not possible the value has been combined in the edible portion with the meat. Finally, more or less approximate values for inedible viscera have been established for all animals and animals groups to give a rough idea of portion of food available for dogs, but not for human consumption.

The basic tables are organized in pairs for each animal or animal group, one of the tables summarizes the data on the percentage of the whole weight that can be potential food and another table summarizes the data on average whole weights of that animal or animal group. For some animals tables showing the calculations used are given. The determinations are discussed animal by animal below. The source references on each table refer to the authors and works listed in the bibliography at the end of this Appendix. For consistency it has often been necessary to transform data from the original source for use on the tables. When this transformation has only involved conversion of units or aggregation of data, specific note of the change has generally not been given. When other transformations are made they are generally cited.

B - Food Weights

i) Moose

Moose is the largest animal caught by Waswanipi hunters. There is a relative abundance of data on the distribution of weight of this species to component body parts for animals killed by non-Native sport hunters. The most relevant and detailed available data are summarized on Table A8.1-1. The values from the National Meat Institute (1970) are probably from Quebec killed moose. Peterson's moose are from Ontario (1955), whereas the White (1953) and Blood et al., (1967) values are from elsewhere. Additional values are available for moose but a generally consistent pattern emerges from the data presented. Up to forty-five percent of the whole weight is composed of flesh, fat, including the sub-cutaneous layer of fat found during the winter period, and an additional nine to twelve percent is found in the edible organs. The Cree consider the tongue, lips, heart, liver, brains and eyeballs of the moose delicacies. In this study I have considered fifty-four percent of the whole weight to be potential food, 35 percent meat, 10 percent fat, and 9 percent edible organs. In addition, 10 percent is allocated to other internal organs, after cleaning.

During the course of the year the weight of a moose may vary considerably. This feature is very wide spread, DesMeules reports it for Quebec (1967:7), Knorre reports variations up to 20 percent during the course of the year in Russia (1956) and Peterson reports that bulls in Scandinavia loose and gain 6 to 12 percent of their weight during the year (Peterson, 1955:98, citing Skuncke). Rausch reports twenty percent lower average weights for cows killed in late spring and early summer as compared to animals killed during the fall and winter, for a sample of fourteen moose in Alaska (1959:68). These changes are attributed to changes in the fat deposits of the body, particularly the sub-cutaneous layer (Knorre, 1956:22-3). The cycle appears to be different in males and in the females. The peak of fat accumulation in both sexes occurs in late summer. In males the fatty layer is first reduced rapidly during the fall rut and then declines slowly throughout the remainder of the winter and

Table A8.1-1 Moose, Percentage Distribution of Weight to Component Parts and to Food Weight Portion

Source	Food Weight Portion	Meat	Fat	Bone in Meat	Other Bone	Feet	All Bone	Edible Organs[1]	Other Viscera	All Viscera	Skin	Total
	%	%	%	%	%	%	%	%	%	%	%	%
White, 1953.			← 50 →									
Peterson, 1955[2]			← 60 →							22	8	90
National Meat Institute, 1970[3]	71				10[4]	6				29	9	96
National Meat Institute, 1970[5]		← 43 →		16							10	
Kelsall, 1969.		35	10				25	12	18	30		100
Blood, *et al.*, 1967.			← 50 →									
Values Used		35	10	(16)			25	9	10[6]		8	97

Footnotes:

1. Cree consider edible: tongue, heart, liver, brain, kidneys, plus other minor organs.
2. Based on one moose.
3. Average of figures for five animals.
4. Head.
5. Re-calculated for two animals from carcass weights to percentage of estimated whole weights.
6. Assumed value for cleaned viscera.

spring. In females there is no rapid decline during the fall, but only a continuous decline through the winter and spring. Females probably have less fat accumulation in the fall than males. The accumulations of immature animals probably parallel those of the females. The average value attributed to this layer is critical for a caloric analysis such as I will be making because of the high caloric value of fat which provides over twice as many calories per unit weight than does protein. I know of no extensive butchering samples that reveal averages for this layer in moose although Kelsall gives some measure (1969). The figures cited above indicate that for the late summer and fall at least, moose may have 20 percent, or more, fat. An overall average of ten percent fat is used in the values for this study, a figure which I believe may be reasonable because the majority of moose are caught by the Waswanipi in early winter, by the end of February, after the fall decline in males, but before the full decline that has occurred by spring.

The sub-species of moose occurring in the Waswanipi region is Alces alces americana (Clinton). Weights for moose of this sub-species are reported by DesMeules and Heyland for animals killed by sport hunters during the fall hunting season in the provincial parks of the province of Quebec. On the basis of 291 recorded weights, 110 for cows and 181 for bulls DesMeules provides average weights for each age class from 6 months to 15½ years and older. For females the age class averages vary relatively little from 2½ years old and up, the range being from 695 to 822 pounds with a median at 758 pounds. For males the range of age class averages above 2½ years is from 686 to 1078 pounds, with a median at 882 pounds. Heyland's figures which are based on a larger sample of animals (694) are approximately ten percent higher than those reported by DesMeules. Table A8.1-2 summarizes relevant available data on whole weights of moose grouped into three age classes. All values are from Quebec. Male and female weights have been averaged assuming an equal sex ratio in the kill.

In order to estimate average weights per animal harvested the age distribution of the harvest was estimated. I gathered reports on approximately one-quarter

Table A8.1-2 Whole Weights of Quebec Moose by Age Classes and Sex

Age Class and Sex		Source	Average Whole Weight (Pounds)	Average Male and Female Whole Weight (Pounds)
Calves	- Males	DesMeules, 1966[1]	336	
	- Males	Heyland, 1964, 1966[2]	365	324[1] - 348[2]
	- Females	DesMeules, 1966[1]	313	
	- Females	Heyland, 1964, 1966[2]	332	
Yearlings	- Males	DesMeules, 1966[1]	610	
	- Males	Heyland, 1964, 1966[2]	624	
	- Females	DesMeules, 1966[1]	590	600[1] - 621[2]
	- Females	Heyland, 1964, 1966[2]	618	
	- Males and Females	National Meat Institute, 1970	(567)[3]	
Adults	- Males	DesMeules, 1966[1]	882[4]	
	- Males	Heyland, 1964, 1966[2]	1004[5]	
	- Females	DesMeules, 1966[1]	758[4]	820[1] - 904[2]
	- Females	Heyland, 1964, 1966[2]	804[5]	
	- Males and Females	National Meat Institute, 1970	(790)[3]	

Footnotes:

1. Based on a total of 291 moose weighed after a controlled hunt in Quebec parks.
2. Based on 19 male calves, 26 female calves, 51 male yearlings, 34 female yearlings, 300 male adults and 194 female adults and published in Peterson, 1974.
3. Based on two moose, one male, one female.
4. Medians for 2½ year old and older age classes.
5. Means for 2½ year old and older age classes.

of the moose harvested by Waswanipi hunters studied in 1968-69 and 1969-70, ca. 50 animals, and found the age distribution to be 29 percent calves, 19 percent yearlings and 52 percent adults (Table A8.1-3). These figures were used to calculate two average whole weights, one based on the figures provided by DesMeules, and one on those from Heyland (Table A8.1-4). The latter is nine percent higher than the former. The lower value is used in the main calculation in the text of this study despite the fact that the higher figure is based on a largersample. This is done to offset any over-estimation that may be occurring by using fall weight records to estimate the weights of Waswanipi kills which are made primarily in early winter when males may weigh approximately 10 percent less than at the beginning of the fall.

ii) Beaver

There are few detailed studies of the weights of the various components of the bodies of beaver. However there are some general estimates of the edible meat and fat portion for beaver. A percentage distribution of the live weight of beaver can be estimated on the basis of these reports of the relative weights of some components, and reasonable assumptions about the weights of other components. Bailey, examining the possibilities of beaver farming, reported that dressed beaver provide between fifty and sixty percent of their live weight as meat including bone, tail fat and liver (1927). White estimated 55 percent as a meat portion, including bone in the meat, and edible organs. Given that many internal organs in addition to the liver are considered edible by the Waswanipi a sixty-seven percent figure is used here as a baseline for meat, fat, bone and edible organs and parts of the tail.

From figures provided by Hodgden and Hunt for 865 skinned beaver (1955:15), I have calculated that the pelt and feet together weigh 23 percent of live weight. Osborn has reported from two independent samples of approximately 80 to 100 beaver that the pelt alone weighs 15 percent of live weight. Feet are then 8 percent. Because beaver is an animal adapted in part to an aquatic environment its bone structure appears to be relatively light, and therefore I assume a total bone weight of 19 percent of live weight, as compared to

Table A8.1-3 Percentage Age Structure of Waswanipi Cree Moose Harvest

Number in Sample	Adults	Young		
		Yearlings	Calves	Total
	%	%	%	%
50	52	19	29	48

Table A8.1-4 Calculation of Average Whole Weight Value of Moose

Age/Sex Structure	Percentage of Harvest (a)	Component Average Whole Weight (Pounds) (b)	Weight Contri-bution (axb) (c)	Average Whole Weight (Pounds) (d)
Calculation 1[1]				
Calves	29	324	94	
Yearlings	19	600	114	
Adults	52	820	426	
				634[3]
Calculation 2[2]				
Calves	29	348	101	
Yearlings	19	621	118	
Adults	52	904	470	
				689

Footnotes:

1. Based on figures from DesMeules on Table A8.1-2.
2. Based on figures from Heyland on Table A8.1-2.
3. Value used.

Table A8.1-5 Beaver, Percentage Distribution of Weight to Component Weights

Source	Meat %	Fat %	Bone in Meat %	Edible Organs %	Other Bones %	Other Viscera %	Skin %	Feet %
White, 1953.	←	55		→				
Aleksiuk and Cowan, 1969		30-40[1]						
Osborne, 1949.							15[2]	
Bailey, 1922, 1927.	←	50-60		→				
Hodgdon and Hunt, 1955.							←23	→
Spector, 1956.				8[3]				
Values used	29	20	10	8	9	9	15	

Footnotes:

1. Estimate, may include some viscera, includes tail.
2. Based on 175 weights.
3. Values for organs of beaver and/or muskrats, include: brain, heart, kidney, liver, stomach and eyes.

approximately 25 percent in moose and caribou. If just over half the weight of the feet is in the bones, then the weight of bones in the feet is four percent, and if I assume the skull is a further 5 percent, then the remaining 10 percent of the total bone weight remains with the dressed carcass. The dressed carcass is composed of meat, bone in meat, sub-cutaneous and tail fat deposits, and edible organs.

The annual cycle of fat deposition and mobilization found in the beaver in the Northwest Territories was for the animals to deposit fat in the autumn, remain obese all winter and mobilize fat rapidly in the spring (Aleksiuk, 1968a:34). This cycle is similar to that of hibernating animals. Using a sub-cutaneous fat index, recorded by observation, Aleksiuk noted peak accumulations from December to March and second order accumulations for November and April (1968a). Thus nearly the entire period of beaver trapping falls within the period of heavy fat accumulations. Aleksiuk reports that the tail of the beaver is a major fat storage area in addition to the sub-cutaneous and intraperitoneal depots common in the other animals (1970:147). He and Cowan report that in the North-West Territories "winter-caught animals were very obese, containing perhaps 30-40% fat..." Discussions suggest that a more conservative percentage of total weight in fat accumulations is appropriate, and a 20 percent value is adopted here. Starting with 67 percent edible, and taking away 10 percent for bone and 20 percent for fat, this leaves a residual 37 percent of the live weight in meat and edible organs. I have estimated the internal edible organs on the basis of percentages provided by Spector (1956) to be eight percent of whole weight, so the residual meat is 29 percent. The distribution of beaver weight to various components is summarized on Table A8.1-5. The overall food portion weight is 57 percent, and the other viscera value is estimated as a residual.

Data on the live weights of beaver have recently become available from the James Bay Region. As part of a study of a beaver population inland from Fort George, Quebec (at approximately 53°45'N, and 76°45'W), Normand Traversy recently captured and weighed some 139 beaver during pre-winter period. He classified them by years of growth, starting with a half a year of age and up to sixteen and a half years of age. Traversy and McNicoll concluded that two and a half year old beaver were adults. The average weights for those under one year of age ranged from 8.25 to 16.5 pounds and averaged 12.9 pounds, those between one and two years ranged from 18.15 to 39.05 pounds, averaging 24.34 pounds, and I calculate that for those two and a half years and older the mean was 40.29 with a range from 30.25 to 53.90 and the peak weights at 8½ years of age (Traversy and McNicoll, 1976:44, Table 12). Unfortunately, these data were not available to me when the main calculations for the present study were undertaken.

At the time when my calculations were made there were no extensive studies of beaver weights from Quebec, although a large number of studies had been conduced in the sub-arctic, northern temperate and arctic regions. The weights found in studies from northern Alberta, Alaska, Saskatchewan, the Nort-West Territories, northern Manitoba, and Wyoming were examined. There was a striking uniformity of averages between the different areas, and the values fall within those summarized by Peterson (1966:133&136) for eastern Canada, and close to those found by Traversy and McNicoll. In his study of beaver at the northern limit of its range, Aleksiuk has noted that the beaver attains a body weight commensurate with that of southern animals of comparable age (Aleksiuk and Cowan, 1969b:477). Aleksiuk comments,

> "On purely theoretical basis one might expect that environmental conditions in the north would result in a smaller body size, or in a prolonged period of immaturity. However, such is not the case... The beaver at northern latitudes is evidently able to compensate for the growth lost during the prolonged winter by growing very rapidly during the summer." (Aleksiuk, 1968a:29&31).

This compensatory ability apparently limits variation in weights of animals across the whole central and northern range of the beaver. The main variation in average weight is therefore a function of the age of the animals caught, rather than of location. The weights of whole beaver reported from the various geographical areas (Table A8.1-6) generally confirm this conclusion, including those from Quebec. These data indicate that the mean age class weights for kits, yearlings, and adults, fall within a reasonably narrow range and have

Table A8.1-6 Whole Weights of Beaver by Age Classes

Age Class	Source	Average Whole Weight (Pounds)	Whole Weights Used (Pounds)
Kits	Novakowski, 1965[1]	15.4	
	Buckley and Libby, 1955[3]	13-15	
	Nash, 1951[5]	8	
	Hakala, 1952[6]	12-18	
	Osborn, 1949[7] (15.6x1.13)	17.6	15.4
	Peterson, 1966	16-20	
	Traversy and McNicoll, 1976[10]	12.9	
Yearlings	Novakowski, 1965[1]	21.1	
	Buckley and Libby, 1955[3]	24-28	
	Nash, 1951[5]	18	
	Hakala, 1952[6]	24-30	
	Aleksiuk and Cowan, 1969[8]	18-23	
	Pearson, 1960[9]	18-23	
	Osborn, 1949[7] (26.6x1.13)	30.1	21.1
	Peterson, 1966	20-27	
	Traversy and McNicoll, 1976[10]	24.3	
2 + years old	Novakowski, 1965[1]	37.0[2]	
	Buckley and Libby, 1955[3]	32-40[4]	
	Nash, 1951[5]	33	
	Hakala, 1952[6]	30-45	
	Osborn, 1949[7] (35.4x1.13)	40.0	37.0
	Peterson, 1966	30-80	
	Traversy and McNicoll, 1976[10]	40.3	

Footnotes:

1. Northern Alberta beaver, based on a total of 96 individuals.
2. Average of 2, 3 and 4+ year classes.

Table A8.1-6 Whole Weights of Beaver by Age Classes

Footnotes: (Continued)

3. Alaska beaver, based on 164 individuals.
4. Two year olds.
5. Northern Manitoba beaver.
6. Alaska beaver.
7. Wyoming beaver skinned weights to which we have applied a correction factor.
8. North-West Territories beaver.
9. Saskatchewan beaver.
10. Quebec, La Grande River, James Bay beaver, 139 individuals.

virtually no overlap.

I have used Novakowski's figures for average weights of different age classes because they were the most detailed published, and are median or low within the range of figures reported in other studies. The Quebec figures which were available later, were lower for kits, but higher for yearlings and adults.

Table A8.1-7 gives the age structure of the Cree beaver harvests, based on the reported age of 1169 beaver trapped during 1968-69 by Waswanipi trappers and reported to me during this study.

On Table A8.1-8 the average whole weight values for beaver are calculated. The estimated value used is 26.7 pounds per beaver, but the average whole weight for the Quebec sample would have been 28.4 pounds, or about six percent higher.

iii) Hare

The hare of the Waswanipi region is the varying hare for which the most extensive growth and weight studies have been made by Severaid in Maine (1942). The average live weight of 29 adult hare which had been in captivity for at least ten months was 3.6 pounds in December (Severaid, 1942:51). These animals had apparently been captured and then confined. The average weights of a group of 68 animals caught from the wild in February was 2.6 pounds, frozen. These animals had been box-trapped and crated for one to three days. A group of 50 hares which were live trapped and live weighed in February after having been confined and without food for approximately one day, weighed an average of 2.9 pounds (Table A8.1-9). It seems likely that weights for animals in captivity are "slightly higher due to a less active existence and a diet presumably more nutritious" (Severaid, 1942:38). On the other hand frozen animals desiccate. I have adopted the February live weight, 2.9 pounds, as an average weight, because this value is probably just slightly below the freshly captured weights. This weight is also just below the weight range for eastern Canada reported by Peterson of 3 to 5 pounds (1966:87).

Table A8.1-7 Percentage Age Structure of Waswanipi Cree Beaver Harvest, 1968-69

Number in Sample	Adults (2+ Years Old) %	Yearlings %	Kits %
1169	45	28	27

Table A8.1-8 Calculation of Average Whole Weight of Beaver

Age Structure	Percentage of Harvest (a)	Component Average Whole Weight (Pounds) (b)	Weight Contri-Bution (axb) (c)	Average Whole Weight (Pounds) (d)
Calculation 1[1]				
Kits	27	15.4	4.2	
Yearlings	28	21.1	5.9	
Adults	45	37.0	16.6	
				26.7[3]
Calculation 2[2]				
Kits	27	12.9	3.5	
Yearlings	28	24.3	6.8	
Adults	45	40.3	18.1	
				28.4

Footnotes:

1. Based on weights in Novakowski, 1965.
2. Based on weights in Traversy and McNicoll, 1976.
3. Value used.

Table A8.1-9 Whole Weight of Various Animals and Animal Groups

Animal or Animal Group	Source	Number	Average Whole Weight (Pounds)	Whole Weight Used (Pounds)
Hare	Severaid, 1942	29	3.6	
	Severaid, 1942	22	3.4	
	Severaid, 1942	68	2.6	
	Severaid, 1942	243	2.6	
	Severaid, 1942	50	2.9	
	White, 1953		3	
	Banfield, 1974		3.3	2.9
Black bear	Peterson, 1966		300	
	Tremblay, 1970		up to 450	
	White, 1953		300	
	Black, 1958	179[1]	205	
	Banfield, 1974		336	205
Muskrat	Peterson, 1966		1.8-3.5	
	Tremblay, 1970		1-2	
	White, 1953		3	
	Banfield, 1974		2.4	2
Otter	Peterson, 1966		10-30	
	Tremblay, 1970		up to 25	
	Banfield, 1974		16	
	White, 1953		18	15
Lynx	Peterson, 1966		17	
	Tremblay, 1970		15-30	
	White, 1953		30	17
	Banfield, 1974		21	

(CONTINUED)

Table A8.1-9 Whole Weight of Various Animals and Animal Groups (Continued)

Animal or Animal Group	Source	Number	Average Whole Weight (Pounds)	Whole Weight Used (Pounds)
Marten	Peterson, 1966		1-3	
	Tremblay, 1970		5-6	
	Banfield, 1974		1.3-2.0	2
Mink	Peterson, 1966		1.3-3.6	
	Tremblay, 1970		up to 2	
	Banfield, 1974		1.7-5.1	1.5
Weasel	Peterson, 1966		.1-.4	
	Tremblay, 1970		1.5	
	Banfield, 1974		.1-.2	0.5
Squirrel	Peterson, 1966		.31-.55	
	Tremblay, 1970		.37-.63	0.36
	Banfield, 1974		.42	
Ducks	White, 1953		3.0-0.8[2]	
	Hanson, Rogers, Rogers, 1949		2.3	2.5
Grouses				
- Grouse	White, 1953		2.0[3]	
- Ptarmigan	Usher, 1970[7]		1.5[4]	2.0
	Usher, 1970[7]		1.0[5]	
Loons				4.0[6]

(CONTINUED)

Table A8.1-9 Whole Weight of Various Animals and Animal Groups (Continued)

Animal or Animal Group	Source	Number	Average Whole Weight (Pounds)	Whole Weight Used (Pounds)
Geese	Hanson, 1965, immature	72	7.3[8]	
	Hanson, 1965, yearlings	11	8.1[8]	
	Hanson, 1965, adults	71	8.6[8]	
	White, 1953		8.0	8.0

Footnotes:

1. Measurements on 179 bears of which 24 were cubs, and 26 yearlings, and of which 48 were female and 131 were males.
2. Range of values for: American merganser, pintail, black duck, mallard, lesser scaup, and green-winged teal. With the exception of the last two all others average 2.5 pounds or more.
3. Value for sharp-tailed grouse.
4. Value for willow ptarmigan.
5. Value for rock ptarmigan.
6. Estimated.
7. Usher cites Manning et al.
8. Mean of male and female average weights.

No adjustment for age structure seems necessary for hare because most hares are trapped in winter. Hares reach adult size four to six weeks after birth (Peterson, 1966), and litters are born in spring and summer, the last each year probably being born in August.

The percentage of whole weight of hare that is usable as food is from domestic rabbit from Watt and Merrill (1963) with supporting data on arctic hare from William Kemp (personal communication) (Table A8.1-10). The inedible viscera are estimated as twenty-two percent of live weight based on data provided by Kemp for arctic hare.

iv) Black Bear

General weight figures for black bear in the literature range from 300 to 450 pounds whole weight, but these appear to apply to adults. Black's figures for weights of 179 New York bears indicate figures in this range for adult males over 4½ years old - 346 pounds for one group of 7 and 368 pounds for another group of 18. However, when his whole sample of 179 bears (including 24 cubs, 26 yearlings and 28 adult females) is included the average weight was 205 pounds (1958). This is the value used in the present study.

The percentage of edible portion for bear used is 63 percent, based on the data in the literature less a percentage for bone in the meat. Twenty-two percent is assumed to be inedible viscera. It must be noted however, that these figures may not take adequate account of the special treatment and preparation accorded to bears by Cree hunters, and the meticulous use of body components that is part of these rituals. Because the number of bear occurring in the data is small, no more intensive correction for these values was made.

v) Muskrat, Otter, Lynx, Marten, Mink, Weasel, Squirrel

Low or medium whole weights are used for these animals, chosen from the range of weights reported as common in the general literature on mammals of eastern Canada. The percentages edible are estimated from standard values including

Table A8.1-10 Percentage Distribution of Weight to Food and Edible Portions for Various Animals

Animal or Animal Group	Source	Food Portion Including Bones, as Percentage of Whole Weight	Edible Portion Excluding Bones, as Percentage of Whole Weight[1,7]
Hare	Watt & Merrill, 1963	64[2]	
	Kemp, pers. comm.	64[3]	
	White, 1953	50	57
Bear, Black	Foote, 1967	70[4]	
	White, 1953	70	63[5]
Muskrat	White, 1953	70	56
Otter	White, 1953	70[6]	56
Lynx	White, 1953	50	40
Marten	White, 1953	70[6]	56
Mink	White, 1953	70[6]	56
Weasel	White, 1953	70[6]	56
Squirrel	White, 1953	70[6]	56

Footnotes:

1. Value used is a best estimate of meat, excluding bone but including fat and edible organs as percentage of whole weight.
2. Value for "rabbit", calculation includes meat plus one half of bones and viscera.

(CONTINUED)

Table A8.1-10 Percentage Distribution of Weight to Food and Edible Portions for Various Animals Continued

Footnotes: (Continued)

3. Value for "arctic hare", calculation includes meat plus one half of viscera.

4. Value for "grizzly bear", calculation includes meat, fat plus one half of bones and viscera.

5. This value may be too low because it does not take into consideration the meticulous use of bear remains that is a part of the Cree ritual for killing, transporting, butchering, cooking, and consuming black bears.

6. Based on value for muskrat.

7. A value of 22 percent of live weight is assumed to be inedible viscera for all the animals listed on this Table, based on the data for arctic hare which was provided by William Kemp (personal communication).

bones, estimated by White (1953) on the basis of body form. A reduction for bones in the meat portion is made in each case. A general value of 22 percent for inedible viscera is included for all these animals, based on Kemp's value for arctic hare (personal communication).

vi) Waterfowl

The animal group ducks covers numerous common specific kinds of animals, and other additional animals of rarer occurrence. The weight figure for this group can only be of a very generalized kind, because little is known of the frequency of the various species in the Cree harvest. White (1953) provides average live weight values of 3.0 pounds for American merganser, 2.5 for black duck and mallard, 1.8 for lesser scaup, and 0.8 for green-winged teal. Hanson, Rogers and Rogers (1949) report taking seven ducks during their waterfowl survey of the Mistassini-Rupert River region (4 American scoter and 1 each of American goldeneye, American merganser, and surf-scoter) which averaged 2.3 pounds.

Two species of grouse and one of ptarmigan are covered by the term grouses as used in this study, and very few data were available on the live weights of these species (Table A8.1-9). No values were found for loons in the literature. The values for loons were estimated by the author.

Data on whole weights of Canada geese by age appear on Table A8.1-9. These weights are for birds on the wintering grounds in the United States, and are averages of the weights for males and females. Calculation of the average whole weight and potential food portion weight on a detailed basis by age and sex class was not considered possible because sufficient data were not available on the age structure of the Cree harvests, by season. Birds vary in weight between the spring and fall migrations, and the age structure of the population varies between the two seasons. While some data are available on the variations in weights, the lack of data on the age structure of the harvest by seasons meant there was insufficient data for a detailed calculation. For purposes of this study, I adopted a whole weight of 8.0 pounds, which may be conservative.

The available data on composition of the component food weights of waterfowl are given on Table A8.1-11. Percentage distributions of food components provided by William Kemp for the northern Quebec and Baffin Island Inuit use of Canada geese, eider ducks and ptarmigans were used as the basis of the figures for this study. Higher values for meat and edible viscera than would usually be given would probably be appropriate because Cree families use the majority of internal organs, including intestines, stomach, lungs and heart, among other components. However, the limited harvest of waterfowl in the main periods covered by this study did not warrant further detailing of the estimates.

vii) Fishes

The procedure adopted for estimating the whole weights and the potential food weights for species of fish was somewhat different than that adopted for other important species. Because there have been several studies of fish in the Waswanipi and neighboring Mistassini region, I concentrated on gathering the data for the region and assessing its relevance for present purposes. The position adopted for the assessment was that an adjustment would have to be made to data on fish, to adapt the weights of fish gathered by scientific researchers to estimates of weights of fish caught by the native fishermen. This was done because differences in fishing gear can make a very considerable difference in the average weights of the fish harvested, even though the fish come from the same region. A striking example of this was encountered during the literature search and may be worth citing. Magnin's (1964) sampling of the fishes of Waswanipi Lake and river with gang nets of varying mesh size netted 156 lake sturgeon of between 12 and 56 inches, average 28.75 inches. Roussow (1957) reports fishing in the Waswanipi River slightly to the west, between Gull and Olga Lakes with 4-inch and 10-inch mesh nets. He caught 52 sturgeon with the 4-inch mesh, all young and between 23 and 35 inches in length. With the 10-inch mesh net he caught 58 sturgeon, all adult, and measuring 41 to 56 inches. Thus while Magnin's nets designed for sampling of the population may have sampled a wide range of the whole sturgeon population, Roussow's were highly selective. Magnin's average value would not adequately estimate the harvest with 10-inch mesh nets, which in fact, is the mesh size the Waswanipi

Table A8.1-11 Percentage Distribution of Weight to Edible Portions and Viscera for Waterfowl

Animal	Source	Percentage of Whole Weight			
		Edible	Meat	Edible Organs	Viscera (Inedible)
Grouses	Watt and Merrill, 1963[1]	67			
	Watt and Merrill, 1963[2]	50			
	Watt and Merrill, 1963[3]	66			
	Kemp, personal communication	60	44	16	2
Geese, Canada	Watt and Merrill, 1963[4]	50			
	White, 1953[5]	70			
	Kemp, personal communication	60	44	16	2
Duck	Watt and Merrill, 1963[6,7]	58			
	Watt and Merrill, 1963[6,8]	57			
	White, 1953[5]	70			
	Kemp, personal communication[9]	41	38	3	36
Loon[10]		60	44	16	2

Footnotes:

1. Value for quail, calculation includes meat and edible organs.
2. Value for guinea hen, calculation includes meat, edible organs, plus head and feet.
3. Value for pheasant, calculation includes meat and edible organs, plus head and feet.
4. Value for domesticated goose.
5. Includes meat, edible organs and bone.
6. Values for duck include meat, edible organs including lungs and kidney, and head and feet.
7. Value for wild duck.
8. Value for domesticated duck.
9. Value for eider duck.
10. No values for loons were found. The value for geese was used as an estimate.

fishermen prefer to use when specifically fishing for sturgeon.

In the discussions that follow I will first review the available data on fish weights on a species by species basis to indicate the range of weights that have been reported in the various studies to date. Then I will estimate the general fish values needed for this study.

For the food portion as a percentage of the live weights of fish the values used are based on an adaptation of the values found in a standard handbook on the composition of foods (Watt and Merrill, 1963). The values have been adapted to take account of Cree patterns of fish processing and consumption. The portion of whole weight attributed to refuse in Watt and Merrill appears to be generally based on filleting the fish. In all cases entrails, head, bones and fins, were discarded, and in all cases but whitefish the tails were discarded. Widespread Cree practices involve: use of some of the organs of fish; consumption of the edible portions of the heads and tails; boiling of some bones and consumption of the broth; and some consumption of skins. To take account of this additional use I have usually added a blanket increase of twenty percent to the percentage of the whole weight Watt and Merrill report as edible. Where appropriate a modified increase has been adopted, and such specific adjustments have been noted below.

a. Whitefishes

Whitefishes have been caught by and weighed Magnin (1964) in the Lake Waswanipi area, by Lejeune (1964) in the Lake Assinica area, by Morisset (1962) in Lake Mistassini, and by James Bay Energy Corporation and James Bay Development Corporation (1974) at many locations in the general region (Table A8.1-12). LeJeune and Morisset were using standard fishing nets of 3-inch and 4-inch mesh nets respectively. The sizes that are commonly used by Cree fishermen on inland lakes are 2½-inch and 3½-inch meshes.

Table A8.1-13 indicates the percentage of whole weight considered edible by Watt and Merrill (1963) and the adjustment made in accordance with our general

Table A8.1-12 Whole Weights of Fishes Caught in the James Bay Territory

Animal or Animal Group	Source	Number	Average Whole Weight (Pounds)
Whitefishes	Magnin, 1964[1,2]	202	1.88
	Magnin, 1964[1,3]	70	1.25
	LeJeune, 1964[4]	103	2.51
	Morisset, 1962[5]	6806	2.10[11]
	JBEC-JBDC, 1974	--	2.2-2.4
Walleyes	Magnin, 1964[1,6]	788	1.56
	Magnin, 1964[1,7]	177	0.58
	LeJeune, 1964[4]	247	2.64
	Morisset, 1962[5]	2388	(1.40)[8]
	JBEC-JBDC, 1974	--	3.3-4.4
Suckers	Magnin, 1964[1,9]	203	2.5
	Magnin, 1964[1,10]	100	1.88
	LeJeune, 1964[4]	56	3.89
	Morisset, 1962[5]	4840	2.7
Pike	Magnin, 1964[1]	298	1.72
	LeJeune, 1964[4]	13	3.39
	Morisset, 1962	334	3.6
Cisco	JBEC-JBDC, 1974	--	.4-1.5
Sturgeon	Magnin, 1964[1]	156	3.96
	Roussow, 1957[13]	5	12.7
	Roussow, 1957[13]	52	6.6[12]
	Roussow, 1957[13]	58	18.7[12]
Burbot	Morisset, 1962	12	3.50

(CONTINUED)

Table A8.1-12 Whole Weights of Fishes Caught in the James Bay Territory (Continued)

Footnotes:

1. Values read from graphs for weight of average length of fish in the sample, from Waswanipi Lake and River.
2. Value for lake whitefish.
3. Value for tullibee.
4. From Assinica Lake with 3-inch mesh nets.
5. From Lake Mistassini with 4-inch mesh nets.
6. Value for walleye.
7. Value for eastern sauger.
8. Weights for headless and gutless fish.
9. Value for white sucker.
10. Value for long-nosed sucker.
11. Weights for gutted fish.
12. Median lengths converted to weights on length-weight graphs provided by Magnin.
13. From Waswanipi River.

discussion above.

b. Walleyes

The pattern for walleyes is generally similar to that outlined for whitefishes. The value from Morisset (1962) for Lake Mistassini is for headless and gutless fish (Table A8.1-12). These fish probably weighed 1.8 to 1.9 pounds whole (adding 2/3 of the percentage refuse figure in Watt and Merrill, 1963). The estimated whole weight for the area might therefore be 2.4 pounds.

Watt and Merrill (1963) report that 51 percent of the dore is food, and we have used a figure of 71 percent overall.

c. Suckers

Whole weight values for suckers are reasonably consistent among studies using 3-inch and 4-inch mesh nets. A significant percentage of the suckers harvested are not used for human consumption, they are used as dog food or otherwise disposed of. A standard increment is added to the percentage usable.

d. Pike

Again, studies with 3-inch and 4-inch nets gave consistent weights. The proportion of the pike that are usable as filets is only 26 percent of the whole weight, probably because of the very large head of this species. Cree fishermen eat the edible parts of the head, therefore a special increment was added to the percentage of pike potentially usable as food portion (Table A8.1-13).

e. Sturgeon

Roussow's reports of sturgeon catches, see above, were converted to weights by looking up the weight for the mean length of the fish on a length-weight graph provided by Magnin (1964). I had to estimate the percentage whole

Table A8.1-13 Fishes, Percentage Distribution of Weight to Meat Portion

Animal or Animal Group	Source	Filet Food Portion as Percentage of Whole Weight	Food Portion Percentage
Whitefish	Watt & Merrill, 1963	47	67[1]
Walleye	Watt & Merrill, 1963	51	71[1]
Suckers	Watt & Merrill, 1963	39	59[1]
Pike	Watt & Merrill, 1963	26	60[3]
Cisco	Watt & Merrill, 1963	52[4]	72[1]
Sturgeon		--	62[5]
Burbot	Watt & Merrill, 1963	15	50[6]
Fish, Average			65[7,8]

Footnotes:

1. Twenty percent added for use of head, tail, and some viscera, skin and bones.
2. For suckers the proportion usable as potential food is increased by the standard amount, but note should be taken of the fact that a significant percentage of the suckers harvested are not used for human consumption.
3. The low food value for filets of pike requires special augmentation because Cree eat the flesh from the large head of this species.
4. Value for lake herring.
5. No values were available, estimate.
6. The low food value for filets of burbot requires special augmentation because the large liver is considered a delicacy by Cree fishermen.
7. The value used is an average for sturgeon, whitefish, pike and walleye.
8. Inedible viscera are estimated to be an additional 15 percent of live weight.

weight that could be converted into food, because no figures were available.

f. Burbot

A limited sample of weights were available for burbot. The percentage of whole weight that converts to filet weight was especially low, we believe because of the large internal organs of this species, especially the liver. Because Cree fishermen eat some organs a special increment was added to establish the food portion percentage.

g. Averaged Fish Values

Because the data provided by the hunters did not identify the specific kinds of fish captured, it was necessary to estimate an average weight and percentage food portion for fish caught by the Waswanipi that would appropriately average the weights of the various specific kinds of fish.

The method used to estimate a general average live weight for fish is based on a modification to the results of the studies of Magnin of the fish of Waswanipi River. First, all species occurring as more than five percent of the captures were listed (Table A8.1-14). Magnin's sample was based on a total of 2122 specimens caught mostly by nets of ¾, 1½, 3, 4, 4½ and 12 inch mesh. His sample is the most extensive available from the region. On the basis of the average length of each species and the graphs of the length-weight relationship he has published for each species, I estimated the weight of average length specimens (Table A8.1-12). A weighted average based on these weights and the percent occurrence of each species is 1.9 pounds per fish (Table A8.1-14). But this value is not directly utilized.

The distributions of the catch, both the numbers caught of each species and sizes of the fish caught of each species, are influenced by the size of the net used. As indicated above, Magnin's sample was caught in a variety of net sizes in order to widely survey the fish populations of the Waswanipi River. Waswanipi fishermen almost all use 2½ inch or 3½ inch mesh nets for winter

Table A8.1-14 Estimations of Average Live Weight of Fish Caught at Waswanipi[1]

Species Caught as More Than Five Percent of Captures in Waswanipi Lake (Magnin, 1964)	Percent of Total Captures N = 2122 (Magnin, 1964)	Estimated Weight for Average Length of Specimens (Magnin, 1964) (Pounds)	Percent of Total Captures (N= 497) (Lejeune, 1964a) on Lake Assinica	Average Weight of Specimens Caught in Lake Assinica[2] (LeJeune 1964a) (Pounds)	Percent of Total Captures Waswanipi Lake	Average Weight Per Individual Lake Assinica (Pounds)
Lake Sturgeon	7.3	4.0			7.3	6.6[3]
Whitefish	9.5	1.9	20.8	2.5	9.5	2.5
White Sucker	9.6	2.5	11.3	3.9		
Northern Pike	14.0	1.7	14.7	3.4	14.0	3.4
Walleye	37.1	1.6	49.7	2.6	37.1	2.6
Eastern Sauger	8.3	0.6				
Total	85.8		96.5		67.9	
Weighted Average Weight (Pounds)		1.9		2.9		3.2

Footnotes:

1. See text for discussion.
2. Using 3-inch mesh nets.
3. Median length from Roussow, 1957, converted to weight on length-weight graphs in Magnin, 1964.

fishing, with the exception of sturgeon fishing in summer when 10 and 12 inch mesh nets are used. Unfortunately, there is no record of the catch from nets of these sizes in the Waswanipi region. However, just to the north-east of the area of study, in the drainage system of the Broadback River, LeJeune has conducted a study of Lake Assinica with 3-inch nets, with which he caught 497 specimens. The average weights and percent of captures are reported on Tables A8.1-12 and A8.1-14 respectively. I have calculated a weighted average of 2.9 pounds per capture (Table A8.1-14). However, because the fish species common to the Lake Assinica basin do not include lake sturgeon, these values do not appear to be a good estimate of Waswanipi harvests either.

As an estimate of an average whole weight for fish I have therefore used the percentage distribution of the total captures from Magnin, for Waswanipi, and the average weights from LeJeune, for Lake Assinica. For sturgeon an average weight was derived for the median length recorded by Roussow (1957), using the length-weight graph provided by Magnin (1964). No estimate was made for white sucker to take account of the fact that few were used for human consumption, and no value could be calculated for eastern sauger because they do not occur at Lake Assinica. The overall weighted average live weight for fish by this method is 3.2 pounds per fish. This value was adopted as the main value used in this study.

As a general average value for the percentage of the live weight of fish that is in the food portion, I have used the average of the food portion percentages for the four species used to arrive at an average live weight, namely sturgeon, whitefish, pike and walleye, which is 65 percent. Fifteen percent of the whole weight is estimated to be inedible viscera. Sections of sturgeon contain 15 percent bone and skin (Watt and Merrill, 1965) so 20 percent of the whole live weight of fish is assumed to be bone, leaving 15 percent of live weight as a residual for inedible viscera.

C - General Conclusions Concerning Food Weights for Animals and Animal Groups

From the data provided in the preceding tables several values can be derived for most kinds of animals, by multiplying the average whole weight by the appropriate component weights. The two most immediately useful values are the butchered food weight and the edible portion weight that can be produced from the carcass of a given kind of animal. The former value includes meat, fat, edible viscera and those portions of bone that usually occur in butchered meat, the latter excludes such bone, and only includes the edible components. The latter is the figure I use for assessing the subsistence production. The former value is more directly comparable to food weights generally reported in the literature and would be most appropriate when comparing Waswanipi food harvests to those reported elsewhere. The former is also useful when Waswanipi production is to be compared to purchased foods.

On Table A8.1-15, I list the edible portion weight and the butchered weights used in this study. In addition I have provided comparisons between the values used in the present study, and other estimates or observations of the weights of animals killed by Indian hunters in the eastern sub-arctic. There are, needless to say, extremely few of such figures, either measured or estimated, and when they are based on measurements the sample size has been very small. Some observed food portions for animals are reported by A.J. Kerr (1950) in his study of Rupert House, by John J. Honigmann (1961) in his study of Attawapiskat on the west coast of James Bay, and by Edward Rogers (1973) in his study of Mistassini. The correspondence between the present values and those used by others is often good, although some discrepancies are also apparent. The values I have used for ducks and geese are considerably below those used by others and may be too conservative.

The other estimates for comparison to those used here are the values used by the James Bay and Northern Quebec Native Harvesting Research Committee (JBNQNHRC, 1976a). The values adopted by the JBNQNHRC and those used here are based on the same literature surveys, but each set has been modified for the specific purposes to which it was put, and some new data have been incorporated into the present estimates.

Table A8.1-15 Edible Food Weights and Butchered Food Weights for Animals or Animal Groups and Comparison of Weights With Available Studies on Food Portions of Various Animals Harvested by Cree Hunters

Animal or Animal Group	Edible Food Weight (Pounds)	Butchered Food Weight (Pounds)	Food Weight JBNQNHRC, 1976a (James Bay) (Pounds)	Food Weight Kerr, 1950 (Rupert House) (Pounds)	Food Weight Honigmann, 1961 (Attawapiskat) (Pounds)	Food Weight Rogers, 1973 (Mistassini)
Moose	342	444	438	594[2]	594[2]	
Bear	129	144	210	100[2]	100[2]	
Beaver	15.2	20.6	17.4	25.6 (3)[3]	17.8 (2	
Fish, general	2.1	2.4[1]				
Hare	1.7	1.9	1.9	1.5 (3)	1.6 (4)	
Otter	8.4	10.5	10.5	3.1 (1)	2.5[2]	9.0[2]
Muskrat	1.1	1.4	1.4	1.5 (3)	1.6 (5)	
Lynx	6.8	8.5	8.5			
Marten	1.1	1.4	-			
Mink	0.8	1.1	-			
Weasel	0.3	0.4	-			
Squirrel	0.2	0.3				
Duck	1.0	1.7	1.7	2.3 (4)	2.3 (1)	
Goose	4.4	5.6	4.7	7.2 (3)	8.1 (12)	
Grouses	1.2	1.3	0.7	1.4[2]	1.4[2]	0.5[2]
Loon	2.4	2.8	2.5		2.5[2]	4.0[2]

Footnotes:

1. Assumes ten percent of whole weight of fish is bone in meat.
2. Estimated.
3. Number in parentheses is number of observations. Kerr and Honigmann apparently consulted on their values.

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APPENDIX 8-2 NUTRIENT COMPOSITION VALUES FOR VARIOUS SUB-ARCTIC ANIMAL FOODS

Data on the nutrients in the flesh, fat and organs of sub-arctic animals used as food were adopted from the literature. During fieldwork a limited number of samples of animal meat were collected for nutritional analysis, but these were all ruined in transit, and by a break-down of storage freezer facilities at the laboratory. I have therefore depended entirely on published figures, and where no figures were available for a specific animal I have used values from either a closely related sub-arctic or arctic species, or from a related temperate zone species.

For published figures I have referred to the following sources: Farmer and Neilson, 1967; 1970; Farmer, Ho, and Neilson, 1971; Heller and Scott, 1967; Mann, 1962; Watt and Merrill, 1963; Uhl, Borrely, Hjorde, Jensen, Lieck and Porotnikoff, 1955; and Rodahl, 1954. The results of the survey are summarized on Table A8.2-1. A special listing of the nutrients in the livers of animals was made, because the liver contains especially high levels of some vitamins and minerals, Table A8.2-2. Only fresh meat and organ values are used, not dried or cooked, because the weights I have are estimated in Appendix 8-1 for live weight at the time of harvesting. In general the various sources are in reasonably good agreement. When choosing alternate figures consideration was given to four factors in the following order: use of a limited number of sources for consistency, use of the most standardized sources for comparability, priority on figures from the sub-arctic regions, priority on lean figures for meats. The priority on lean figures was established because separate fat calculations were made for the most important species. The sources chosen for use for the meat portion of the various animals are listed on Tables A8.2-3 and A8.2-4.

While there were data available on the nutrients in the flesh of the types of animals harvested by the Waswanipi, there was less data available on the non-flesh, non-meat components, the fat and various edible organs. The only extensive data were on nutrients in livers, Table A8.2-2. A wider ranging survey of comparable food stuffs from domesticated animals was therefore

Table A8.2-1 Nutrients per 100 gm. of Food for Meat of Sub-Arctic and Related Animals

Animal Food, Source	Water %	Energy Calories	Protein gm.	Fat gm.	Carbo-hydrate gm.	Calcium mg.	Phos-phorus mg.	Iron mg.	Vitamin A I.U.	Thiamin mg.	Riboflavin mg.	Niacin mg.	Vitamin C mg.
Moose, Fresh													
Mann, 1962	72.4		25.5	1.1	0	16	-	-	1000	0.02	0.37	-	4
Heller and Scott, 1967	-		-	0.9	-	-	226	-	-	-	-	-	-
Heller and Scott, 1967	-		-	2.1	-	-	218	5.7	-	-	-	-	-
Heller and Scott, 1967	73.8		-	2.4	-	12	210	5.7	-	-	-	-	-
Heller and Scott, 1967	72.4		24.5	2.0	-	-	203	2.7	310	0.09	0.18	-	-
Beaver, Fresh													
Mann, 1962	46.2		14.3	39.0	0	-	-	-	-	0.06	0.31	-	2
Heller and Scott, 1967	67.4		26.8	4.8	0	-	265	-	-	-	-	-	-
Heller and Scott, 1967	72.5		-	4.8	0	-	185	-	270	-	-	-	-
Heller and Scott, 1967	-		-	-	0	15	262	6.9	180	0.05	0.14	1.9	-
Fox, Arctic													
Farmer, Ho and Neilson, 1971	73.0	118	22.6	4.1	-	14	264	3.9	-	0.12	0.93	4.8	3
Wolf													
Farmer, Ho and Neilson, 1971	73.4	114	23.2	2.7	-	6	271	3.8	-	0.34	0.84	4.1	2
Muskrat, Fresh													
Mann, 1962	73.4		22.4	1.3	0	25	-	-	2820	0.09	0.37	-	5
Heller and Scott, 1967	-		-	-	-	0	220	8.6	-	0.10	0.66	6.2	-

(CONTINUED)

Table A8.2-1 Nutrients per 100 gm. of Food for Meat of Sub-Arctic and Related Animals (Continued)

Animal Food, Source	Water %	Energy Calories	Protein gm.	Fat gm.	Carbo- hydrate gm.	Calcium mg.	Phos- phorus mg.	Iron mg.	Vitamin A I.U.	Thiamin mg.	Riboflavin mg.	Niacin mg.	Vitamin C mg.
Hare													
Farmer and Neilson, 1967	71.7	132	23.3	4.3	-	-	-	-	-	-	-	-	-
Farmer and Neilson, 1967	74.8	108	24.6	1.1	-	-	-	-	-	-	-	-	-
Rabbit													
(Wild) Watt and Merrill, 1963	73	135	21	5	0	-	-	-	-	-	-	-	-
(Domesticated) Watt and Merrill, 1963	70	162	21	8	0	20	352	1.3	-	0.08	0.06	12.8	-
Black Bear													
Heller and Scott, 1967	71.2		20.0	8.3	0	-	162	7.2	260	0.16	0.68	3.2	-
Ptarmigan													
Rodahl, 1954	70.4	-	28.5	1.2	-	-	-	-	-	-	-	-	-
Uhl, et al., 1955	73.0	101	24.3	1.1	-	40	265	15.0	65	0.06	0.17	7.8	<2
Mann, 1962	71.2		25.7	1.4	0	351	-	-	trace	0.07	0.23	-	7
Heller and Scott, 1967	71.5		24.8	2.5	0	-	268	6.2	420	0.25	1.00	-	-
Farmer and Neilson, 1967	70.2	124	26.7	1.9	-	-	-	-	-	-	-	-	-
Farmer and Neilson, 1967	70.5	125	26.3	2.2	-	-	-	-	-	-	-	-	-
Farmer, 1970	70.2	121	26.7	1.9	-	-	-	-	-	-	-	-	-
Goose													
Mann, 1962	71.5		24.0	0.6	0	18	-	-	-	0.09	0.55	-	5
Heller and Scott, 1967	-		-	-	-	-	312	5.6	-	0.28	0.46	9.3	-

(CONTINUED)

Table A8.2-1 Nutrients per 100 gm. of Food for Meat of Sub-Arctic and Related Animals (Continued)

Animal Food, Source	Water %	Energy Calories	Protein gm.	Fat gm.	Carbo-hydrate gm.	Calcium mg.	Phos-phorus mg.	Iron mg.	Vitamin A I.U.	Thiamin mg.	Riboflavin mg.	Niacin mg.	Vitamin C mg.
Goose (Cont'd)													
(Snow) Farmer, 1970	71.3	131	23.1	3.3	-	-	-	-	-	-	-	-	-
(Snow) Farmer and Neilson, 1967	70.0	151	24.1	6.1	-	-	-	-	-	-	-	-	-
Duck													
(Mallard) Farmer and Neilson, 1967	71.0	129	24.3	3.6	-	-	-	-	-	-	-	-	-
(Pintail) Farmer and Neilson, 1967	71.0	121	23.8	2.9	-	-	-	-	-	-	-	-	-
(Mallard) Farmer, 1970	71.0	124	24.3	3.5	-	-	-	-	-	-	-	-	2
Rodahl, 1954	69.9		17.8	4.0	-	-	-	-	-	-	-	-	-
(Wild) Watt and Merrill, 1963	70.8	138	21.3	5.2	0	-	-	-	-	-	-	-	-
(Domesticated) Watt and Merrill, 1963	68.8	165	21.4	8.2	0	12	203	1.3	-	0.10	0.12	7.7	-
Owl, Horned													
Heller and Scott, 1967	71.3		22.3	5.0	0	16	218	4.8	350	-	-	-	-
Loon													
Farmer, 1970	64.5	191	22.4	10.8	-	-	-	-	-	-	-	-	2

(CONTINUED)

Table A8.2-1 Nutrients per 100 gm. of Food for Meat of Sub-Arctic and Related Animals (Continued)

Animal Food, Source	Water %	Energy Calories	Protein gm.	Fat gm.	Carbo-hydrate gm.	Calcium mg.	Phos-phorus mg.	Iron mg.	Vitamin A I.U.	Thiamin mg.	Riboflavin mg.	Niacin mg.	Vitamin C mg.
Whitefish													
Mann, 1962	70.9		25.8	1.3	0	356	-	-	106	0.13	0.22	-	6
Heller and Scott, 1967	70.0		12.3	5.3	-	-	257	0.2	540	0.11	0.13	-	-
Heller and Scott, 1967	69.1		15.9	14.2	-	-	302	-	-	0.15	0.12	-	-
Watt and Merrill, 1963	71.7	155	18.9	8.2	0	-	270	0.4	2260	0.14	0.12	3.0	-
Farmer and Neilson, 1967	74.0	144	21.8	4.9	-	-	-	-	-	-	-	-	-
Farmer and Neilson, 1967	72.9	151	22.8	4.2	-	-	-	-	-	-	-	-	-
Farmer and Neilson, 1967	70.4	165	23.6	5.5	-	-	-	-	-	-	-	-	-
Pike													
Mann, 1962; Head end	80.1		18.4	0.4	0	80	-	-	-	0.08	0.05	-	2
Mann, 1962; Middle	77.7		18.7	0.2	0.1	62	-	-	900	0.04	0.09	-	6
Mann, 1962; Tail cut	80.1		17.5	0.7	0	28	-	-	-	0.04	0.05	-	4
Heller and Scott, 1967	76.3		-	1.1	0	-	265	0.4	-	-	-	-	-
Heller and Scott, 1967	-		-	-	-	-	204	0.7	-	-	-	-	-
Watt and Merrill, 1963	80.0	88	18.3	1.1	0	-	-	-	-	-	-	-	-
Burbot													
Mann, 1962	74.2		24.2	0.7	0	81	-	-	101	0.17	0.38	-	5
Mann, 1962	78.7		19.7	0.5	0	20	-	-	trace	0.07	0.07	-	3

(CONTINUED)

Table A8.2-1 Nutrients per 100 gm. of Food for Meat of Sub-Arctic and Related Animals (Continued)

Animal Food, Source	Water %	Energy Calories	Protein gm.	Fat gm.	Carbo-hydrate gm.	Calcium mg.	Phos-phorus mg.	Iron mg.	Vitamin A I.U.	Thiamin mg.	Riboflavin mg.	Niacin mg.	Vitamin C mg.
Burbot (Cont'd)													
Heller and Scott, 1967	79.3		-	0.3	-	-	-	0.6	-	-	-	-	-
Heller and Scott, 1967	79.6		19.1	0.3	-	-	-	-	-	-	-	-	-
Heller and Scott, 1967	80.4		17.0	1.1	-	-	-	-	230	0.09	0.48	-	-
Heller and Scott, 1967	79.2		-	0.7	-	-	-	-	-	0.13	0.23	-	-
Watt and Merrill, 1963	81.1	82	17.4	0.9	0	-	190	-	-	0.39	0.14	1.5	-
Walleye													
Watt and Merrill, 1963	78.3	93	19.3	1.2	0	-	214	0.4	-	0.25	0.16	2.3	-
Sturgeon													
Watt and Merrill, 1963	78.7	94	18.1	1.9	0	-	-	-	-	-	-	-	-

Table A8.2-2 Nutrients per 100 gm. of Food from Livers of Sub-Arctic and Related Animals

Animal Food, source	Water %	Energy Calories	Protein gm.	Fat gm.	Carbo-hydrate gm.	Calcium mg.	Phos-phorus gm.	Iron mg.	Vitamin A I.U.	Thiamin mg.	Riboflavin mg.	Niacin mg.	Vitamin C mg.
Moose, liver;													
Heller and Scott, 1967	73.5		-	4.3	-	-	429	-	96,000	-	-	-	-
Whitefish, liver;													
Mann, 1962	78.8		11.0	4.4	5.1	55	-	-	8,300	0.01	0.95	-	8
Heller and Scott, 1967	76.1		-	-	-	-	297	8.6	1,510	0.18	0.54	2.7	-
Pike, liver;													
Heller and Scott, 1967			-	-	-	-	-	-	860	-	-	-	-
Burbot, liver;													
Mann, 1962	45.9		5.6	42.0	6.0	-	-	-	3,940	-	-	-	4
Heller and Scott, 1967	-		-	-	-	5	123	1.0	9,100	0.22	-	4.2	-
Caribou, liver;													
Heller and Scott, 1967	71.4		15.0	5.9	6.8	4	282	15.7	28,800	-	-	-	-
Beef, liver;													
Watt and Merrill, 1963	69.7	140	19.9	3.8	5.3	8	352	6.5	43,900	0.25	3.26	13.6	31
Hog, liver;													
Watt and Merrill, 1963	71.6	131	20.6	3.7	2.6	10	356	19.2	10,900	0.30	3.03	16.4	23
Lamb, liver;													
Watt and Merrill, 1963	70.8	136	21.0	3.9	2.9	10	349	10.9	50,500	0.40	3.28	16.9	33
Goose, liver;													
Watt and Merrill, 1963	66.9	182	16.5	10.0	5.4	-	-	-	-	-	-	-	-

Table A8.2-3 Nutrients per 100 gm. Edible Portion of Meat, Values Used

Animal Flesh	Water Percent	Energy Calories	Protein grams	Fat grams	Carbohy-drate gram	Sources
Moose	73.1[2]	124[1]	24.5	2.0	0	Heller & Scott, 1967; Vit.C. from Mann, 1962.
Beaver	67.4	158[1]	26.8	4.8	0	Heller & Scott, 1967; Vit.C. from Mann, 1962.
Fish	75.7	126	18.7	4.6	0	Watt & Merrill, 1963 - Weighted Average for Whitefish, Walleye, Pike.
Hare	73	135	21	5	0	Watt & Merrill, 1963 - Wild Rabbit.
Bear	71.2	160[1]	20.0	8.3	0	Heller & Scott, 1967.
Muskrat	73.4	107[1]	22.4	1.3	0	Mann, 1962.
Marten, Otter Mink, Weasel	73.4	107[1]	22.4	1.3	0	Values for muskrat used.
Lynx	73.0	118	22.6	4.1	-	Farmer, Ho, Neilson, 1971 - Arctic Fox values used.
Grouses	70.2	121	26.7	1.9	-	Farmer, 1970 - Ptarmigan values used.
Duck	71.0	124	24.3	3.5	-	Farmer, 1970 - Mallard Duck.
Geese	71.3	131	23.1	3.3	-	Farmer, 1970 - Snow Goose.
Loon	64.5	191	22.4	10.8	-	Farmer, 1970.

Footnote:

1. Values calculated on basis of 4.27 Cal./gm. of protein and 9.02 Cal./gm. of fat.
2. Average of two values.

Table A8.2-4 Selected Vitamins and Minerals per 100 gm. Edible Portion of Meat, Values Used

Animal Flesh	Calcium mg.	Phosphorus mg.	Iron mg.	Vitamin A (RE)[4]	Thiamin mg.	Riboflavin mg.	Niacin mg.	Vitamin C mg.	Sources
Moose	12	214[1]	4.7[2]	93	0.09	0.18	3.2[3]	4	Heller and Scott, 1967, Vit. C from Mann, 1962
Beaver	15	237[2]	6.9	68	0.05	0.14	1.9	2	Heller and Scott, 1967, Vit. C from Mann, 1962
Fish	56	241	0.4	216	0.29	0.29	2.6	5	Heller and Scott, 1967; Mann, 1962; Watt and Merrill, 1963 - Average of values for Whitefish, Pike and Walleye.
Hare	20	352	1.3	-	0.08	0.06	12.8	-	Watt and Merrill, 1963. Value for Domesticated Rabbit
Bear	-	162	7.2	78	0.16	0.68	3.2	-	Heller and Scott, 1967
Muskrat	25	220	8.6	847	0.10	0.66	6.2	5	Heller and Scott, 1967; Man 1962
Marten, Otter, Mink, Weasel	25	220	8.6	847	0.10	0.66	6.2	5	Values for Muskrat used
Lynx	14	264	3.9	-	0.12	0.93	4.8	3	Farmer, Ho, Neilson, 1971; Arctic Fox values used
Grouses	40	265	15.0	20	0.06	0.17	7.8	2	Uhl, et al., 1955; Ptarmigan value used
Duck	10	176	1.6	-	0.08	0.19	6.7	-	Watt and Merrill, 1963; Values for Domesticated Duck
Geese	18	312	5.6	-	0.28	0.46	9.3	5	Heller and Scott, 1967; Mann, 1962
Loon	18	312	5.6	-	0.28	0.46	9.3	5	Heller and Scott, 1967; Mann, 1962. Values for Geese

Table A8.2-4 Selected Vitamins and Minerals per 100 gm. Edible Portion of Meat, Values Used (Continued)

Footnotes:

1. Average of four values.
2. Average of three values.
3. Value for Bear.
4. The nutrient content of Vitamin A was given in all the reports in International Units, but the Dietary Standard for Canada now recommends use of Retinol equivalent units. I.U. converted to RE by dividing by 3.3.

tabulated. Tables A8.2-5 and A8.2-6 summarize the values available for non-meat components of various foods as reported primarily by Watt and Merrill (1963). These values were generally found to be sufficiently uniform to warrant generalizing them to the animals in our data, and to warrant establishing a standard value to cover a number of animals and/or components. This was necessitated by the lack of direct values, but the error involved appears to be modest.

For the caloric values of the non-meat components of animal foods, estimates were made for fat, of moose and beaver, edible organs of moose, edible organs of birds and inedible viscera.

For the vitamin and mineral values of the non-meat components of animal foods estimates were made for the livers of moose and beaver. The liver is the most important repository and in some cases producer of certain vitamins and minerals, and especially high concentrations of some of these nutrients therefore occur in liver, as indicated above. It was therefore thought to be inappropriate to apply liver values for moose and beaver, to all internal organs of those species. For sub-arctic and arctic animals, the only edible organs for which there are data on the nutrient contents are the liver. For moose and beaver I therefore estimated vitamin and mineral values only for livers, and made no estimates for the other edible organs. This may lead to some underestimation, but because the liver is the largest of the internal organs, Table A8.2-7, and generally the richest in vitamins and minerals, the error is thought to be small. Vitamin and nutrient values for the edible organs of waterfowl were also dropped because of a similar lack of data. For fat in general, the vitamin and mineral levels were found to be relatively low, Table A8.2-6, so no estimates of vitamins and minerals from the fat portion of moose or beaver were made.

The actual values adopted for the nutrient compositions of non-meat animal components are listed on Tables A8.2-8 and A8.2-9. The caloric fat and protein nutrient values for animal fat were adapted on the basis of various values given in Watt and Merrill (1963) and Rodahl (1954). For moose, where the major fat depot is the sub-cutaneous layer the value for pork backfat for

Table A8.2-5 Sample of Nutrient Values for Non-Meat Components of Animals per 100 gm. Edible Portion

Component to be Estimated	Items	Water Percent	Energy Calories	Protein grams	Fat grams	Sources
Fat	Caribou Intestinal Fat	9.4	789[1]	0	87.5	Rodahl, 1954.
	Pork Backfat (Fat)	6.4	841	1.7	92.4	Watt & Merrill, 1963.
	(Med-Fat)	7.5	827	2.1	90.7	Watt & Merrill, 1963.
	(Thin)	8.6	814	2.4	89.1	Watt & Merrill, 1963.
	Beef Kidney Fat (Suet)	4	854	1.5	94	Watt & Merrill, 1963
	Lard	0	902	0	100	Watt & Merrill, 1963
	Beaver Tail Tissue (Fat)	29.9	595[1]	(4.8)	63.7	Aleksiuk, 1970. Protein estimated as ¾ of 6.4% residue.
Moose Edible Organs	Beef: Liver	69.9	140	19.9	3.8	Watt & Merrill, 1963.
	Tongue Med-Fat	68	207	16.4	15	Watt & Merrill, 1963.
	Thin- Very Thin	70	175	17.4	11	Watt & Merrill, 1963.
	Heart	77.5	108	17.1	3.6	Watt & Merrill, 1963.
	Kidneys	75.9	130	15.4	6.7	Watt & Merrill, 1963.
	Hog: Liver	71.6	131	20.6	3.7	Watt & Merrill, 1963.
	Tongue	66.1	45	16.8	15.6	Watt & Merrill, 1963.
	Heart	77.4	113	16.8	4.4	Watt & Merrill, 1963.
	Kidneys	77.8	106	16.3	3.6	Watt & Merrill, 1963.
	Brain (All Animals)	78.9	125	10.4	8.6	Watt & Merrill, 1963.

(CONTINUED)

Table A8.2-5 Sample of Nutrient Values for Non-Meat Components of Animals per 100 gm. Edible Portion (CONTINUED)

Component to be Estimated	Items	Water Percent	Energy Calories	Protein grams	Fat grams	Sources
Birds	Giblets: Goose	69.9	156	21.1	7.0	Watt & Merrill, 1963.
Edible	Guinea Hen	69.8	157	20.8	7.0	Watt & Merrill, 1963.
Organs	Quail	63.0	176	21.8	6.2	Watt & Merrill, 1963.
Inedible	Lungs, Beef	78.8	96	17.6	2.3	Watt & Merrill, 1963.
Viscera	Tripe, Beef	79.1	100	19.1	2.0	Watt & Merrill, 1963.
	Stomach, Pork-Scalded	74.0	152	16.5	9.0	Watt & Merrill, 1963.
	Spleen, Beef	76.9	104	18.1	3.0	Watt & Merrill, 1963.
	Hog	77.4	107	17.1	3.8	Watt & Merrill, 1963.
	Pancreas, Beef, Thin	67	217	14.9	17	Watt & Merrill, 1963.
	Hog	63.4	242	14.7	19.9	Watt & Merrill, 1963.

Footnote:

1. Values calculated on the basis of 4.27 Cal./gm. of protein and 9.02 Cal./gm. of fat.

Table A8.2-6 Selected Vitamins and Minerals for Fat per 100 gm. Edible Portion

Component to be Estimated	Items	Calcium mg.	Iron mg.	Vitamin A I.U.	Thiamin mg.	Riboflavin mg.	Niacin mg.	Vitamin C mg.	Sources
Fat	Pork Backfat								
	(Fat)	1	0.03	0	0.08	0.02	0.4	-	Watt and Merrill, 1963
	(Med-Fat)	1	0.03	0	0.10	0.02	0.5	-	Watt and Merrill, 1963
	(Thin)	1	0.04	0	0.12	0.03	0.6	-	Watt and Merrill, 1963

Table A8.2-7 Weight of Liver and Other Internal Organs as a Percentage of Total Body Weight for Moose, Beaver and Related Animals

Animal	Liver %	Kidneys %	Heart %	Brain %	Lungs %	Stomach and Intestine %	Liver Weight Used %
Moose - *Alces alces*	-	-	-	-	-	-	1.6
Caribou *Rangifer arcticus*	1.83	0.13	0.90	0.30	2.10	-	
Deer *Odocoileus virginianus*	1.57	-	0.97	0.32	-	-	
Beaver *Castor canadensis*	-	0.38	0.79	0.45	-	-	2.4
Muskrat *Ondatra zibethicus*	2.44	0.83	0.36	0.59	0.48	1.95	
Porcupine *Erethizon dorsatum*	4.0	0.96	0.55	0.78	0.98	-	
Skunk *Mephitis mephitis*	2.69	0.28	0.58	0.33	1.59	-	

Footnote:

1. From *Handbook of Biological Data* (Spector, 1956).

Table A8.2-8 Nutrient Values per 100 gm. Edible Portion of Non-Meat Bush Food Items Used in this Study

Components	Water Percent	Energy Calories	Protein grams	Fat grams	Sources
Fat: moose, beaver	8.6	814	2.4	89.1	Watt and Merrill, 1963; values for pork backfat (thin)
Moose, edible organs	69.9	140	19.9	3.8	Watt and Merrill, 1963; values for beef liver
Birds, edible organs	69.8	157	20.8	7.0	Watt and Merrill, 1963; values for guinea hen
Inedible Viscera	79.1	100	19.1	2.0	Watt and Merrill, 1963; values for beef tripe

Table A8.2-9 Selected Vitamins and Minerals per 100 gm. Edible Portion of Liver, Values Used

Animal Liver	Calcium mg.	Phosphorus mg.	Iron mg.	Vitamin A RE	Thiamin mg.	Riboflavin mg.	Niacin mg.	Vitamin C mg.	Sources
Moose, liver	4	282	15.7	28,828	0.25	3.26	13.6	31	Heller and Scott, 1967; Watt and Merrill, 1963. Vit. A for moose, calcium and iron values for caribou liver, other values for beef liver
Beaver, liver	8	352	6.5	13,183	0.25	3.26	13.6	31	Watt and Merrill, 1963; values for beef liver

thin specimens is used (Table A8.2-5). For beaver Aleksiuk has given the percentage of moisture, fat and residue in the tail tissue of fat animals in fall (1970:147) from which I have computed an energy value. Aleksiuk has reported elsewhere that the order of mobilization of fat is: coelomic (splenic and perirenal), sub-cutaneous, and tail fat. Our field observations indicate that the sub-cutaneous layer is substantially the largest depot throughout the winter, and we would expect the fat content of this layer to approximate closer to the values for pork backfat than to those of beaver tail tissue. This is the value used.

For edible organs of moose the caloric, fat and protein composition of the organs of beef and hogs were adopted from Watt and Merrill (1963). The data available on moose liver, Table A8.2-2, is incomplete so the values for beef liver are used as estimates for edible organs of moose. The choice of the liver value was based on the nutritional importance of the liver, the size of the liver among the internal organs, and the fact that the caloric values for liver are in approximately the middle of the values for the brain, liver, tongue, heart and kidneys, the most important internal organs. For the vitamin and mineral composition of moose and beaver livers, values for moose, caribou, beef, hog and lamb livers were examined. Moose data were used where available, caribou was used to supplement the moose data, and beef data were used to complete missing items. For beaver liver there was no data and the values for the vitamins and nutrients in beef liver were adopted as estimates. An estimate of the weight of the livers of moose and beaver as a percentage of the whole weights of the animals was also adopted, the moose value being based on deer, the beaver value being based on muskrat.

The caloric, protein and fat values of the giblets of geese and guinea hens were found to be very similar, so a uniform value was used for all birds, including both waterfowl and gamebirds. Finally, the nutrient composition of inedible viscera for all species was adopted from the values for beef tripe.

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APPENDIX 8-3 RECOMMENDED INTAKES OF SELECTED VITAMINS AND MINERALS FOR INDIVIDUAL MEMBERS OF HUNTING GROUP SAMPLE

The recommended intakes calculated herein are based on the daily intakes for various age and sex categories and, where appropriate, for energy intake levels, recommended in the Dietary Standard for Canada (Canada, 1975). The daily recommended intake for each individual has been multiplied by the number of days that individual was a member of the hunting group to determine total recommended intakes by individual; and, these have been aggregated for all members of a hunting group.

Table A8.3-1 Recommended Intake and Minimum Requirements for Vitamin C for Members of Hunting Group Sample

No.	Total Minimum Requirements Vitamin C (mg.)	Total Recommended Intake of Vitamin C (mg.)
Group 68A		
970	2,060	6,180
971	2,060	6,180
972	2,060	4,120
580	2,060	6,180
973	1,450	4,350
550	530	1,590
Group Total	10,220	28,600
Group 68B		
520	2,040	6,120
521	2,040	6,120
610	2,040	6,120
550	490	1,470
Group Total	6,610	19,830
Group 68C		
530	1,770	5,310
531	1,770	5,310
532	1,770	5,310
533	410	1,230
620	800	2,400
540	1,450	4,350
590	1,120	3,360
Group Total	9,090	27,270

(CONTINUED)

Table A8.3-1 Recommended Intake and Minimum Requirements for Vitamin C for Members of Hunting Group Sample (Continued)

No.	Total Minimum Requirements Vitamin C (mg.)	Total Recommended Intake of Vitamin C (mg.)
Group 68J		
810	490	1,470
811	490	1,470
812	490	980
813	490	980
890	490	1,470
820	490	1,470
814	490	1,470
870	1,510	4,530
871	1,510	4,530
872	1,510	3,020
873	1,510	3,020
874	1,510	3,020
300	490	1,470
301	490	1,470
302	490	980
303	490	980
304	490	980
Group Total	13,430	33,310
Group 68P		
930	1,560	4,680
931	1,560	4,680
990	1,560	4,680
Group Total	4,680	14,040

Table A8.3-2 Recommended Intake of Iron, Calcium, Phosphorus and Vitamin A for Members of Hunting Group Sample

No.	Total Iron (mg.)	Total Calcium and Phosphorus (mg. each)	Total Vitamin A (RE)
Group 68A			
970	2,060	164,800	206,000
971	2,884	144,200	164,800
972	1,648	103,000	82,400
580	2,060	164,800	206,000
973	1,305	101,500	116,000
550	530	42,400	53,000
Group Total	10,487	720,700	828,200
Group 68B			
520	2,040	163,200	204,000
521	1,836	142,800	163,200
610	2,040	163,200	204,000
550	490	39,200	49,000
Group Total	6,406	508,400	620,000
Group 68C			
530	1,770	141,600	177,000
531	1,593	123,900	141,600
532	2,478	123,900	141,600
533	410	32,800	41,000
620	800	64,000	80,000
540	1,450	116,000	145,000
590	1,120	89,600	112,000
Group Total	9,621	691,800	838,200

(CONTINUED)

Table A8.3-2 Recommended Intake of Iron, Calcium, Phosphorus and Vitamin A for Members of Hunting Group Sample (Continued)

No.	Total Iron (mg.)	Total Calcium and Phosphorus (mg. each)	Total Vitamin A (RE)
Group 68J			
810	490	39,200	49,000
811	686	34,300	39,200
812	441	24,500	24,500
813	392	24,500	19,600
890	490	39,200	49,000
820	686	49,000	49,000
814	686	34,300	39,200
870	1,510	120,800	151,000
871	2,114	105,700	120,800
872	1,057	75,500	60,400
873	1,208	75,500	60,400
874	1,208	75,500	60,400
300	490	39,200	49,000
301	686	34,300	39,200
302	441	24,500	24,500
303	392	24,500	19,600
304	392	24,500	19,600
Group Total	13,369	845,000	874,400
Group 68P			
930	1,560	124,800	156,000
931	2,184	109,200	124,800
990	1,560	124,800	156,000
Group Total	5,304	358,800	436,800

Table A8.3-3 Recommended Intake of Niacin, Riboflavin and Thiamin, Assuming Minimal Caloric Requirements for Members of Hunting Group Sample

No.	Total Niacin (mg.)	Total Riboflavin (mg.)	Total Thiamin (mg.)
Group 68A			
970	5,742	522	435
971	3,933	358	298
972	1,357	123	103
580	5,320	484	403
973	1,825	166	138
550	1,369	124	104
Group Total	19,546	1,777	1,481
Group 68B			
520	5,186	471	393
521	3,623	329	274
610	5,351	486	405
550	1,265	115	96
Group Total	15,425	1,402	1,169
Group 68C			
530	4,522	411	343
531	3,894	354	295
532	3,992	363	302
533	818	74	62
620	1,740	158	132
540	2,858	260	216
590	3,434	312	260
Group Total	21,256	1,932	1,610

(CONTINUED)

Table A8.3-3 Recommended Intake of Niacin, Riboflavin and Thiamin, Assuming Minimal Caloric Requirements for Members of Hunting Group Sample (Continued)

No.	Total Niacin (mg.)	Total Riboflavin (mg.)	Total Thiamin (mg.)
Group 68J			
810	1,145	104	87
811	941	86	71
812	488	44	37
813	367	33	28
890	1,112	101	84
820	1,077	98	82
814	983	89	75
870	3,736	340	283
871	3,755	341	284
872	995	90	75
873	1,085	99	82
874	1,357	123	103
300	1,414	129	107
301	1,046	95	79
302	600	55	45
303	455	41	34
304	264	24	20
Group Total	20,821	1,893	1,577
Group 68P			
930	3,815	347	289
931	3,707	337	281
990	3,726	339	282
Group Total	11,247	1,022	852

Table A8.3-4 Recommended Intake of Niacin, Riboflavin and Thiamin, Assuming Maximal Caloric Requirements for Members of Hunting Group Sample

No.	Total Niacin (mg.)	Total Riboflavin (mg.)	Total Thiamin (mg.)
Group 68A			
970	6,639	604	503
971	5,316	483	403
972	1,357	123	103
580	6,164	560	467
973	1,825	166	138
550	1,612	147	122
Group Total	22,913	2,083	1,736
Group 68B			
520	6,057	551	459
521	5,010	455	380
610	6,199	564	470
550	1,490	135	113
Group Total	18,756	1,705	1,421
Group 68C			
530	5,281	480	400
531	4,611	419	349
532	4,633	421	351
533	956	87	72
620	2,034	185	154
540	3,341	304	253
590	3,978	362	301
Group Total	24,835	2,258	1,881

(CONTINUED)

Table A8.3-4 Recommended Intake of Niacin, Riboflavin and Thiamin, Assuming Maximal Caloric Requirements for Members of Hunting Group Sample (Continued)

No.	Total Niacin (mg.)	Total Riboflavin (mg.)	Total Thiamin (mg.)
Group 68J			
810	1,350	123	102
811	1,105	100	84
812	488	44	37
813	367	33	28
890	1,300	118	98
820	1,259	114	95
814	1,150	105	87
870	4,329	394	328
871	5,076	461	385
872	995	90	75
873	1,085	99	82
874	1,357	123	103
300	1,639	149	124
301	1,420	129	108
302	600	55	45
303	455	41	34
304	264	24	20
Group Total	24,239	2,203	1,837
Group 68P			
930	4,442	404	336
931	5,051	459	383
990	4,309	392	326
Group Total	13,802	1,255	1,046

APPENDIX 8-4 SELECTED VITAMINS AND MINERALS AVAILABLE TO HUNTING GROUP SAMPLE FROM BUSH FOODS

Based on food portion weights established in Appendix 8-1, nutritional value of bush foods from Appendix 8-2, and harvests of each animal reported in Chapter 8.

Table A8.4-1 Selected Vitamins and Minerals Available to Group 68A from Bush Foods

Animals and Components	Calcium (mg.)	Phosphorus (mg.)	Iron (mg.)	Vitamin A (RE)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Vitamin C (mg.)
Moose								
- meat	108,802	1,939,482	42,614	844,059	816	1,632	29,014	36,267
- liver	1,658	116,748	6,507	11,949,084	104	1,351	5,637	12,849
Beaver								
- meat	121,445	1,855,710	55,864	547,047	405	1,133	15,383	16,193
- liver	4,201	183,744	3,414	6,923,351	131	1,712	7,142	16,280
Fish	57,112	234,252	408	220,510	296	296	2,652	5,098
Hare	4,953	92,928	322	-	20	15	3,170	-
Fur-bearers								
- Bear	-	94,932	4,222	45,780	94	399	1,876	-
- Small Fur-bearers	9,918	86,020	3,412	33,596	40	262	2,460	1,984
Fowl								
- Grouse								
- meat	18,058	119,780	6,772	8,812	27	77	3,521	903
- Geese								
- meat	575	9,984	179	-	9	15	297	160
- Loon								
- meat	144	2,496	45	-	2	4	74	40
- Duck								
- meat	431	7,040	69	-	3	8	289	-
Totals	327,297	4,743,116	123,828	20,572,239	1,947	6,904	71,515	89,774

Table A8.4-2 Selected Vitamins and Minerals Available to Group 68B from Bush Foods

Animals and Components	Calcium (mg.)	Phosphorus (mg.)	Iron (mg.)	Vitamin A (RE)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Vitamin C (mg.)
Moose								
- meat	60,446	1,077,490	23,675	468,922	453	907	16,119	20,149
- liver	921	64,860	3,615	6,638,380	58	751	3,132	7,138
Beaver								
- meat	48,159	735,885	22,153	216,932	161	449	6,100	6,421
- liver	1,666	72,864	1,354	2,745,466	52	679	2,832	6,456
Fish	17,980	73,746	128	69,420	93	93	835	1,605
Hare	527	5,632	34	-	2	2	337	-
Fur-bearers								
- Small Fur-bearers	7,627	66,220	2,624	258,365	31	201	1,892	1,525
Fowl								
- Grouse								
- meat	4,954	32,860	1,858	2,417	7	21	966	248
- Geese								
- meat	2,014	34,944	626	-	31	51	1,040	559
- Loon								
- meat	719	12,480	224	-	11	18	372	200
- Duck								
- meat	518	8,448	83	-	4	10	347	-
Totals	145,531	2,185,489	56,374	10,399,903	903	3,182	33,972	44,301

Table A8.4-3 Selected Vitamins and Minerals Available to Group 68C from Bush Foods

Animals and Components	Calcium (mg.)	Phosphorus (mg.)	Iron (mg.)	Vitamin A (RE)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Vitamin C (mg.)
Moose								
- meat	24,178	430,996	9,470	187,569	181	363	6,448	8,059
- liver	368	25,944	1,446	2,655,352	23	300	1,253	2,855
Beaver								
- meat	26,522	405,270	12,200	119,470	88	248	3,360	3,536
- liver	918	40,128	745	1,511,995	29	374	1,560	3,555
Fish	264,410	1,084,500	1,889	1,020,877	1,369	1,369	12,276	23,608
Hare	4,803	90,112	312	-	19	14	3,074	-
Fur-bearers								
- Small Fur-bearers	4,163	36,080	1,432	141,026	17	110	1,032	833
Fowl								
- Grouses								
- meat	23,811	157,940	8,929	11,620	36	101	4,643	1,191
Totals	349,173	2,270,970	36,423	5,647,909	1,762	2,879	33,646	43,637

Table A8.4-4 Selected Vitamins and Minerals Available to Group 68J from Bush Foods

Animals and Components	Calcium (mg.)	Phosphorus (mg.)	Iron (mg.)	Vitamin A (RE)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Vitamin C (mg.)
Moose								
- meat	24,178	430,996	9,470	187,569	181	363	6,448	8,059
- liver	368	25,944	1,446	2,655,352	23	300	1,253	2,855
Beaver								
- meat	47,461	725,220	21,832	213,789	158	443	6,012	6,328
- liver	1,642	71,808	1,334	2,705,677	51	669	2,791	6,362
Fish	259,122	1,062,810	1,851	1,000,469	1,342	1,342	12,031	23,136
Hare	7,505	140,800	488		30	23	4,803	-
Fur-bearers								
- Small Fur-bearers	11,569	96,580	3,980	391,895	46	305	2,869	2,314
- Lynx	432	8,184	120	-	4	29	148	93
Fowl								
- Grouse								
- meat	11,027	73,140	4,135	5,381	17	47	2,150	551
- Duck								
- meat	86	1,408	14	-	1	2	58	-
Totals	363,390	2,636,890	44,670	7,160,131	1,853	3,523	38,563	49,698

Table A8.4-5 Selected Vitamins and Minerals Available to Group 68P from Bush Foods

Animals and Components	Calcium (mg.)	Phosphorus (mg.)	Iron (mg.)	Vitamin A (RE)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Vitamin C (mg.)
Moose								
- meat	36,267	646,494	14,205	281,353	272	544	9,671	12,089
- liver	553	38,916	2,169	3,974,920	35	450	1,879	4,283
Beaver								
- meat	76,077	1,162,485	34,996	342,691	254	710	9,636	10,144
- liver	2,632	115,104	2,138	4,337,041	82	1,072	4,474	10,198
Fish	0	2,169	0	0	0	0	0	0
Hare	17,261	323,840	1,122	-	69	52	11,047	-
Fur-bearers								
- Small Fur-bearers	11,568	100,100	3,979	391,853	46	305	2,869	2,314
Fowl								
- Grouse								
- meat	39,153	259,700	14,682	19,106	59	166	7,635	1,958
- Geese								
- meat	2,301	39,935	716	-	36	59	1,189	639
- Duck								
- meat	1,768	28,864	283	-	14	34	1,185	-
Totals	187,580	2,717,608	74,290	9,355,072	867	3,392	49,585	41,625

APPENDIX 8-5 SELECTED VITAMINS AND MINERALS AVAILABLE TO HUNTING GROUP SAMPLE FROM PURCHASED FOODS

Based on nutritional values in Watt and Merrill (1963), and purchases reported in Chapter 8.

Table A8.5-1 Selected Vitamins and Minerals Available to Group 68A from Purchased Foods

Food Item	Calcium (mg.)	Phosphorus (mg.)	Iron (mg.)	Vitamin A (RE)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Ascorbic Acid (mg.)
Baking Powder	313,302	470,921	0	0	0	0	0	0
Lard	0	0	0	0	0	0	0	0
Evaporated Milk	213,840	168,120	90	88,108	65	310	162	900
Rolled Oats	11,520	88,176	979	0	131	31	216	0
Rice	1,199	4,686	145	0	22	0	175	0
Sugar	0	0	87	0	0	0	0	0
Flour	20,075	108,625	3,630	0	550	325	4,373	0
Total	559,936	840,528	4,932	88,108	767	665	4,925	900

Table A8.5-2 Selected Vitamins and Minerals Available to Group 68B from Purchased Foods

Food Item	Calcium (mg.)	Phosphorus (mg.)	Iron (mg.)	Vitamin A (RE)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Ascorbic Acid (mg.)
Lard	0	0	0	0	0	0	0	0
Evaporated Milk	35,640	28,020	15	14,685	11	52	27	150
Rolled Oats	4,800	36,740	408	0	54	13	90	0
Sugar	0	0	60	0	0	0	0	0
Flour	16,425	88,875	2,970	0	450	265	3,578	0
Total	56,865	153,635	3,453	14,685	515	330	3,694	150

Table A8.5-3 Selected Vitamins and Minerals Available to Group 68C from Purchased Foods

Food Item	Calcium (mg.)	Phosphorus (mg.)	Iron (mg.)	Vitamin A (RE)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Ascorbic Acid (mg.)
Baking Powder	341,784	513,732	0	0	0	0	0	0
Hamburger	810	12,744	220	973	6	13	351	0
Bread, White	7,620	8,800	226	0	23	19	218	0
Cheese Spread	35,882	55,566	38	16,607	1	34	7	0
Chicken Necks	384	6,336	66	3,219	2	9	104	0
Cookies	2,352	10,346	45	1,514	2	3	25	0
Crackers, Saltine	950	4,080	54	0	1	2	45	0
Eggs	3,924	14,904	167	25,730	8	22	7	0
Lard	0	0	0	0	0	0	0	0
Macaroni	2,684	16,170	290	0	88	37	598	0
Evaporated Milk	140,184	110,212	59	57,760	42	203	106	590
Powdered Milk	27,426	36,204	199	29,198	32	51	29	0
Rolled Oats	19,920	152,471	1,693	0	226	53	373	0
Pancake Mix	24,492	32,112	169	0	24	18	158	0
Bacon	180	2,810	50	0	16	4	82	0

CONTINUED

Table 8A.5-3 Selected Vitamins and Minerals Available to Group 68C from Purchased Foods (Continued)

Food Item	Calcium (mg.)	Phosphorus (mg.)	Iron. (mg.)	Vitamin A (RE)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Ascorbic Acid (mg.)
Pork Chops	576	11,040	150	0	18	11	251	0
Potatoes	416	3.120	35	0	6	2	88	1,168
Rice	1,744	6,816	211	0	32	0	254	0
Sausage, Bologna	320	5,810	82	0	7	10	118	0
Hot Dogs	416	7,839	112	0	10	12	159	0
Sugar	0	0	58	0	0	0	0	0
Flour	26,645	144,175	4,818	0	730	431	5,803	0
Total	638,709	1,155,287	8,741	135,001	1,302	935	8,779	1,758

Table A8.5-4 Selected Vitamins and Minerals Available to Group 6&J from Purchased Foods

Food Item	Calcium (mg.)	Phosphorus (mg.)	Iron (mg.)	Vitamin A (RE)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Ascorbic Acid (mg.)
Baking Powder	313,302	470,921	0	0	0	0	0	0
Lard	0	0	0	0	0	0	0	0
Macaroni	2,928	17,640	317	0	96	40	653	0
Evaporated Milk	427,680	336,240	180	176,216	130	619	324	1,800
Rolled Oats	6,000	45,925	510	0	68	16	113	0
Rice	2,834	11,076	343	0	52	0	413	0
Sugar	0	0	120	0	0	0	0	0
Flour	25,550	138,250	4,620	0	700	413	5,565	0
Total	778,294	1,020,052	6,090	176,216	1,045	1,089	7,068	1,800

Table A8.5-5 Selected Vitamins and Minerals Available to Group 68P from Purchased Foods

Food Item	Calcium (mg.)	Phosphorus (mg.)	Iron (mg.)	Vitamin A (RE)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Ascorbic Acid (mg.)
Lard	0	0	0	0	0	0	0	0
Evaporated Milk	35,640	28,020	15	14,685	10	51	27	150
Rolled Oats	6,000	45,925	510	0	68	16	112	0
Sugar	0	0	25	0	0	0	0	0
Flour	7,300	39,500	1,320	0	200	118	1,590	0
Total	48,940	113,445	1,870	14,685	278	185	1,729	150

APPENDIX 9-1 SOME GENERAL FEATURES OF THE SUB-ARCTIC ECOSYSTEMS[1]

I propose to briefly examine some of the distinctive characteristics of the sub-arctic ecosystems by considering one of the first features that appears during a study of northern ecology, the relative paucity of species of plants and animals in northern regions. It is a central feature because the best known characteristics of the sub-arctic ecosystems, the simplicity of their structures and the variability of the biological populations, are thought to follow closely from the fact that there are few species components in the system. It is also a central feature for the present analysis because it is a topic that immediately raises questions about what are the constraints on adaptation in general in this environment. Therefore, it would seem worthwhile to inquire into the answers that have been offered to the two questions: Why have not more species successfully adapted to this environment? What are some of the common characteristics of those species that have successfully adapted? The nature of the problem can be described with data on the situation in the Province of Quebec. There are some 2,000 seed bearing plant species in the temperate southern regions of the province, approximately 700 in the sub-arctic areas and only 360 in the arctic portion of the Province (Rousseau, 1967:6). Similarly, considering just forest tree species, there are 75 species in southern Ontario, fifty at Montreal-Ottawa, twenty-five at Temiskaming, twelve near James Bay (Rowe, 1966:18) and none at the tip of Ungava. Such differences in the diversity of species found at different latitudes have been reported for a wide range of groups of species and over large parts of the globe, with only relatively few exceptions (cf., Connell and Orias, 1964; Pianka, 1966, Pielou, 1975).

The reasons for such gradients of diversity have been the subject of considerable theorizing and debate among evolutionary ecologists. One explanation offered was that the sheer rigorousness of the environment, the struggle for existence against severe physical conditions, especially temperature, was sufficient to explain the low species diversity in high latitudes. But the question of why a few species should be successful and others not successful could not be answered, and evidence that some organisms did adapt to extremely rigorous environments, such as hot water springs, raised further doubt about this explanation (Colinvaux, 1973). Even for the warm-blooded mammals the claim that temperature was the main limiting condition, is not convincing because a few centimeters of fur has sufficient insulating effect to compensate for the temperature difference between the northern temperate and sub-arctic zones.

A second explanation was that the lower biological production of the northern latitudes results in a lower diversity relative to the greater productivity of tropical areas. Tests of this hypothesis are difficult, but it is commonly known that increasing nutrient levels in freshwater lakes, either intentionally or by pollution, may result in an increased production but a reduced species diversity thus falsifying the hypothesis (Pianka, 1966:40).

A third theory is the age/time theory, that northern latitude ecological systems are young and immature, and that whereas tropical systems had reached equilibrium, polar systems were still developing. The evidence that older communities have more species than younger ones is scanty so the theory is difficult to test (Pianka, 1966:35) and the whole question of defining equilibrium and stability has proven to be more complex than originally thought (Margalef, 1963; Holling, 1973; Holling and Goldberg, 1971).

A final theory I will mention, though not the only other theory, is that regions with stable climates allow for finer specializations and adaptations than do regions with more erratic climates, more frequent perturbations, and less relative stability of resources. To survive in a less predictable environment an organism must have greater flexibility (Pianka, 1966:38). This theory has been gaining some support although no one theory has been widely accepted. Recently several theories that combine different explanations have been proposed, the most promising being the stability-time hypothesis.

According to the stability-time hypothesis, one factor is the stability of the physical conditions of the environment and a second factor is the length of time an environment has been inhabited (Saunders, 1969:71). The severity of physical conditions as such, for example the low temperatures of northern latitudes, does not go far by itself to explain the lack of diversity. Rather, diversity seems to be related firstly to variations in physical conditions, more variable conditions being the more "severe". Where the physical conditions are relatively stable over extended periods of time, the community of species appears to be biologically accommodated, and there are a large number of species per given number of individuals sampled. Where physical conditions are unstable and unpredictable, the community is physically controlled and there are a small number of species per given number of individuals sampled (1969:71).

Where the environment is physically severe and relatively predictable it represents a strong selective pressure for the evolution of adaptive mechanisms to specifically lessen the impact of the severe physical conditions on the functioning of the organims (Solbodkin and Sanders, 1969:85). The trend will therefore be for greater reduction of physical control of functioning, and of future development, and increasing biological control.

If however the environment is also relatively unpredictable, there will be less chance that such adaptive mechanisms will evolve. Under such conditions the fluctuations in physical conditions will tend to subject organisms in the area, to relatively severe physiological stress and presumably to reduced reproductive and survival success, at least for some portion of the time. Organisms in such environment will have a greater chance that at one time or another the physical conditions will exceed their tolerance limits, and some of the populations may be eliminated (Slobodkin and Sanders, 1969:85-86). Thus, even though genetic processes that lead to species formation take place in such environments, and even though immigration of species new to such environments may occur, the populations of these organisms are less likely to survive, and the diversity of species found at any one time is likely to be lower than where conditions are less severe and/or more predictable (Slobodkin and Sanders, 1969:83).

A second factor affecting the diversity is the length of time that the environment has been inhabited. No matter how predictable an environment is, if it is new, and especially if it is a short-lived environment, evolutionary development will not have proceeded for long and physical controls will still be dominant, and species diversity will be low.

What are the implications of environmental instability and short history, when combined, for the features of individual species populations that survive? Organisms can respond to such environments only by having a broad physiological tolerance (Slobodkin and Sanders, 1969:85), at least with respect to how they relate to those environmental features that are stressful and unpredictable.

In the majority of species in such an environment, ecological specialization will be relatively undeveloped because in an unpredictable and fluctuating environment available food and shelter are likely to change at various times and to be different in different places, and in general no species can afford to be too specialized in terms of narrow preferences in food types and habitat (1969:89). It is also likely the species will have a high rate of natural increase (Slobodkin and Sanders, 1969:88). Populations will tend to be fluctuating, with the population being for the large part of the time either under severe physiological stress due to changing physical features of the environment or in the process of recovery from decimation (1969:89). Interactions between species will tend not to permit stable outcomes (1969:89). And species in unstable and unpredictable environments will tend to be easily dispersed and able to colonize virgin areas with rapidity (Margalef, 1963:370), because dispersion helps enhance the probability that some indivuals somewhere will survive a catastrophe (Colinvaux, 1973:392).

Such species have been characterized as opportunistic, as opposed to being equilibrium species, and they are the result of a dynamic selection, a selection that does not link success to stability or efficiency but rather to prolificness and flexibility (Margalef, 1963:370-371, see also Dunbar, 1968:68-69). Opportunist species, because they evolved to survive environmental catastrophes, often have oscillating population growth patterns.

Because an opportunist remains a generalist, the organism must channel considerable energy into maintaining a plastic physiology, unspecialized behavior and methods of dispersion (Colinvaux, 1973:570). Opportunists must use energy to maintain structures and responses that are needed to meet emergencies, but which may come relatively infrequently. Because of this behavior they are not well equipped to achieve lasting dominance in an environment, nor to succeed in ecological competition with the more specialized equilibrium species (1973:570) should environmental variability be reduced or should the equilibrium species somehow avoid this variability. They predominate not because of superior competitive ability, but because of high reproductive capacity.

This list of characteristics or elements of species behaviors in unstable and unpredictable environments, however, may give a somewhat overdrawn impression. Opportunistic and equilibrium species are general concepts and specific species are often not easily classified by such criteria. While opportunistic species will be especially common in unstable environments, not all species will show all of these features. Since, in such environments the probability of extinction or survival does not depend wholly on past events, but rather on environmental perturbations that are likely to occur in the near future, there probably is no single general property of organisms that will be of value under all circumstances, not even fecundity, longevity, or efficiency (Slobodkin and Rappaport, 1974:189). All these become of contingent value. Thus, "the only measure of success is duration of the game", and the "optimal strategy" is to minimize the costs of the future (1974:191 and 195).

To follow such a strategy, organisms that are evolutionary successes maintain flexibility in response to environmental perturbations (Slobodkin and Rappaport, 1974:198). Thus, the organisms will have variable behavior patterns, they will be flexible, or more particularly, resilient, i.e., capable of absorbing extreme fluctuations in their environment by changing themselves, but surviving (Holling, 1969:18). A population will respond to environmental change by initiating a series of changes "that restore its ability to respond to subsequent unpredictable environmental changes" (1969:18). But within these broad outlines a wide range of adaptive responses is still possible, and most species will not conform to all of the general features.

In fact, the climatological, physiographic and edaphic features of the sub-arctic region are all highly variable and unpredictable, relative to most southerly environments, and also, in some cases, relative to arctic conditions.

For example, the climate of the continental sub-arctic climatic region as defined in the world classification of climatic regions by Strahler, is characterized by the greatest seasonal differences on any region in the world (Barry and Chorley, 1975:394-399). The variation is greater than in the arctic, and this appears to be related to the fact that the region is dominated by different airmasses in different seasons, by northerly continental polar and arctic origin air in winter, from November to May, and by more southerly and westerly air trajectories in summer (Bryson, 1966:257). A review of the climate of the Waswanipi region in particular appears as Appendix 9-2, and it indicates that the features that have the greatest variability are those winter features which are of critical importance to living things: snowfall, snow cover depth and duration, and ice cover duration, among others; and, it also indicates that while many of these factors are influenced by local geological factors, such as forest types, the processes that underlie the variability are often continental or global in scope.

Furthermore, because of recent glaciation, the sub-arctic region has, geologically speaking, only recently been reinhabited by the life forms that now characterize it (Dunbar, 1968:80).[2] The recentness of glaciation has meant that in addition to climatic perturbations, there are physiographic and edaphic processes initiated by the glacial and post-glacial events that continue today and that create additional unstable and unpredictable conditions for the species that inhabit the high latitude regions. In the Waswanipi region, for example, glacial retreat occurred about 9,000 years ago, and the drainage network of the region is still disorganized and irregular. The boreal forests which characterize the Waswanipi region are still in a state of flux and imbalance, having gone through hardly more than 100 generations since recolonization of the land. The forests of the region do not exhibit fixed plant associations, and paramount factor affecting local distribution today is the generally poor drainage (Baldwin, 1958).

The broad distribution of the boreal forests which stretch nearly across the continent, and which are typical of the sub-arctic region, appear to be controlled by physical conditions, particularly climatic. The northern and southern limits of the boreal forest distribution, generally correspond respectively to the summer and winter modal positions of the arctic front which separates the polar and arctic airstreams to the north from the pacific and tropical airstreams to the south (Bryson, 1966:257; c.f., Barry, 1967). The main features the boreal forest is considered to be adapted to are: short growing season and long period of frost; great inter-annual variations in the durations of these from year to year (Hustich, 1970), low and variable productivity. The development of the boreal forest ecosystem itself is characterized by lack of a stable climax, inability to reproduce itself, and the occurrence of widespread naturally occurring forest fires, particularly in mature forests, that are the kingpin for breaking nutrient and reproductive bottlenecks and starting new cycles of forest development. Thus, in addition to climate and drainage, the other factor affecting distribution of the forests is the predominantly physical control of fire, which is a periodic perturbation in the system, although apparently a critical perturbation. A review of boreal forest ecology, and of the geology, forests and vegetation of the Waswanipi region appears as Appendix 9-3.

In summary, the general features of the sub-arctic region, and in particular, possible causes for the low species diversity in the sub-arctic environment, seem to fit the stability-time hypothesis of ecological diversity, and it has been noted that northern animal populations, in general, conform to the expectations for opportunistic response to environmental conditions (Dunbar, 1968:74), conditions characterized by the frequency of biologically significant perturbations in the physical environment.

In the specific reviews of the biological data on the species of animals that are of primary concern to the Waswanipi, and towards which their hunting activity is directed, I will indicate how each is adapted to sub-arctic conditions.

However, my focus will not be solely on adaptation, I will also indicate how in each case the adaptations that have evolved give rise to certain regularities and patterns that are in fact the basis of Waswanipi hunting recipes. That is, I will attempt to indicate how,when the principles of the adaptation are understood by men, the behavior of the species appears as predictable or at least anticipatable in a given situational context, even though the behavior may be flexible and adaptive across larger geographical and temporal expanses. Strikingly, it will appear in the accounts that follow that some of the things the Waswanipi know about the behavior of the animals they hunt have only been studied by scientific investigators in the last two decades, whereas others have yet to be considered scientifically.

Footnotes for Appendix 9-1

1. The references cited in this appendix are listed in the bibliography of natural sciences.

2. The importance of the time factor, by itself, is however open to exaggeration because the climatological events that led to glaciation, although not well understood, were very widespread in scope, and in that general sense all or many environmental systems, including those of the temperate regions, have been changed in the geological recent period by these events. Nevertheless, there is a _prima facie_ case for arguing that the impacts of glaciation have generally been more severe, more recent, and are working themselves out more slowly in the higher latitudes.

APPENDIX 9-2 THE CLIMATE OF WASWANIPI

Climatic factors are of critical importance in the ecology of sub-arctic and arctic regions. In this appendix I first review some of the most ecologically relevant climatic features of the Waswanipi region, emphasizing the high seasonal and annual variability of those features, and showing how the regional climatic patterns are linked to continental and global atmospheric patterns. Second, I attempt to integrate the patterns of the various climatic features and show how they are related to one another by reviewing a model of the weather systems that traverse the sub-arctic region.

A - Sub-Arctic Climates

The prevailing winds over the North American continent are westerlies, and the eastern parts of the continent therefore have generally continental climates. In winter freezing cold temperatures predominate in the northern portions of the continent due in part to low solar radiation, but also due in part to particular features of the circulation and the geography of the area. The westerly upper air (high altitude) circulation of the northern latitude is characterized by a persistent counter-clockwise air flow around an extension of a low pressure cell centered over Baffin Island and Iceland (Thompson, 1968:265). This flow pattern brings large masses of cold arctic air from the northwest on a south-eastward course across Hudson and James Bays, Quebec and the interior of North eastern North America.

However, a particular geographical feature of the Quebec-Labrador peninsula, of which the Waswanipi region may for present purpose be considered a part of the base, is that it is surrounded on nearly all sides by extensive bodies of water. The climatological significance of this is that the average annual effect of the surrounding seas is to produce sub-normal temperatures (Hare and Longley, 1950:14). The overall result of these factors is that the temperature regime of the whole of northern Quebec is particularly low relative to the regimes of other areas at comparable latitudes.

In summer the low cell in the Baffin region is much weaker and the arctic high cell is further north because of greater solar radiation and the northeastward tracks of cyclones bring more southerly continental air across northern Quebec. This relatively warm moist air is cooled as it passes over the large water bodies surrounding the peninsula. The climate of the area therefore characterized by long very cold winters which alternate with cool short summers.

On the Koppen Classification the Waswanipi region is a Dfc type climate, a cold snowy climate with the temperatures in the coldest month being less than 32^{o}F (0^{o}C) and those of the warmest month being greater than 50^{o}F (10^{o}C). It has no dry season and sufficient precipitation in all months (sub-type f), and is cold with cool summers, less than four months per year with mean monthly temperatures over 50^{o}F (sub-type c) (Barry and Chorley, 1975:389). In the world classification of climatic regions by Strahler the Waswanipi region falls into the continental subarctic climate region, one of the four high-latitude climatic regions controlled by polar and arctic air masses (Barry and Chorley, 1975:394-399). Great seasonal differences characterize the subarctic climatological region and they are related to the differences in the sources and trajectories of the air that dominates the weather in different seasons. This region is dominated by air of northerly continental polar and arctic origin from November to May, and by air from more southerly and westerly trajectories in summer (Bryson, 1966:257). The temperature regime varies enormously. Using Strahler's classification of climatic regions and data Barry and Chorley have presented from representative stations in each of thirteen of the fourteen world climatic regions, it is possible to compare the range of temperatures characteristic of the climatic regions at different latitudes. The range of temperatures, apparently the monthly means, for each station is generally greater in climates of the higher latitude, and highest in the station selected from subarctic climatic region. Data for the Waswanipi region are available from Amos, 113 miles south of Matagami and the station closest to the Waswanipi region for which there is a long-record of weather data, where the long term annual range of monthly mean daily temperatures is 63^{o}F (35^{o}C) (Wilson, 1973: Fig. 17).

B - Meteorological Data

For the Waswanipi region climatic data are available from a network of stations run by various levels of government. C.V. Wilson, in her summary of the climate of Quebec has noted that the central western and north western portions of the privince are presently the areas least well covered by climatological stations. There are no climatological stations operating in the heart of the Waswanipi area on an all-year-round basis. The only station that was operated year round in the area is at Matagami which makes temperature, precipitation and several other observations four times a day. However, this station had only been in operation for several years (Table A9.2-16). Long-term data are available only from stations adjacent to the study area. Three stations just to the east of the study area at Chapais and Chibougamau make synoptic and/or hourly observations. They are located approximately 75 to 105 miles east of Waswanipi River settlement. Chapais is in fact located on a Waswanipi trapline, but one that was not studied during this research. To the south of the region the three stations with the most extensive data are at Amos, Senneterre and Val d'Or approximately 110 to 160 miles south of Matagami. Only the latter two keep synoptic and/or hourly observations, the last named now being the most important (Wilson, 1971: Fig. 3). Amos however provides the longest climatic records for a station near the region. Because various studies have summarized data from some, but not all of these stations, we have presented data as available, giving priority to Chapais (Radar), Cache Lake (near Chibougamau), Amos and then Val d'Or. For comparative purposes, we present published data from these stations on Table A9.2-1. It should be noted that all the stations used in this description are near or below the southern portion of the Waswanipi region. There are no stations in the northern portion of the region, and the nearest ones further north apparently provide little data and have not been used in published analyses of the climate of this area of Quebec.

i) Temperature

The recorded temperatures of the Waswanipi region reflect a range that would be expected in a region that regularly is in an arctic air mass, but that occassionally is covered by tropical air masses. The absolute minimum temperature recorded at Chapais is -45°F (-43°C), the absolute maximum 90°F (32°C). Even comparing temperatures that occur over the years within a single month of the year considerable variation occurs. At Lac Cache the absolute high and low temperatures recorded during the period of operation of the station can differ by over 100°F (56°C) for a single month, February, and are frequently over 80°F (44°C) (Table A9.2-1).

The variability of the temperature regime is not just the result of a few extreme days. This is shown by the averaged values of the monthly mean daily temperatures which also show significant variability between the years. At Amos where records have been reported for the continuous period from 1931 to 1965, the monthly means differ as much as 22°F (12°C) between years in the months of November, December, January, February and March (Table A9.2-2) and are not less than 10°F (6°C) for any month. The greatest variation occurs in the winter months.

The annual temperature pattern is generally: maximum mean temperatures occur in July with continuing warm but slightly lower mean temperatures in August, and minimum mean temperatures generally to occur in January with nearly as cold mean temperatures continuing in February (Table A9.2-1). During February increasing insolation begins to increase the temperatures. The July daily mean is 61°F (16°C) at Chapais with a mean daily maximum of 71.4°F (22°C) and mean daily minimum of 50.5°F (10°C) (Table A9.2-1). The January daily mean at Chapais is -2°F (-19°C), the mean daily minimum is -12.9°F (-25°C) and the mean daily maximum 9.0°F (-13°C). The annual mean daily temperature is 31.6°F (0°C). In the northern parts of the Waswanipi region, temperatures must be somewhat lower, by about two degrees Farenheit.

The monthly mean daily range of temperatures is also quite high in this region indicating that significant variability occurs not only yearly and monthly but daily as well. At Chapais the mean daily range of temperatures for January and for July falls between 18.0° and 22.4°F (10° and 12°C) (Table A9.2-1).

At Amos, which tends to be one or two degrees warmer than Chapais, the number

Table A9.2-1 Summary of Monthly Temperature Data, Matagami, Chapais, Lac Cache, Amos and Val d'Or, Quebec

Variable and Station	Oct.[13]	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
Monthly Mean Daily Temperature (°F)[1]													
Chapais[3]	38.8	23.6	5.6	- 2.0	1.9	12.9	29.2	43.7	55.0	61.0	58.8	50.3	31.6
Lac Cache[4]	38.9	23.6	5.1	- 2.6	2.0	12.8	28.8	42.6	55.2	60.6	58.4	49.5	31.2
Amos[5]	39.9	24.7	7.3	0.1	3.6	15.4	32.5	47.2	57.9	62.4	60.2	51.4	33.6
Val d'Or[6]	40.5	25.9	9.4	2.3	5.1	16.6	33.2	47.0	58.8	63.5	60.9	52.1	34.6
Monthly Mean Daily Maximum Temperature (°F)[1]													
Matagami[2]	47			12			43			75			
Chapais[3]	46.5	30.4	14.6	9.0	15.0	26.4	40.3	55.4	66.8	71.4	68.4	58.9	41.9
Lac Cache[4]	45.6	29.4	14.0	8.3	14.0	25.1	39.4	53.3	65.8	70.7	67.9	57.5	40.9
Amos[5]	49.4	32.7	18.0	13.2	17.6	29.0	44.1	59.9	71.1	75.5	73.3	63.0	45.6
Val d'Or[6]	48.2	32.3	17.9	12.0	15.2	26.8	42.9	58.3	70.0	74.1	71.3	61.2	44.2
Monthly Mean Daily Minimum Temperature (°F)[1]													
Matagami[2]	30			-16			17			47			
Chapais[3]	31.0	16.7	-3.4	-12.9	-11.3	-0.7	18.1	32.0	43.1	50.5	49.2	41.6	21.2
Lac Cache[4]	32.1	17.7	-3.8	-13.5	-10.1	0.4	18.2	31.8	44.6	50.5	48.9	41.4	21.5
Amos[5]	30.3	16.6	-3.5	-13.1	-10.5	1.8	20.9	34.5	44.7	49.3	47.0	39.7	21.5
Val d'Or[6]	32.7	19.4	0.9	- 7.5	- 5.0	6.3	23.5	35.6	47.6	52.6	50.5	42.9	25.0

(CONTINUED)

Table A9.2-1 Summary of Monthly Temperature Data, Matagami, Chapais, Lac Cache, Amos and Val d'Or, Quebec (Continued)

Variable and Station	Oct.[13]	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
Extreme Highest Temperature on Record (°F)													
Chapais[7]	72	51	40	36	38	51	69	80	90	89	85	74	90
Lac Cache[8]	74	57	49	38	51	58	69	80	88	91	86	88	91
Amos[9]	80	68	51	47	50	71	83	90	99	99	95	91	99
Val d'Or[8]	78	65	54	41	49	62	72	91	93	94	91	90	94
Extreme Minimum Temperature on Record (°F)													
Chapais[7]	15	-12	-32	-45	-43	-26	-13	12	31	31	29	24	-45
Lac Cache[8]	4	-25	-44	-57	-51	-42	-26	9	24	30	30	23	-57
Amos[9]	6	-28	-54	-56	-63	-44	-21	2	22	25	29	19	-63
Val d'Or[8]	12	-20	-35	-47	-44	-32	-13	14	28	35	27	23	-47
Mean Daily Range of Temperature (°F)[10]													
Matagami[11]				27.0-31.4						27.0-31.4			
Chapais[11]				18.0-22.4						18.0-22.4			
Lac Cache[4]				18.0-22.4						18.0-22.4			
Amos[5]				22.5-26.9						22.5-26.9			
Val d'Or[12]				18.0-22.4						18.0-22.4			

(CONTINUED)

Table A9.2-1 Summary of Monthly Temperature Data, Matagami, Chapais, Lac Cache, Amos and Val d'Or, Quebec (Continued)

Footnotes:

1. From: Villeneuve, 1967a, unless otherwise noted.
2. Matagami from Wilson, 1971, for a period of less than 10 years.
3. For a period of less than 10 years, with adjustments for extreme values.
4. For a period of 10 to 24 years between 1931 and 1960, no adjustments.
5. For a period of 25 to 30 years between 1931 and 1960.
6. For the period 1951-1960, with adjustments for the period 1931-1960.
7. For one to nine years.
8. For ten to nineteen years.
9. For fifty to fifty-nine years.
10. From: Wilson, 1971, Figure 13 a & b.
11. For less than 10 years.
12. For the period 1951-1960.
13. The monthly patterns start with October to correspond with the "hunting year" schedule used in later parts of the study.

Table A9.2-2 Monthly Mean Daily Temperatures, Amos, Quebec, 1931-1965[1]

Monthly Mean Daily Temperature (°F)	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.
Average	40	25	7	0	3	16	32	47	58	62	50	51
Maximum year	50	34	16	12	16	29	41	54	64	67	66	55
Minimum year	32	10	-8	-10	-9	7	24	39	51	55	55	45

Footnote:

1. From: Villeneuve, 1967b:34 (Tableau IX).

of days per month on which the temperature does not exceed 30°F (0°C) is given on Table A9.2-3. In the months of December, January and February there is an average of nine days, i.e., ten percent of days, with maximum temperatures above freezing. This indicates both the mean duration of the period of almost constant cold, and also that thaws can occur in any month. Conversely, only two months July and August are generally frost free, although freezing temperatures have occurred in both months (Villeneuve, 1967b:38, Table 13).

If the cold season is defined as beginning and ending with the first and last days with mean temperatures below 32°F (0°C), then the season lasts between 170 and 180 days, six months, and the mean dates for the start and finish of the cold season in the Waswanipi region are between October 25 and 31 and April 15 and 25 (Wilson, 1961: Figs. 19 a, b and c).

ii) Freeze-up and Break-up

A clearer measure of the duration of cold, and one directly related to the possibilities and means of travel in the region, is the period of the ice cover. In general, lakes tend to freeze over more quickly in the fall than do rivers. Some fast moving turbulent parts of the rivers stay open during the entire winter and the few large and deep lakes are very slow to freeze. In the spring, ice clears from the rivers much more quickly, because most of it is flushed out, than it clears on lakes where it must be removed by the gradual process of melting (Allen, 1964:5; Burbidge and Lauder, 1951:18). The break-up is erratic in streams, and the larger and deeper lakes generally take longer to clear of ice (Hare, 1950a:170). Shallow lakes which are most common in this region freeze-over and thaw relatively quickly.

In the Waswanipi region freeze-up begins at the end of October or early November on most lakes, and slightly later on rivers (Hare, 1950a:171). Reading from maps provided by Allen, the mean dates for the first appearance of ice on lakes is November 1 to November 20, and for freeze-over of lakes and bays November 10 to November 20, (1964:197,198). Mean dates for the freeze-over of rivers are November 20 to December 1 (Allen, 1964:196). Break-up of rivers begins in late April (Hare, 1950a:171), and the mean dates for the initial

Table A9.2-3 Mean Number of Days with a Maximum or a Minimum Temperature of 32°F or Less - Amos, Quebec, 1931-1965[1]

Mean Number of Days With:	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Total
Maximum Temperature 32°F or Less	2	14	26	29	26	19	4	0	0	0	0	0	120
Minimum Temperature 32°F or Less	18	26	30	31	28	30	25	13	2	0	0	6	209

Footnote:

1. From: Villeneuve, 1967b:41 and 42, Tableaux 16 and 17.

breaking of the ice, and for clearing of ice from rivers are May 1 to May 10, and mean dates for clearing of ice from lakes and bays are May 10 to May 20 (1964:192-4). Allen suggests a difference between mean dates of freeze-up for rivers and lakes of up to ten days and a difference for break-up of some ten to twenty days (1964:199-200). These values give an ice cover period of about 180 days, six months, possibly extending to a maximum of 210 days in some years. The ice free period would then vary from 180 to 150 days (Wilson, 1971: Fig. 2).

There is however a considerable range of dates for freeze-up and break-up conditions from one year to the next. Hare has suggested that in individual years dates may be two weeks on either side of the means (1950a:170), i.e., may vary over a one-month period. Variability in ice conditions over the years can be seen from the recorded dates for freeze-up and break-up of the Waswanipi Post from 1949 to 1963, the longest record for the region (Table A9.2-4 Freeze-up varies over an eleven-day period from November 15 to 26, and break-up over forty-six days from April 7 to May 13. However, if one year of exceptionally early break-up is excluded from consideration the range in other years was eighteen days from April 20 to May 13. The majority of figures for the region fall in a relatively brief period, but exceptional variations can occur in ice conditions some years.

Variations in ice conditions between locations in the same year, and especially between river locations with different flow and turbulance regimes, can be demonstrated with data from several flow measurement stations in the territory. In 1962-63, the Waswanipi River at Lake Waswanipi froze over November 1, 1962, and broke up April 30, 1963. A few miles further upstream, near Desmaraisville, the river froze December 1 and broke April 20. The Bell River at Matagami froze over November 6, but broke up March 13, apparently because of a different set of conditions in the southern portions of its drainage basin. The Nottaway River north of Lake Matagami however froze over November 15 and broke up only on April 30 (all dates from Russell, Huberman and Strilaeff, 1965). Table A9.2-5 lists the freeze-up and break-up dates for the period of research of the present study.

Table A9.2-4 Freeze-up and Break-up Dates for the Waswanipi River at the Outflow from Lake Waswanipi, 1949 to 1963[1]

Year	Date of Freeze-up	Date of Break-up
1949	19 Nov.	-
1950	18 Nov.	6 May
1951	15 Nov.	-
1952	23 Nov.	26 April
1953	16 Nov.	7 April
1954	18 Nov.	26 April
1955	19 Nov.	24 April
1956	18 Nov.	13 May
1957	15 Nov.	25 April
1958	15 Nov.	25 April
1959	26 Nov.	6 May
1960	15 Nov.	5 May
1961	15 Nov.	5 May
1962	17 Nov.	4 May
1963	21 Nov.	29 April

Footnote:

1. From: Quebec, 1966:20-34. Station 080702.

Table A9.2-5 Freeze-up and Break-up Dates for 1968-69 and 1969-70 at Sites in the Waswanipi Region[1]

Locations	Dates of Freeze-up 1968	Dates of Break-up 1969	Dates of Freeze-up 1969	Dates of Break-up 1970
Nottaway River at head of Suscumica Lake	Nov. 8	April 30	Nov. 18	April 30
Waswanipi River downstream from Opawica Lake	Nov. 21	May 3	Nov. 25	April 29
Broadback River upstream from Lake Evans	Nov. 19	-	-	May 11

Footnote:

1. Source: Annuaire hydrologique, 1968, 1969, 1970. Québec: Ministère des Richesses naturelles. Services hydrométéorologiques.

Freeze-up and break-up conditions make travel by water or on the ice very treacherous during these periods and the variability of their dates of occurrence make it necessary to exercise caution during an extended period of at least four to six weeks each fall and spring.

The entire Waswanipi region is south of the southern limit of discontinuous perma-frost (Wilson, 1971: Fig. 2), however, there are some pockets of perma-frost, but they are infrequent and very small.

iii) Precipitation

A total precipitation of 35 inches per annum has been registered at Chapais. The period from June to September are the months of maximum precipitation and the minimum precipitation occurs in February, March and April, with the low in April. Mean monthly rainfall at Chapais is over two inches per month from May to October with the peak amounts of rainfall coming in June, July and August.

Compared to other parts of the globe, this precipitation is moderate and uniformly distributed. At Amos, where precipitation appears to be slightly lower than at Chapais or Matagami, the annual total precipitation varied during the period 1931 to 1965 from 23.43 to 45.67 inches, a variation by a factor of two (Villeneuve, 1967b:26, Tableau 1). This is not particularly variable, and the coefficient of variation (standard deviation as a percentage of the mean) for the mean total precipitation is 14.5 percent (Wilson, 1973: Fig. 26). Precipitation is also common, the mean number of days with a precipitation of 0.01 inches or more is 136, and the monthly range of from fourteen (September) to eight (March and April) (Table A9.2-6). The maximum recorded precipitation in 24 hours is 2.91 inches (Villeneuve, 1967b:31, Tableau 6). The hourly frequency of rainfall recorded at Val d'Or, fifty miles south of Amos, is relatively high in May and June and peaks in August and September, remaining high in October before becoming considerably less frequent (Table A9.2-7).

Water is abundant in all months, although most is physiologically unavailable to vegetation during the period from freeze-up to break-up. The actual evapo-

Table A9.2-6 Mean Number of Days With Precipitation of 0.01 and 0.80 Inches or More by Month, Amos, Quebec[1]

Mean Number of Days With:	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Total
Precipitation 0.01 Inches or More	12	12	12	10	10	8	8	1,	13	13	13	14	136
Precipitation 0.80 Inches or More	0.3	0.4	0.2	0.3	0.2	0.2	0.1	0.6	1.0	0.9	0.9	0.3	6.0[2]

Footnotes:

1. From: Villeneuve, 1967b:27 and 28, Tableaux 2 and 3.
2. Total from original source.

Table A9.2-7 Percentage of Hourly Observations with Snowfall, Rainfall, Blowing Snow and Freezing Precipitation, by Month, Val d'Or, Quebec

Percentage of all Hourly Observations in the Month with:	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
Snow[1]	9.4	28.0	37.4	36.2	35.5	19.1	11.4	3.4	0.1	0	0.0	0.8	15.0
Blowing Snow[2]	0.4	1.8	2.4	3.9	5.2	2.1	0.9	0.1	0	0	0	0	2.8
Rain[1]	12.8	9.5	2.6	0.6	1.2	1.8	7.0	13.7	13.5	10.4	15.9	16.6	8.8
Freezing Precipitation[2]	0.3	1.5	1.6	1.7	1.1	0.7	0.4	0	0	0	0	0	1.1

Footnotes:

1. From: Wilson, 1973:52, Table 24.
2. From Wilson, 1973:24 and 25, Tables 11b and 12b.

transpiration is less than 18 inches per year, so there is a surplus of 11 to 16 inches per year (Wilson, 1971: Fig.34,35,36). The effective temperature is cool microtermal (Hills, 1962:41). Based on the moisture index classification the region is a moist climate (Rowe, 1972:155).

iv) Snowfall and Snow Accumulation

Despite the general abundance of precipitation and the stability of the mean total precipitation, the snowfall regime which comprises about one-third of the total water precipitation per annum is more variable. In cold climates snowfall is an important feature of the climate and a vital part of the environment for many animals and for a wide range of human activity. In northern and central Quebec the mean annual snowfall and the variability of the snowfall from year to year are significant (cf. Tout, 1964:126).

The total mean snowfall at Chapais is 115.2 inches. This is a greater snowfall than occurs in any portion of the Canadian arctic and is exceeded only in the snow belt on the north shore of the Gulf of St. Lawrence and in the mountains of British Columbia. The Waswanipi region is, in fact on the western edge of the former snow belt. At Amos, which receives a mean of 99.3 inches of snowfall per year, the actual annual variation in the years from 1931 to 1965 has been from 51.0 inches to 167.0 inches (Table A9.2-8). The year-by-year variability (coefficient of variation) of total snowfall is 24.6 percent at Amos and is between 25 and 30 percent for the Waswanipi region (Wilson, 1971: Figs. 26 and 30). This is significantly higher than the variability of the total precipitation.

Recordable snowfall which probably begins somewhat later in the fall and stops earlier in the spring at Amos has occurred there between September 5 and May 30, and the mean dates for the first and last snowfalls are October 21 and April 27 (Villeneuve, 1967b:32, Tableau 7). This suggests that the dates of the first and last snowfall may vary by as much as five weeks before and presumably five weeks after the mean dates, a total variability of over two months.

Table A9.2-8 Annual Snowfall, Amos, Quebec, 1931-1965[1]

Year	Snowfall (Inches)	Year	Snowfall (Inches)
1931	51.0	1956	91.0
1932	106.7	1957	72.5
1933	123.6	1958	99.0
1934	64.1	1959	-
1935	99.3	1960	107.5
1936	-	1961	98.0
1937	145.0	1962	80.2
1938	167.0	1963	64.2
1939	-	1964	92.6
1940	103.0	1965	90.8
1941	92.5		
1942	96.5		
1943	92.0		
1944	84.0		
1945	78.5		
1946	96.5		
1947	99.1		
1948	-		
1949	134.0		
1950	-		
1951	110.0		
1952	108.0		
1953	-		
1954	78.0		
1955	85.0		

Footnote:

1. From: Villeneuve, 1967b:32, Tableau 5.

The heaviest monthly mean snowfalls at Chapais and Matagami occur between November and March, with the peak fall in December (Table A9.2-9). Mean November and December snowfalls together account for thirty-six percent of the annual mean total and January and February account for thirty-five percent.

As snowfalls occur through the winter snow accumulates on the ground, although the number of inches that accumulate are not comparable to the number of inches of snow that fall. Snow accumulation reaches a peak usually during March. The cycle of snow build-up and decline are shown on Table A9.2-10 for the winter of 1969-70 for a station in central-western Quebec. The weekly readings show a slow and irregular accumulation in November, rapid increases in December, January and February, relative stability in March, and a rapid decline in later April. The rapidity of the decline should be noted, within two weeks the depth of snow on ground drops thirty-six inches, and a week later the last inch has disappeared. These features are typical of exposed sites where most climatological stations are located. Mean values for several years of measurements of the depth of snow at several dates during the winter season at Chapais are given on Table A9.2-11, and they indicate a post-December monthly pattern similar to that discussed above. Unfortunately pre-January values are not available.

The snow is constantly being modified from the time it falls until its final disappearance. An increase in the density of the snow is indicated by the increased water equivalent of the accumulated snow throughout the winter (Table A9.2-10). The factors that affect the modification of snow are themselves modified at the micro-climatic level by the type of vegetation present. Very different snow conditions therefore exist as a result of local vegetational and topographical conditions.

The density of falling snow is affected by temperature, wind and humidity conditions. In general, in temperatures characteristic of this region, snow falls as relatively large flakes and forms a fluffy layer on the ground that is quite different from the more cylindrical snow flake forms characteristic of the colder arctic regions (Formozov, 1946:23-4). Once fallen, snow is affected primarily by wind, sunlight, temperature and precipitation conditions. Wind

Table A9.2-9 Monthly Total Precipitation and Snowfall, Matagami, Chapais, Amos, Val d'Or, Quebec

Variable and Station	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
	Total Precipitation (Inches)[1,6]												
Matagami[2]	2.83	3.47	3.90	2.34	2.01	1.99	.83	3.27	4.23	4.65	3.91	4.50	-
Chapais[3]	3.20	2.70	2.50	2.10	2.05	2.00	1.70	2.80	4.00	4.20	4.00	3.80	35.05
Amos[4]	2.70	2.74	2.31	2.25	2.01	1.84	1.67	2.69	3.53	3.69	3.60	3.96	32.99
Val d'Or[5]	2.81	3.12	2.83	2.73	2.07	1.76	1.47	2.22	3.75	3.82	4.29	4.18	34.55
	Snowfall (Inches)[1]												
Matagami[2]	3.0	19.2	24.7	22.7	18.6	18.6	4.4	1.3	0.0	0.0	0.0	0.0	112.5
Chapais[3]	6.0	18.5	22.7	20.3	19.9	17.0	9.0	1.6	0.1	0.0	0.0	0.1	115.2
Amos[4]	4.2	13.2	21.2	21.8	18.9	14.9	6.4	0.8	0.0	0.0	0.0	0.5	101.9
Val d'Or[5]	4.3	18.3	24.6	21.6	19.9	14.7	6.3	1.0	T[7]	0.0	0.0	0.3	111.0

Footnotes:

1. From: Villeneuve, 1967a, unless otherwise stated.
2. From: data sheets of Québec, Service de Météorologie, for less than five years.
3. Normals interpolated from "cartes isohyétales" by Villeneuve.
4. Normals calculated from the values for a period of 25 to 30 years between 1931 and 1960.
5. Mean values for a period of 10 years ending at the beginning of the 1960's.
6. Snow is included in total precipitation on the basis that 10 inches of snow has a water equivalent of one inch.
7. T =Trace.

Table A9.2-10 Snow Depth on the Ground by Week, Winter 1969-70, Central-Western Quebec Station[1]

Month	Day	Snow Depth (Inches)	Water Equivalent (Inches)
October	23	2.4	0.5
November	1	4.6	0.6
	8	0.0	0.0
	15	5.2	0.4
	23	3.2	0.4
December	1	5.7	0.7
	8	8.1	1.4
	15	16.1	2.3
	23	18.4	1.4
January	1	23.7	5.6
	8	24.6	5.3
	15	24.0	5.4
	23	22.6	5.6
February	1	30.2	6.5
	8	32.8	7.8
	15	39.4	9.2
	23	40.0	9.7
March	1	40.3	10.8
	8	43.8	10.9
	15	44.1	12.2
	23	37.3	10.4
April	1	36.8	11.5
	8	40.3	12.4
	15	37.8	12.6
	23	25.3	3.2
May	1	1.1	-

Footnote:

1. From: Canada, n.d., a.

Table A9.2-11 Mean Monthly Depth of Snow on the Ground, Chapais, Quebec[1]

Date	Snow Depth (Inches)	No. of Years of Observations
January 15	27.3	5
February 15	36.2	5
March 15	41.0	5
April 1	33.8	4
April 15	25.8	4

Footnote:

1. From: Soucy, 1971.

blows the fallen snow, and the movement breaks up the large flakes into smaller particles which pack together more closely and hence more densely (Pruitt, 1966). The wind also redistributes the snow from exposed surfaces, such as open lakes and rivers, hill tops, and the windward sides of hills, to calm areas or wind breaks, such as the leeward side of lakes, rivers, hills, and openings in the forests (Rikhter, 1954:14-15). As the snow ages it goes through a process whereby it slowly develops a open hard crumbly crystalline structure at its base, a structure usually characteristic of old snow (Pruitt, 1966). Newly fallen fluffy snow may have a density of 0.03 to 0.19 g/cm^3, whereas old dry snow densities may be 0.30 to 0.35 g/cm^3 (Peterson and Allen, 1974:484).

When the sun is stronger in the late winter the radiant heat melts the surface of the snow which then refreezes as a crust during the nights and cloudy days. Temperature rises cause thaws that also form crusts and that accelerate evaporation and melting in the spring. Rain during the season of snow cover is absorbed into the snow and forms a crust or hard layer when temperatures drop below freezing. Crusted snow may have densities of 0.40 to 0.50 g/cm^3 (Peterson and Allen, 1974:484). Later snowfalls can cover the crusts, so the resulting cover of snow on the ground is composed of several layers of snow with different histories and densities (for a general account see Rikhter, 1954).

Forests influence the formation of the snow cover by intercepting snow, protecting fallen snow from the wind, creating shade, retarding the melting (see Baldwin, n.d.:18). Forests therefore markedly affect the depth, density and duration of the snow cover (Formozov, 1946:19). Coniferous trees intercept considerable snow and delay accumulation of snow on the forest floor (Formozov, 1946:20). The snow on the floor of the forest beneath coniferous trees has an irregular depth, being thinnest near the stem of the trees and thickest in areas between trees. Hollow bowls are formed under the trees. As the snow caught in the branches melts, blobs of wet snow fall to the ground making the snow at the edges of the trees rough, and compressed (Formozov, 1946:20). On Isle Royale in Michigan, an area with a heavy canopy of conifers averaged 29 percent less snow than a nearby opening (Peterson and Allen, 1974:485).

Coniferous forests, with dense cover also are areas where the snow cover lasts longer in the spring (Formozov, 1946:28). In the Soviet Union, Rikhter reported that under fir the thawing lasted 23 to 28 days longer than in open cultivated land nearby (1954:36, Table 40). Thus, despite lower snow cover depths under coniferous forests, snow lasts longer (Baldwin, n.d.:19).

By comparison with coniferous forests, snow in open areas, such as in recently burned areas and in open bogs, has a strong liability to drift (Rikhter, 1954: 14). Solar radiation is not intercepted and can melt top layers of snow so that ice crusts are common when temperatures drop. The range of temperature variation in the open leads to greater compacting and settling than is found in forested areas where snow tends to be comparatively less thick (Formozov, 1946: 24).

Intermediate snow cover conditions between those generally found under coniferous forests and those found in open areas are generally found under deciduous forests or mixed forests with a significant deciduous component. There is less drifting and crusting than in the open. Accumulation of snow in the trees themselves is less than in conifers because they are leafless in winter so snow tends to be fluffier than under other conditions (Formozov, 1946: 23-24; Rikhter, 1954:14). On Isle Royale, an area with sparse deciduous canopy exposed to winds had 15 percent less snow than an open area (Peterson and Allen, 1974:485). Melting is delayed somewhat under deciduous forests when compared to the process in open fields, but is less retarded than under conifers. Near Moscow, Rikhter reported that snow in deciduous woods lasted from two to sixteen days longer than on cultivated land (1954:35, Table 40).

Thus, the variability in the snow cover in the region is dependent not only on year to year fluctuations in the broad climatic factors, but on microclimatic factors as well, and therefore varies with topographic and vegetational conditions. These variations are generally not reported in standard meteorological data.

In the Waswanipi region the median dates for the first snow cover are October

15 to 31, and the median date for the last snow cover at meteorological stations is April 30 to May 15. This date roughly coincides with break-up. Snow cover has been continuous during December to March over the ten years of records, and the median number of days with snow cover is about 180 (Wilson, 1971: Fig. 2). In especially early or late seasons the date of first snow cover varies from the median date by about one month each way (Potter, 1965:11), as does the first and last snow fall, see above. Rainfall can occur during all months of the year, and freezing precipitation occurs during the winter months.

v) Cloud and Sunshine

The entire province of Quebec is exceptionally cloudy, with a particularly high frequency of observations with between 8/10's and 10/10's of the sky covered with cloud. Maximum cloudiness occurs in autumn, and minimum cloud in the winter (Wilson, 1973:22). At Amos the percentage of possible insolation actually received is 37.6 percent annually, with a monthly low of 18 percent in November and highs of 40 to 44 percent from March to August. (Villeneuve, 1967b:55, Tableau 30). The Lac Cache cloud pattern is reported on Table A9.2-12.

The cloud pattern in the Waswanipi region, especially in autumn, is related to the freezing and thawing of James Bay and Hudson Bay. In the autumn the continental arctic air is colder than the surface of the water of the two bays which only reach freezing temperatures in October or November and do not freeze over until December (Wilson, 1973). The arctic air therefore picks up moisture and heat in the lowest layers as it moves southeast across the bays. The change produces relatively warm northwestern flows, instability, clouds and frequent snow flurries on the lands east and south of the bays (Burbridge, 1951:367; Hare and Longley, 1953:3-4). In October and November northwest winds from over the bay bring most of the bad weather. In December, however, the bay is frozen over and there is little effect, and the clear northwestern flows become more prominent (Hare, 1950a:34).

The patterns of insolation are highly variable by season. At 50^{o}N latitude

Table A9.2-12 Mean Monthly Cloud Cover, Bright Sunshine, Lac Cache, Quebec

Variable	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
Mean Monthly Cloud Amount[1,2]	7.1	8.4	7.0	5.9	6.3	5.5	6.3	6.6	6.5	6.6	6.5	6.9	6.6
Approximate Percentage Frequency of 8 to 10 Tenths Cloud Cover[1,3,4]	61	76	60	53	57	48	54	57	51	57	57	60	58
Approximate Percentage Frequency of 0 to 2 Tenths Cloud Cover[1,3,4]	20	10	21	34	28	36	28	24	20	20	20	20	24
Mean Percentage Cloud Cover[3,5]	75	90	75	58	60	56	65	70	70	72	70	75	
Mean Duration of Bright Sunshine (Hours)[3,5]	80	45	45	60	95	150	190	170	220	210	165	110	
Daylight Duration for 21st day of Month at Latitude 50°N (Hours and Minutes)[6]	10h 26m	8h 47m	8h 04m	8h 48m	10h 28m	12h 13m	14h 07m	15h 40m	16h 23m	15h 44m	14h 09m	12h 17m	

Footnotes:

1. From: Wilson, 1971: Figure 6.
2. 10 =complete cloud covered sky.
3. Read from graph.
4. Based on four observations per day.
5. From: Wilson, 1971: Figure 38(a).
6. From: Wilson, 1973:7, Table 1b.

the duration of daylight during the winter solstice drops to only eight hours and four minutes a day and darkness lasts sixteen hours. Daylight is less than nine hours for over two months (Table A9.2-12). This severely limits the amount of daylight available for outdoor work. At the winter solstice the sun only rises 16^{o} in the sky (Wilson, 1973:7). By March and April however over twelve and fourteen hours of daylight are available respectively with the June peak providing sixteen hours and twenty-three minutes of daylight.

In the early winter months when peak cloudiness coincides with shortening daylight, the monthly mean duration of bright sunshine becomes very small, only 45 hours in each of November and December and 60 hours in January. The mid-winter clearing, and the lengthening in the day change the monthly mean duration of bright sunshine rapidly, and in March 150 hours are normal.

vi) Wind

Monthly mean windspeed in miles per hours varies from 7.2 to 8.7 miles per hour at Val d'Or (Table A9.2-13). At Lac Cache 96 percent of daily maximum wind speeds are under 18 miles per hour, the remaining four percent are between 19 and 24 miles per hour, with just traces of maximum daily winds in excess of 24 miles per hour (Villeneuve, 1967a Tableau 34). Wind direction frequencies for Val d'Or appear on Table A9.2-14, and on Figures A8.1-1 and A8.1-2.

At the common mid-winter temperatures in the region the mid-winter winds increase the coldness of the temperature and occasionally combine to make the outdoor human bio-climate uncomfortable and sometimes dangerous. Windchill is a function of the combined effect of temperature and wind, and is expressed as a measure of heat loss per unit of exposed skin per unit of time (measured as kg. cal/m^2 hr.).[1] At 600 kg. cal/m^2 hr. (very cold) it is unpleasant to travel on overcast days, and at 1200 units (bitterly cold) travel is unpleasant on clear sunlit days. At 1400 units exposed human flesh may freeze under certain conditions and living in a temporary shelter becomes disagreeable (Wilson, 1973:62).

Table A9.2-13 Monthly Mean Wind Speed, and Dominant Wind Direction, Matagami, Amos and Val d'Or, Quebec

Variable	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
Monthly Mean Wind Speed, m.p.h.													
Matagami[1]	6	6	5	5	6	5	5	7	6	5	6	6	-
Amos[2]	7	7	5	5	6	6	7	7	7	6	6	7	-
Val d'Or[4,5]	8.3	8.6	7.3	7.7	8.3	7.9	8.6	8.7	8.3	7.3	7.2	7.9	8.0
Wind Direction													
Amos[2]	SW	SW	SW	NW	NW	NW	SW	SW	SW	SW	SW	SW	
Val d'Or[4,5]	S/SSW	S/SSW	S/SSW	S/SSW	NW/NNW	NW/NNW	NW/NNW	SW/SSW	SW/SSW	SW/SSW	-	S/SSW	

Footnotes:

1. Matagami from monthly summary sheets provided by Service de Météorologie, Ministère des Richesses naturelles du Québec.
2. Amos from: Villeneuve, 1967a and 1967b. One reading daily at 8 a.m.
3. From: Villeneuve, 1967b:59 and 60, Tableaux 34 and 35.
4. Hourly readings.
5. From: Wilson, 1971, Figure 8.

Table A9.2-14 Monthly Frequency of Hourly Winds by Direction, as a Percentage of All Observations, Val d'Or, Quebec[1]

Direction	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
N/NNE	5	10	15	15	10	10	5	10	5	10	5	5
NE/ENE	0	5	5	5	0	0	0	0	0	5	0	0
E/ESE	0	0	0	0	0	0	0	0	0	0	0	0
SE/SSE	10	5	5	10	5	5	0	5	5	5	10	5
S/SSW	15	15	10	10	15	15	15	15	20	20	15	20
SW/WSW	10	5	5	10	15	20	20	15	15	15	10	10
W/WNW	15	15	10	10	10	10	15	15	15	10	10	15
NW/NNW	15	20	20	20	15	20	20	15	10	15	10	15

Footnote:

1. Read from Wilson, 1971: Figure 8.

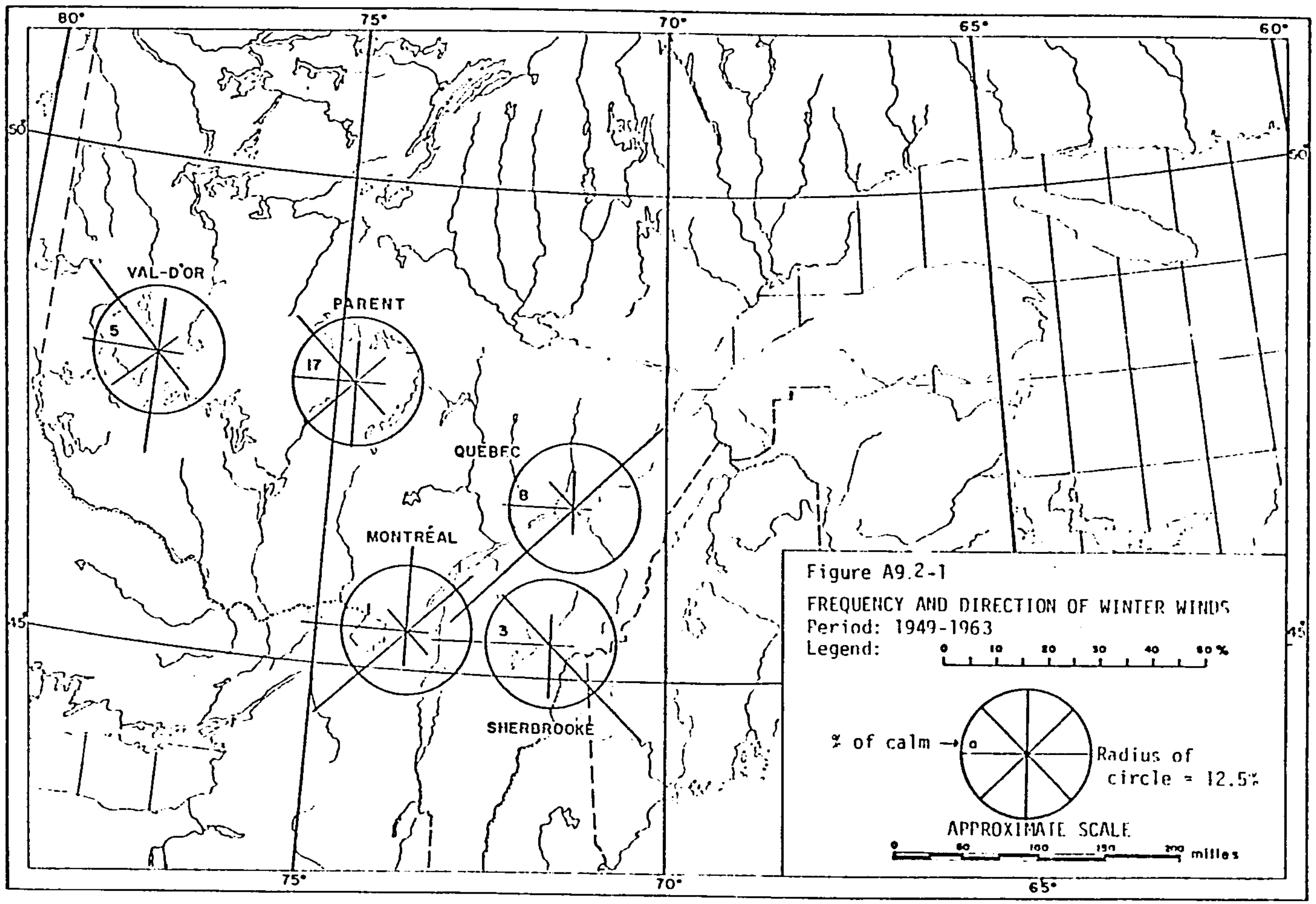

Figure A9.2-1

FREQUENCY AND DIRECTION OF WINTER WINDS
Period: 1949-1963

Source: Ferland and Gagnon, 1967.

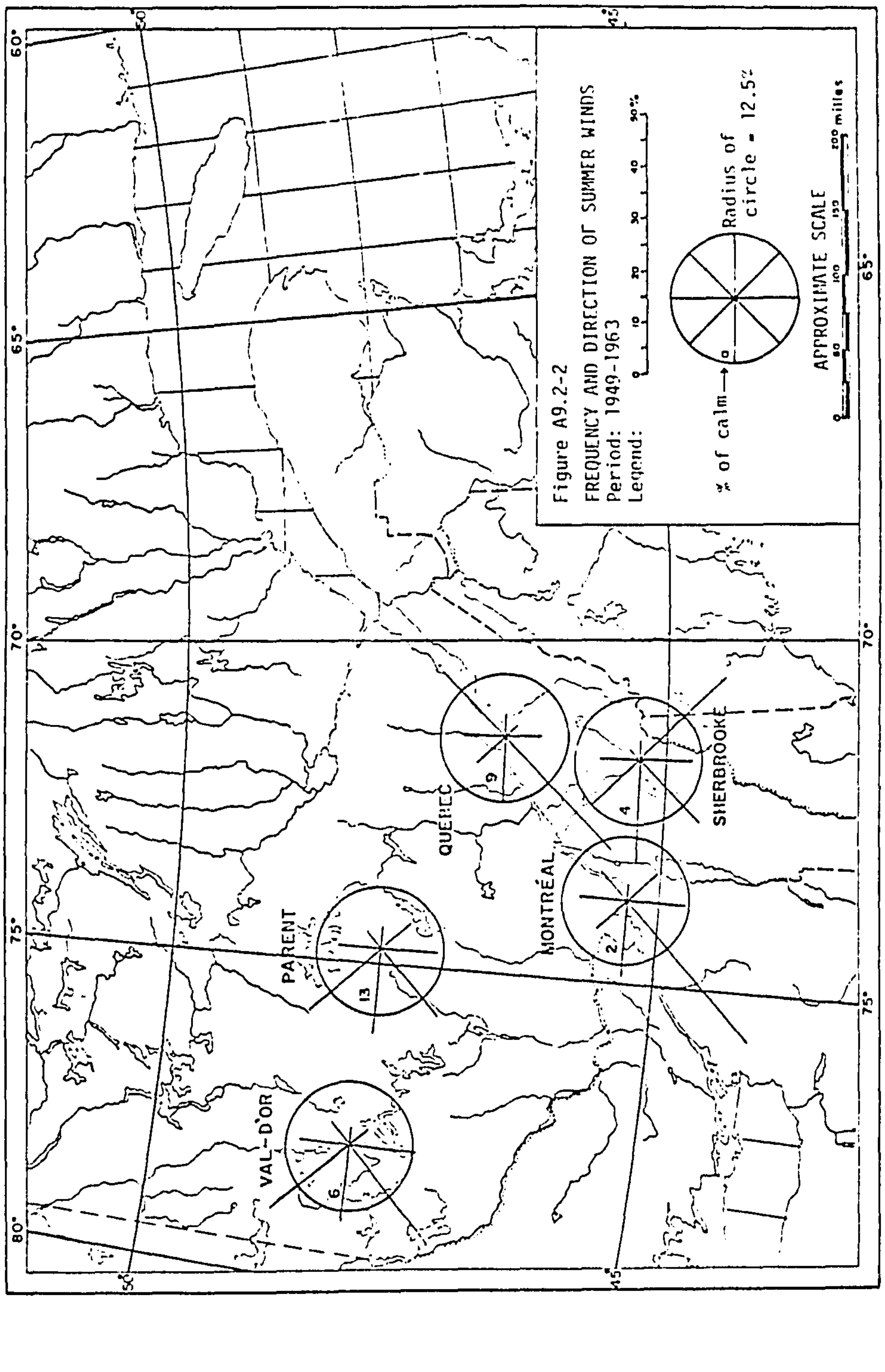

Figure A9.2-2
FREQUENCY AND DIRECTION OF SUMMER WINDS
Period: 1949-1963
Legend:

Source: Ferland and Gagnon, 1967.

At Lac Cache the windchill factors based on monthly means of the most severe year are just below 1400 units for January and February, and generally exceed 1000 units for the four months December to March (Table A9.2-15).

Wind combined with snow, along with freezing rain, are also important during the winter season for their effects on visibility. Visibility can be affected both by falling snow and by fallen snow being picked-up by the winds again. Blowing snow conditions are relatively less important than falling snow, but are high during the same three months, December, January and February, and contribute to the frequency of limited visitibility during that period. During continuous snowfall the mean visibility is usually one-half to one-quarter of a mile, but when combined with blowing snow visibility can drop to zero (Tout, 1964:179).

C - Weather Systems

Having reviewed the meteorological data that characterize the Waswanipi region in sufficient detail to have established their extreme variability, and the difficulty of simply describing how the variables relate one to another as they change through an annual cycle, we will now turn to explore a model that links the variables together into an integrated system that can be readily comprehended.

A synthesis of the synoptic data on weather phenomena of the region is difficult, firstly because of the complexity of climatic patterns over North America in general (Hare and Thomas, 1974), and secondly because of the limited summarized data on the weather systems of Quebec (Wilson, 1973:xii). Nevertheless, those climatologists who have given synthesized accounts of the weather of Quebec, or of various regions of Quebec have repeatedly pointed to the need to use concepts such as fronts, storms and storm tracks, and their seasonal patterns if factors such as temperature, cloudiness, rainfall and snowfall are to be understood and related (Hare, 1951:661; Tout, 1964:117 and 121; Wilson, 1973:51; Hare and Longley, 1953:11). The difficulties of presenting such a synthesis however are

Table A9.2-15 Monthly Mean Windchill, Lac Cache, Quebec[1]

Variable	Oct.	Nov.	Dec.	Jan.	Feb.	March	April
Monthly Means for 1951-60	735[2]	949	1158	1253	1229	1104	854
Monthly Mean of Most Severe Year	801	1048	1288	1324	1366	1185	923
Monthly Mean of Least Severe Year	670	827	1092	1135	1099	854	780

Footnotes:

1. From: Wilson, 1973:63, Table 27.
2. Windchill defined as: Kg. cal./m^2hr.

reflected in the frequency with which the models developed have been subject to revision and replacement (Penner, 1955; Longley, 1959; Hare and Thomas, 1974).

Hare and Thomas have recently undertaken to provide a synthesis for the climate of Canada, in a non-technical format. Such a venture is compounded of simplifications, as they indicate, but it does make the overall system patterns clear. Their approach is to present an account of the wind systems and storms that dominate and affect the climates of Canada. The approach we adopt here is to summarize Hare and Thomas' weather systems models for Canada and for eastern Canada in particular.

The model used by Canadian meteorologists is called the three-front model, because there are four airstreams and three fronts separating them (Penner, 1955; Hare and Thomas, 1974:73): the Arctic, Maritime Arctic, Maritime Polar and Tropical airstreams. The first three airstreams are common in Canada. Each airstream has a unique source and has air with particular temperature and moisture characteristics. The Arctic airstream has its source over the Arctic Ocean and northern Canada, and is cold and dry in winter when arctic waters are frozen over, cool and moist in summer when arctic waters are open. The Maritime Arctic airstream, separated by the Arctic front from the Arctic airstream, is a northern branch of the westerlies, that crosses the north Pacific and the rocky mountains in B.C. and Alberta and is cool moist air. In summer the Arctic airstream retreats and is effectively not distinct from the Maritime Arctic. The Maritime Polar airstream is the southern branch of the westerlies which enters the continent along the California coast and which is mild and moist. The front between Maritime Arctic airstream and the Maritime Polar is called the Maritime Arctic front. The Polar front lies between the Maritime Polar and the Tropical airstreams.

In general, it is the disturbances between the airstreams that are related to the daily weather features, the cyclones (lows) and anticyclones (highs) of the synoptic analysis. The cyclones are disturbances of the circumpolar westerlies, are usually associated with the fronts, and are the dominant synoptic systems of the latitude (Hare and Thomas, 1974:76).

At a very gross level Hare and Thomas characterized four types of lows which affect the eastern half of Canada (1974:76-77): Alberta lows, form on the eastern side of the Rocky Mountains on the Arctic and/or Maritime Arctic fronts; Central U.S. lows, which involve the Polar front and which enter Canada most frequently across the Great Lakes; "Arctic cold" lows which form wholly within Arctic air, but which sometimes travel south; and, Atlantic coast lows which travel up the eastern U.S. and which usually affect the maritime provinces and eastern Quebec. All but the Arctic lows are fast moving storms.

By contrast with the lows, the highs bring clear, dry weather to most areas. Cold highs which bring very cold weather in winter and cool weather in summer, consist of shallow domes of Arctic air moving from the northwest into the westerlies. These highs move as quickly as the cyclones and tend to alternate with the latter (Hare and Thomas, 1974:77-78). They are typical of the eastern Canadian climate, and are common in all months except July and August. Warm highs which are most common in summer and fall move slowly across southern Canada from the Pacific and are usually composed of Maritime Arctic or Maritime Polar air.

In winter the strongest high altitude westerlies are located to the south of Canada and the Arctic, Maritime Arctic and Maritime Polar airstreams dominate the daily weather pattern, which can be seen as a sequence of storms.

One series of storms that affects eastern Canada are the cyclones that form over Alberta on the Arctic front, with warmer Maritime Arctic air on the south side and colder Arctic air to the north and behind the front. They move quickly eastward bringing cold Arctic air behind them. They are frequently quite stormy with strong northerly winds in the Arctic airstreams component. Because they pick up moist air in mid-continent, they bring cloud and light snow of up to four inches to eastern Canada for a 24-hour period (Hare and Thomas, 1974:81).

A second series of storms that affects eastern Canada originates on the Maritime Arctic or Polar fronts in the south central U.S. They form warm fronts with moist, unstable air in the warm sector and belts of heavy snow, freezing rain and heavy rain north of the storm center. Twelve inches of snow are common during a brief passage, but because they are less common than the first kind, they probably bring less of the total snow.

A third stream of cyclones that affect eastern Quebec comes up the Atlantic coast. Similar to the mid-western cyclones, they are more intense; but are rare. Hare reports that eastern flows have "striking" and "distinctly foreign" consequences in the normal climate; in winter the backflow of moist air from the Atlantic brings overcast skies, temperatures near the freezing point and drizzle or freezing rain (Hare, 1950a:40-42).

In eastern Canada the storms are broken by fast moving cold highs that bring two or three days of very cold clear weather between storms (Hare and Thomas, 1974:84). About four such flows a month occur on average, one a week, between September and May (Hare, 1950a:65).

At the spring transition westerly storms become less frequent and strong, but Arctic air continues to dominate and the cyclones from the midwest and the Atlantic coast are especially severe storms because of the strong contrast between the warm and cold air sectors. The transition from winter is gradual.

Summer follows a decline of the outflows of Arctic air in eastern Canada, usually in June. In the north of Canada Arctic air is dominant, but it is cool and moist. Summer cyclones bring cloudy weather and rain, severe storms on occasion, and then clear less humid but warm weather. Storms move more slowly than in winter. The low pressure areas passing over the area from the south-west at four or more day intervals. The main storm tracks are further north across Hudson Bay, and the Waswanipi region is often in the warm zone behind the front. Occasionally Tropical air may reach the area from the south.

The upper westerlies increase in strength during the autumn transition and Pacific cyclones become more common. It is the period of maximum westerly control. With cyclones and anticyclones moving with increasing speed and frequency across the country on a relatively northerly track, low pressure areas crossing the region every three of four days (Thompson, 1968). As the season progresses frost becomes more frequent and severe as the air coming south is progressively colder. At this season Arctic air is typically moist, unstable and very cloudy, with rainshowers or snowflurries. The intervening highs are warm and usually dry and of Pacific origin.

D - Conclusions

The general conclusions which I think can be drawn from this review are: that the Waswanipi region exhibits a fairly typical sub-arctic climate, although not a typical climate for its latitude; that like other regions with sub-arctic climates it exhibits great seasonal variations and great year to year variations; that the greatest variability is associated with winter features such as snowfall and snow and ice cover, and especially with the early and late winter transition periods; that variations are common in climatic variables that are important ecologically and from the point of view of human activities; that the processes that underlie the major climatic variations are often continental or global in scope; but, that local micro-climate conditions may be significantly influenced by ecologically determined patterns.

The weather system model gives a picture of the seasonal variation in the types of storms that traverse the Waswanipi region and dominate daily weather conditions, a picture of the temperature and precipitation associated with each of the different types at any one season, and a picture of the typical combinations for each season. The variations in the climatic variables from year to year are probably related to differential frequency of occurrence of the different storm systems from year to year.

Table A9.2-16 Monthly Climatological Data for Seasons with Complete Records, Matagami, Quebec[1]

Data Code*	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.
Hunting Season 1963-1964												
A	36.6	24.7	- 8.6	- 3.0	- 9.0	- 5.9	18.9	37.6	40.5	51.6	46.8	41.2
B	54.9	35.9	11.0	17.9	16.0	21.6	43.9	58.7	66.1	74.8	62.7	57.5
C	45.8	30.3	1.2	7.5	3.5	7.91	31.4	48.2	53.3	63.2	54.8	49.4
D	.5	13.5	15.7	25.5	13.0	25.0	5.0	1.5	-	-	-	-
E	1.06	2.2	-	-	-	-	-	2.83	6.34	3.93	5.35	5.31
F	6	5	5	5	5	5	5	6	5	4	5	4
Hunting Season 1964-1965												
A	31.0	18.2	- 6.3	-18.2	-15.5	- 5.9	15.1	35.8	44.5	45.0	46.8	40.3
B	44.7	30.8	12.6	4.5	9.8	23.0	38.8	57.1	68.2	64.4	64.0	55.2
C	37.9	23.5	3.2	- 6.9	- 2.9	8.6	27.0	46.5	56.4	54.7	54.4	47.8
D	2.7	9.2	24.0	16.2	32.7	3.4	3.6	-	-	-	-	-
E	1.91	1.38	-	.15	.20	-	.17	4.91	2.87	4.48	2.96	4.22
F	4	4	3	5	6	3	5	6	7	7	7	7

(CONTINUED)

Table A9.2-16 Monthly Climatological Data for Seasons with Complete Records, Matagami, Quebec[1] (Continued)

Data Code*	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.
Hunting Season 1965-1966												
A	31.6	13.0	1.0	- 9.2	- 2.1	4.9	21.0	29.9	46.1	49.6	48.0	40.2
B	42.2	27.0	19.8	8.5	18.5	25.9	39.9	51.1	70.7	71.3	66.4	57.4
C	36.9	20.5	10.4	- 0.4	8.2	15.4	30.5	40.5	58.4	60.5	57.2	48.8
D	3.0	16.6	32.6	16.9	8.8	29.6	7.6	3.3	-	-	-	-
E	2.51	-	.14	-	.42	.46	.94	2.03	5.82	6.67	3.55	4.85
F	7	8	6	4	7	7	6	7	6	7	8	7
Hunting Season 1966-1967												
A	31.5	17.4	-1.7	-12.2	-21.8	- 5.3	16.6	29.8	46.50	52.6	49.0	41.8
B	42.2	29.4	14.5	11.9	5.1	22.1	35.9	48.4	71.6	74.0	69.2	62.7
C	36.9	23.4	6.7	- 0.2	- 8.4	8.4	26.3	39.1	59.1	63.3	59.1	52.3
D	5.8	37.4	26.4	32.1	19.9	16.3	1.5	0.5	-	-	-	-
E	4.66	2.62	5.60	.12	-	.05	.45	2.79	1.90	3.54	3.79	3.61
F	7	6	4	6	7	6	6	8	5	3	4	5

* Data Codes

A Mean minimum temperature °F.

B Mean maximum temperature °F.

C Monthly mean temperature °F.

* Data Codes

D Snowfall, inches.

E Rain, inches.

F Wind speed average, m.p.h.

Footnote:

1. From monthly summary sheets provided by Service de Météorologie, Ministère des Richesses naturelles du Québec.

Footnote for Appendix 9-2:

1. For reference to the literature on the interpretation problems of windchill factors, see Wilson, 1973:62.

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APPENDIX 9-3 THE LAND OF WASWANIPI

A - Geology and Topography

The Waswanipi region is part of the Clay Belt, a distinctive physiographic region within the Precambrian Shield, and of the Northern Clay Forest Section within the Boreal Forest Region of Canada. The Clay Belt and Forest Section are the result of the unique glacial history of the area.

Most of the Waswanipi region is underlaid by the Canadian Shield which is formed of some of the oldest rock on the earth surface. They are predominantly acid types (granite, gneiss, and diorite), however there are two belts of archaen volcanic, sedimentary and derived metamorphic rocks.[1] One belt extends to the east from south of Evans Lake along the Broadback River. The other covers the southern portion of the territory, running from south of Lake Matagami, through Olga and Gull Lakes and east north of Waswanipi Lake as far as Lake Waconichi north of Chibougamau. These belts are important because they are rich in mineral resources, and the southern belt has, since the 1950's, been the focus of mining development and its associated urban and infrastructural complexes.

In 1968-69 approximately six mines were operating in the territory and an additional dozen in the general area to the east and southwest. The main mineralsare copper, gold, silver, zinc, lead and cadmium, although a short-lived project also operated during this period to mine iron ore deposits west of Miquelon.

Though the bedrock controls the basic topography, the detail landscape features are the product of much more recent and still continuing processes.

The entire region was glaciated during pleistocene times. The mass of ice had an impact on the bedrock, and where bedrock is visible today it often shows the scars of the process. The erosion denuded summit areas and deposited glacial debris in valleys leaving them partially filled. This enhanced what was probably already a gently rolling generally level surface. Glacial activity also left a number of distinctive features - eskers, morains and drumlinoid features. Eskers, composed of gravel and sand, sometimes with large boulders, are long sinueous lines of materials deposited on river beds under the ice or in crevaces that formed in the retreating ice. They may be 30 to 40 feet in height, 100 feet wide, and may run for several miles or tens of miles. Drumlins are smaller elongated ridges of glacial drift, deposited and then moulded into a "whale back" form by the moving ice.

The glacial retreat probably reached the area south of Lake Matagami about 9,000 years ago, and was probably completed to the north of Lake Evans about 8,400 years ago (Prest, 1970:722-723, figure XII-16q to s).

During and following the glacial retreat, virtually the entire area was covered, possibly intermittently, by part of the great post-glacial Lake Barlow-Ojibway. This lake existed in various forms for some 2,000 years, although in the submergence would have been for a shorter time because the final slow drainage of the lakes was probably completed some 8,000 years ago (Prest, 1970:724, figure XII-16 u and v).

The waters of Lake Barlow-Ojibway, produced by the melting ice, deposited layers of particles of clay and sand over the land. Deposits of large boulders and other materials found here and there in the clay may have been entrapped in bergs of ice on the lake that dropped their materials as they melted (Dufresne, 1913: 13). The clay deposits generally lowered local relief.

Some of the larger hills must have stood as islands in the lake, and others must have emerged as the lake lowered, because clay deposits are not found on some of the higher hills. The lake also formed beaches of sands and gravels at various levels, and several sandy outwash plains (Baldwin, 1958:7-9).

Today, the region is a generally unbroken, relatively level clay plain, punctuated by occasional low, rounded hills. Most of the area is between 200 and 300 meters above sea level, but some hills just south of Olga and Gull Lakes (Dalhousie hills) have peaks over 400 meters. Generally, higher elevations are to the south and east away from James Bay. The Waswanipi area forms the north-eastern sector of a distinctive physiographic and vegetational area that roughly coincides with the bed of the post-glacial lake and which is called the Great Clay Belt.

In the areas of Evans, Suscumica and Matagami and Olga Lakes and south along the Bell River clays cover 75 percent or more of the surface. Over the rest of the area clay and moraine deposits are found with clay accounting for 50 to 75 percent of the surface, except in a small area in the northeast which is predominantly moraine and rock (JBDC-JBEC, 1974:109, figure 12).

i) Drainage and Soils

The clay deposits in the Waswanipi region are relatively impermeable and have a significant influence on drainage, soil formation and vegetation.

Since the drainage of the post-glacial lake the drainage network of the region has been slowly developed, but it is still considered highly disorganized and irregular.

The main drainage channels are the Nottaway and Broadback rivers and their tributaries which drain north and west into James Bay. The Nottaway drainage basin covers a total of over 25,000 square miles, extending south and east of the region under study, as far as the height of land separating the James-Hudson Bay drainage basin from the St. Lawrence River drainage basin. Generally speaking, flows from the east collect in the Waswanipi River which passes through a series of lakes, Waswanipi, Gull, Olga and finally Matagami where they join the flow from the south collected in the Bell River. The Nottaway proper flows from Lake Matagami to James Bay. The chain of lakes dominate the drainage pattern. The

Broadback drains about 8,000 square miles just north of the Nottaway basin and in a generally east to west direction into James Bay. To the north of the Broadback lies the Rupert River drainage. The heights of land are low.

The relatively flat clay plain has been characterized since exposure by the relatively few large lakes, and by sluggish streams and extensive areas of poor drainage and standing water. During the glacial period a thickness of up to 3,000 feet of ice covered the land and the weight of this ice depressed the land by as much as 1200 to 1500 feet (JBDC-JBEC, 1974:111). The post-glacial uplift of the land has resulted in a general reduction of slope for drainage, and it is possible that there has not been an improvement in drainage conditions over the intervening millenia. Drainage basins are not distinctive and it is not uncommon for lakes, at least during the high water periods of the year, to drain into two different drainage basins. Rivers build up banks of well-drained land, but behind these are poorly drained land. Most lakes are shallow, no more than 50 feet in depth, and many are less than 20 feet deep (JBDC-JBEC, 1974:143).

In the Clay Belt much of the standing water collects in depressions where typical bogs may form. The bogs are slowly converted into land by the rings vegetation that grow at the water edge and that deposit organic matter on the bottom and thereby slowly extend the shorelines in to fill up the pond. The innermost layer of vegetation is floating and aquatic, then semi-aquatic and terrestrial-herbeous species, then shrubs and stunted trees dot the outermost bands. The process is continuing because of the relatively brief time since glaciation, and the continuing topographic changes resulting from glaciation.

No specific estimates of the amount of water cover on the land area of this region have been made, but estimates for different parts of the interior of northern Quebec vary from 15 percent (JBDC-JBEC, 1974: 132) to 25 percent (Low, 1896) and Hare found to the west of this peninsula that open water, excluding large lakes varied from 10 percent to 35 percent, and averaged 15 percent (Hare, 1959,55). Because of the post-glacial history and drainage patterns of the Waswanipi area, it is likely that total water cover in the area is toward the higher of these estimates, but that the area of lake surface is smaller. The major lakes and their surface areas are listed on Table A9.3-1.

Table A9.3-1 Surface Area of Lakes in the Waswanipi Territory

Lake	Surface Area (Sq. Mi.)	
Gull Lake	94.7	
Matagami Lake, incl. Suscamica	90.2	
Waswanipi Lake	80.6	
Lake Evans (part)	69.8	
Lady Beatrix, incl. Opatouaga	63.0	
Lac Olga	50.7	
Lake Miacasagi, incl. Max Narrows	35.0	
Lac Theodat	32.6	
Lac Pusticamica	27.2	
Lac Opawica, incl. Wacigabou	25.0	
Father Lake	23.2	
Lac Bouchier	21.2	
Lac Kenonisca	20.7	
Lac Rocher	17.0	
Lac Westcapis	14.6	
Lac Le Gardeur	13.8	
Lac Amisquoumisca	11.9	
Lac Nicobi	11.8	
Lac Salamandre	10.1	
Lac Inconnu	9.1	
Storm Lake	8.9	
Lac Chensagi	8.3	
Lac Ouagama	6.2	
Lac Yapuwichi	4.9	
Lac Montreuil	4.9	
Bachelor Lake	4.0	
Lac Capississit	4.0	
Lac Chabinoche	3.2	
Lake McDonald	3.0	
Total surface area of lakes 3.0 square miles and larger		769.6
Estimate for smaller lakes (5 percent)		38.5
Estimate of total surface area of lakes		808.1

Much of the land is covered with shallow organic deposits, mostly composed of sphagnum moss, but with woody peat beneath. The organic matter has not been incorporated into the soil proper, because decomposition is slow and the soil animals that live in the acidic litter, e.g., mites, do not mix the surface layers of the soil. On the widespread flats where drainage is poor peaty phase gleysols have developed. In upland areas with better drainage gray luvisols have developed on the calcareous upland clays and glacial tills. Sand and gravel (e.g., eskers and beaches) are still found exposed in some places and shallowly buried in others (Rowe, 1972:19).

B - Forests and Vegetation

i) The Physical Controls

The boreal forest which characterizes much of the sub-arctic climatic region is one of the vegetational units of the earth most clearly controlled by physical conditions, climatic in particular. The northern and southern limits of the geographical distribution of the boreal forest correspond respectively to the summer and winter modal positions of the Arctic front, separating the polar and arctic airstreams to the north from the pacific and tropical airstreams to the south (Bryson, 1966:257). The boreal forest is therefore a region of great contrasts, dominated by polar and arctic air in winter and by pacific and occasional tropical air in summer. The fit between the frontal positions and the forest borders is not as good in the eastern and northern parts of the Quebec-Labrador peninsula as elsewhere, probably because of the influence of Atlantic weather (Barry, 1967).

The particular distinctive features of sub-arctic climatic regime to which boreal forest vegetation must be adapted are the annual variability as characterized by the sharp contrast between a short growing season and a long duration of the period of frost, and the great inter-annual variations which alter significantly the duration of the growing season and the frost period from year to year (Hustich, 1970).

The extreme seasonal differences are related to the variations in the energy available from solar radiation during the year. On an annual basis the global solar radiation at the earth's surface is on the order to 95 to 100 kilolangleys (1000 cal cm-2) per year for central northern Quebec (cf. Wilson, 1973:8; and Barry and Chorley, 1976:40) compared to a maximum mean of approximately 150 kilolangleys between roughly 30^{O}N latitude and 30^{O}S latitude (Barry and Chorley, 1976:40), and approximately 180 kilolangleys in desert regions such as the south-western United States (Odum, 1971:42, Table 3-2). The Waswanipi region therefore receives an average of about one-third less solar radiation than the tropics. The reason the difference is not greater is because of the long daylight hours in summer at the higher latitudes.

The insolation arriving at the outer limit of the earth's atmosphere varies with both latitude and dates. The insolation at 50^{O}N on a per day basis on December 22 is calculated to be one-fifth the level of the insolation for the same date at the equator. But by May 6 the daily insolation is greater at 50^{O}N than at the equator, and by June 22 the daily insolation is higher at 50^{O}N by a factor of 1.3 than at the equator (Barry and Chorley, 1976:37). The period of high potential incoming solar radiation in the north is from March to September. This is ecologically important because this is the season in which plant growth occurs. The critical feature is therefore the duration of the period of high insolation levels.

The percentage of incoming solar radiation absorbed by the surface of the earth depends on the cloud cover, and on the reflective power of the earth's surface. Fresh snow can reflect 80 percent or more of the solar energy as opposed to 20 percent reflectance or less for other ground surfaces (Wilson, 1973:9). The effect of cloud can be seen by comparing the values for solar radiation at the ground surface for north central Quebec with Montreal. The greatest difference occurs in October when the cloud cover in the north is particularly dense (Table A9.3-2). The snow cover is especially important in early and late winter. In the late winter the snow cover reflects considerable amounts of energy from the surface, and this is highly variable from year to year because of the differences in the rate and timing of the melting of the snow cover. Similarly during the

Table A9.3-2 Mean Daily Total Solar Radiation for Year and by Season at Central Northern Quebec and Montreal[1]

Mean Daily Total Solar Radiation	Central New Quebec	Montreal
Per Year	260	300-325
Winter Solstice	60-68	100-125
Summer Solstice	450	500 +
In October	130 to 150	200

Footnote:
1. From: Wilson, 1973:8.

autumn transition when cloud cover is common and snow cover is intermittent absorbed solar radiation is highly variable (Wilson, 1973:8-9).

The net radiation is the final balance of absorbed radiation plus and minus exchanges with the atmosphere. The post-winter net radiation pattern in northern Quebec is for a delayed, but then rapid, increase in the spring and a slow, but irregular decline in the fall, the greatest variability being at the beginning and end of winter. The balance is positive during the summer, but negative in winter, when the ground is subject to continuous cooling.

The solar energy that falls during the period when temperatures are below the levels at which photosynthesis can occur is not usable by the vegetation. This amounts to some one-third to one-half of the total annual radiation (Hare, 1973: 255). Approximately sixty percent of global solar radiation is of wavelengths that are not useable photosynthetically.

The solar energy input is therefore less on an annual basis than to more southerly regions, but the difference is less than might be expected because of the lengthening of the days during the growing season. Nevertheless the length of the period with a positive net radiation balance and temperatures at which photosynthesis can occur is short, and is highly variable. The productivity of the vegetation (primary productivity) depends on these factors, as well as on the availability of nutrients.

Primary productivity per unit area is generally low in the sub-arctic, and is a function of the main features of the region outlined above. Available data on various vegetational units have been summarized on Table A9.3-3. The boreal fores is the most northernly of the widespread forest vegetational units, slowly grading into the tundra vegetation further north. As a forest it has a mature biomass, and an assimilating surface roughly comparable to that of temperate zone mixed and summer green deciduous forests and to tropical rain forests, and in strong contrast to the tundra. However, the effects of the short growing season are reflected in the net primary productivity and annual energy fixation which in the boreal forest are approximately half the mean rates of the temperate zone

Table A9.3-3 Boreal Forests Compared to Other Vegetational Units on Mature Biomass, Assimilation Surface, Chlorophyll, Net Primary Productivity and Annual Energy Fixation[1]

Vegetation Unit	Mature Biomass (Kg/m^2)	Leaf Area Index or Assimilating Surface (m^2/m^2)	Total Chlorophyll (g/m^2)	Net Primary Productivity		Annual Energy Fixation Mean (10^6 cal/m^2)
				Range g/m^2/yr.	Approximate Mean g/m^2/yr.	
Tropical Rain Forest	45	6-16.6	3-9	1000-3500	2000	8.2
Summer Green (Deciduous) Forest	42-46	3-12	2-6	400-2500	1000	4.6
Warm Temperate Mixed Forest	24	5-14	3-8	600-2500	1000	4.7
Boreal Forest	20-52	7-15	1.4	200-1500	500	2.4
Tundra	0.1-3	0.5-1.3	0.4-0.6	100-400	140	0.6
Ice Desert	0	0	0	0-1	0	-

Footnote:

1. From: Leith, 1973:312-313,315.

mixed and summer green deciduous forests, and one quarter of the mean rates for tropical rain forests. But, the rates are three to four times the mean rates for tundra, where a vertically much compressed vegetational structure captures and transforms solar energy.

ii) Species and Communities

A major contrast between boreal forests and temperate and tropical forests is the number of tree species comprising the forest. The trees that have adapted to the sub-arctic climate have had to adapt to four features; short-growing season, winter drought, considerable annual variation in conditions, and the lower and variable productivity typical of the region. During the winter the water and the precipitation are frozen as snow and ice and are physiologically unavailable to vegetation, therefore the drought.

The dominant trees of the boreal forest are conifers which are well adapted to these conditions. They have needle shaped leaves, that in all but one species (tamarack) are retained throughout the year. The coniferous needle-like leaf shape reduces convective loss of heat (Colinivaux, 1973:294-5) and prevents excessive evaporation in winter (Kendeigh, 1974:325) making winter retention of the leaves possible. Retention of leaves in winter however captures considerable amounts of snow, and the conical shape of conifers and the flexible branches are well suited to carrying and shedding winter snow (Cloudsley-Thompson, 1975:13; Kendeigh, 1974:325). Because the leaves are retained all winter they are ready to begin photosynthesis as soon as the temperatures are above the threshold for growth and without any delay for leaf growth (Cloudsley-Thompson, 1975:128). Conifers are also able, because they retain their leaves, to carry on photosynthesis during the intermittent warm periods in the fall (Kendeigh, 1974:325). The conifers can therefore make full use of a short and variable growing season. Finally, the confiers pollinate one year and disperse their seed the next, producing seeds only every few years (Cloudsley-Thompson, 1975:128). This allows them to channel energy and nutrients into reproduction during years with favorable conditions and not carry on reproductive growth in other years. Spreading the costs of reproduction out over more than a single growing season allows them to respond to variations in climatic conditions, without losing the reproductive growth that occurs in years when conditions are not good enough to complete successful reproduction.

While it is possible that other adaptations to sub-arctic conditions could evolve, a practical factor limiting such evolution may be the time available since glaciation as mentioned earlier. As with topography and drainage, the plant cover of the region may still be in an early stage of development and in a state of flux and imbalance. Plants could only migrate into the area after drainage of Lake Barlow-Ojibway some 8,000 years ago. Arthur S. Boughey, an ecologist commented after a botanical excursion to portions of the clay belt that the term "climax vegetation seems hardly applicable to any aspects of this community" (Boughey, 1962:73). He pointed out that over part of the area at least, little more than 100 generations of trees have grown since the recolonization of the land. Under these conditions he commented that the most striking feature of the landscape was its newness. As a result, the forest appears to many botanists not to exhibit fixed plant associations, but rather a series of structural or landscape types (Hare, 1950:618; Rousseau, 1961).

From a study of pollen in bogs from the area from the Rupert River south to Clova, east of Senneterre, it is also clear that even during the post-glacial period climatic and soil conditions have varied sufficiently to affect the development of the forests. Present conditions are cooler and more humid than during the intervening period, and forests with white and red pine were common during the warm intervening period. These forests are now only found south of this region. Black spruce and jack pine have only recently replaced white-red pine control, partly because of the temperature changes, but also because increased wetness may have expanded muskegs and favored black spruce (Potzger and Courtemanche, 1956:488,496).

W.K.W. Baldwin, who made an intensive botanical study of the plants of the Clay

Belt, has commented that the paramount factor for the vegetation of the Clay Belt today is the generally poor drainage. A general characterization of the vegetational relations of the region brings this out:

> "The impressive characteristic of the 'Clay Belt' is the seemingly endless stretches of stands of black spruce which cover the gently rising uplands as well as the lowland flats, alternating in the latter position with extensive sedge fens and sphagnum-heath bogs. Tamarack is an infrequent companion of the black spruce except in young stands....Improvement in drainage....is reflected in fine hardwood or mixedwood stands of trembling aspen, balsam poplar (Abies balsamea), balsam fir, white spruce and the black spruce. Jack pine has a dominant position on many of the drier sites...." (Rowe, 1972:19).

Viewed from a larger perspective, the Waswanipi region is part of the broad belt of boreal coniferous forests that extend across Canada, but with a distinctive set of features due to the particular post-glacial history of the Clay Belt. In Rowe's classification of the forest regions of Canada, nearly the entire Waswanipi region is part of the Northern Clay Section (B4) (Rowe, 1972:14).

The forests of eastern Canada may be conceived of as a series of latitudinal zones of irregular width. Most of southern Quebec is in the Great Lakes-St. Lawrence mixed coniferous and deciduous forest. The central band is in the Boreal Coniferous Forest, above which the tundra begins. Within the Boreal Forest a distinction can be made between the closed-crown forest and the woodlands. In the most general terms, the former is characterized by close dense stands of trees with a "closed" canpoy, while the latter, located further north, is an "open" forest with ten to fifteen feet between trees. The Waswanipi area falls entirely within the former zone.[2]

The common species of the flora are vigorous and variable species capable of filling nearly every niche of habitat (Baldwin, 1958:40) and although 53 species of trees occur in the Clay Belt region, less than ten tree species are quantitatively significant components of the forest (Baldwin, 1958).

The single most important species is the black spruce (Picea mariana) which stands in a class by itself since it is by far the most abundant tree in the region (Baldwin, 1958:12). In the southern portion of the Waswanipi region the black spruce comprises 68 percent of the forests according to W.J. McBride divisional forester for the Abitibi concessions, Domtar, Ltd. (pers. comm.). The black spruce is typically only absent or sparse on very dry sites. In addition to its tolerance of wet conditions a major characteristic giving black spruce dominance in cold swampy environments, is the relative lateness of annual growth inception in the spring when frosts are still common (Cook, 1972: 45). The ability of black spruce to replace other tree species and slowly form pure middle aged stands may also be related to its ability to reproduce by shoots from roots and lower branches (Cook, 1972:45).

Trees of secondary importance are balsam fir (Abies balsamea), trembling aspen (Populus tremuloides), jack pine (Pinus banksiana), and white birch (Betula papyrifera) (Baldwin, 1958). In the forests of the southern Waswanipi area balsam fir comprises 6 percent, trembling aspen 7 percent, jack pine 14 percent and white birch 5 percent (McBride, pers. comm.).

Jack pine is dominant on many drier sites, especially sandy outwash deposits, old beaches, eskers, and on sandy burned-over areas. Jack pine may be succeeded by black spruce.

Areas of improved drainage are covered by black spruce in various mixtures with fir, aspen, birch and white spruce (Baldwin, 1958:20). Improved drainage may be due to upland relief, shallowly buried coarse drift or position beside rivers and lakes. The aspens form large young stands on drier sites of burned or otherwise disturbed ground which may develop into mixed aspen - black spruce stands. Aspen has a relatively light canopy which permits a lot of sunlight to reach the forest floor and makes possible growth of a great variety of herbaceous plants, shrubs and seedling conifers (Cook, 1972:62).

White birch characteristically occurs as entensive stands on open sites on shores, rocky areas, burns and hilltops. Often associated with aspen, white birch is also a colonizing tree providing shade for black-spruce to re-establish.

Balsam fir is found mixed with black-spruce forests, mixed also with aspen, birch and white spruce. White spruce is similarly found mixed with black spruce, on the better drained and more fertile soils. White spruce (Picea glauca) seeds earlier than black spruce and is more susceptible to frost damage, particularly in low lying cold swamp environments (Cook, 1972:57).

Tamarack is characteristically a tree of bogs and wet areas where it grows along with the black spruce.

Less numerous species include: balsam poplar (Populus balsamifera) and cedar (Thuja occidentalis). These are the major species growing to tree size in the area, and the last two mentioned comprise only traces, i.e. probably less than one percent each of the forest.

The remaining tree species that occur are found as small stunted trees or as tall shrubs, frequently in high thickets. They include: black ash (Froxinus nigra), speckled alder (Alnus rugusa var. americana), pin cherry (Prunus pensylvanica), green alder (Alnus crispa var. moolis), eastern choke cherry (Prunus virginiana), dwarf birch (Betula pumila var. glandulifera), Bedd's willow (Salix Bebbiana), pussy willow (Salix discolor), and mountain maple (Acer spicatum) (after Baldwin, 1958:14; see also pp. 14-16 for rarer species).

The typical forest landscapes of the territory are revealed by describing the types of forest communities. This description of the forest communities of the Clay Belt is based on Baldwin (1958:16-36) and descriptions of some forest associations made in or adjacent to the Waswanipi area by Dutilly and Lepage (1963:8-13)[3].

Baldwin distinguishes two varieties of black spruce forest that predominate the Clay Belt, one characteristic of the wetter sites, a boggy forest, the other of better drained sites. He estimates 75 percent of the clay belt land surface is covered by these forests, about equally, and that no sharp boundary separates the types.

In the boggy black spruce forests tamarack grows with black spruce and with an undergrowth predominantly of sedges, with varying quantities of shrubs, and a thick layer of sphagnum mosses. These forests are often soggy underfoot in summer, the mosses acting as sponges. Undergrowth is otherwise not dense, but summer travel is slow and difficult.

In the better drained black spruce forests balsam fir, tamarack, cedar, dwarf birch and speckled alder occur. Undergrowth is predominantly sedges and shrubs, with dense shrub layers and moss, predominantly Pleurozium Schreberi. There is considerable variation among these types of forest. In these forests the dense shrub growth makes travel difficult, and the forest is often separated from rivers, streams and lakes by tangled stands of shrubs that are extremely difficult to cross in summer where they form wide belts.

Mixed coniferous-decideous forests, replace black spruce forests on the well-drained sites on hill tops, and after disturbances on better-drained sites. Nearly all species common in the region may occur in these forests. Undergrowth is diverse. In the Waswanipi region mixed forests are especially extensive and well developed, compared to surrounding regions, although still significantly less extensive than black spruce forests.

A fourth forest type is the jack pine forest found on sandy soils, with other trees occurring only secondarily. The undergrowth is predominantly sedges and lichens. The low frequency of shrubs, often the lack of low branches on the jack pines, and the well drained soil make these forests pleasurable to traverse, even in summer, and favorable camping sites.

Plant associations other than forests are primarily located in or near very wet areas or on lands cleared of forests by disturbances.

Many species form thickets in the Clay Belt. Willow thickets are common on low lake and river shores, and in wet openings in the forest. Bogs are numerous, as mentioned earlier, and often occur as openings in the black spruce forests.

In addition to bogs the Clay Belt has other wet areas including numerous marshes, some meadows, and diverse communities along the shores of rivers and lakes where high spring floods, ice movement, shifting substrate, and silting keep vegetational communities in flux. The shallow lakes and streams are also often rich in aquatic vegetation.

Burned areas are widespread in the region as well, but these may best be treated as part of the discussion of forest processes.

iii) Dynamics of the Forest

Baldwin found that if the major factor affecting forest distribution was drainage, the secondary fact and the critical one for forest distribution on upland sites was the forest fire history of the Clay Belt (1958:38). This finding is consistent with the findings of botanists and ecologists that forest fires play a critical and indispensable role in the continuing existence of boreal coniferous forests, and that fire must be incorporated as a key component in ecosystem models of the dynamics of boreal forests (for a recent review see H.E. Wright, Jr. 1974).

It has been concluded, on the basis of an extensive literature survey, that most contemporary black spruce associations in the sub-arctic orginated following fire (Vincent, 1965). MacLean and Baldwin concluded that most of the boreal forest of the Clay Belt have burned at least once in the last 150 years (1959:20). From a study of tree rings in the Ontario sections of the Clay Belt forests MacLean and Bedell found that high fire frequency occurred at intervals of approximately thirty years, with widespread fires "about 1820, between 1850 and 1865, about 1895, and in 1923" (1955).

As there are relatively few barriers to the spread of intense fires, large areas are often burned during these periods, and this pattern is attested to by the even-aged stands of which the forest of the region is now largely composed (Baldwin, 1958:38). This should not however be taken to mean that the forests are uniform, all of the factors discussed earlier - drainage, topography, migration and others mean that within even aged forests there is considerable diversity of habitat.

The general model of boreal forest ecology can be summarized as follows. The most striking feature of the maturing spruce-fir forest is the absence of any adequate preparation to perpetuate itself (Bloomberg, 1950:157). In a maturing boreal forest, specifically the predominant spruce-fir forest, the processes of reproduction, tree growth, energy flow and biogeochemical cycles, slow down and begin to deteriorate as the forest reaches maturity. Spruce regeneration begins to decline after a stand is approximately 100 years old and continues to drop until it is almost nil, while the relatively higher reproduction rate is common for balsam fir, it is still below the mortality rate and cannot replace the loss of trees caused by age, windthrow and other factors. This is the case because as the stand matures and the crown closes and becomes more dense, less and less sunlight reaches the ground and soil micro-climate temperatures decline over the years. This decline is critical in the summers, the only brief period of the year during which temperatures are high enough for organic decomposition to occur. The progressively lower temperatures reduce the activity of soil microorganisms and dead organic matter increasingly accumulates, resting on the soil as a mantle rather than being incorporated into the mineral soil (H.J. Lutz, 1960:458). The moss layer also often grows in thickness. The combined effect is to prevent the seedling rootlets of spruce from penetrating to the mineral soil for nutrients. Fir is similarly affected but to a lesser degree due to the relatively greater length of the taproot of its seeds. Thus, stand density decreases and an increasing number of poorer tree forms occur as reproduction through underground shoots becomes more frequent.

In system terms, the cycling of nutrients is almost brought to a standstill, and the nutrients in the biogeochemical cycle are increasingly "stored" in the undecomposed organic layer where they are physiologically unavailable to the living vegetation. Thus, a point is reached in the maturation of the forest where reproduction is minimal and continued development of the stand reduces its quality. At the extreme of development the forest floor is strewn with undecomposed dead organic material and an especially high fire hazard is created.

Forest-fires are the kingpin of the successful transition from over-mature forest to vigorous new growth, and a new cycle of forest development (Bloomberg, 1950:160). In terms of the biogeochemical cycles, fire "liberates" the nutrients contained in the layers of organic material (particularly nitrogen and phosphorous) and although the total quantity of nutrients present is reduced by combustion, the quantity of available nutrients increases several fold (see Lutz, 1960:459; Heilman, 1966:152; H. Knight, 1966). These nutrients are deposited at the soil surface which is warm and opened after fire and it is from this layer that regeneration begins.

Only recently has this integral and effective role of forest fires in the cyclical development of the boreal forest been fully recognized. Studies of the fire history of the boreal forests from Alaska to Labrador provide evidence for the extensive occurrence of forest fires (Bryson, Irving, Larsen, 1965; Jeffrey, 1961:19; Wilton, 1964:27; Ahlgren and Ahlgren, 1960; and other references already cited). Furthermore while aboriginal man's activity has increasingly proved important for understanding the extent and effect of forest fires on the vegetation of a number of North American ecosystems, e.g. the prairies, the southern pine forests and the eastern deciduous forests (Omer Stewart, 1956; Gordon Day, 1953:340; and Carl Sauer, 1963:223), in the boreal forest natural causes, namely lightning, provide an adequate explanation (Lutz, 1960; Komarek, 1964; Bennett, 1960). Major fires of severe intensity and vast extent which would be associated with the destruction of overmature stands, only appear to occur under certain conditions which include the concurrence of a high availability of combustible material and warm and dry climatic conditions.

The extent of timing of forest fires is therefore a function of the timing of vegetational development, and of climatic variation. In parts of the boreal forest the extent and timing is also significantly related to insect epidemics including especially the spruce budworm, and cycles of 250 to 350 years can be modelled (see my review of this phenomenon and the model I developed for the neighboring Mistassini region, Feit, 1969). In the Waswanipi area budworm outbreaks have not been reported since botanical research began at the turn of this century, and there are grounds to suspect that epidemic outbreaks of the spruce budworm do not occur in the area because they depend on their host tree, balsam fir, comprising ten percent or more of the forest. These conditions do not now exist at Waswanipi and they may not have in the past (McBride, pers. comm.). Other diseases may also be related to fire incidence however. The two most serious besides the budworm are periodic infestations of forest tent caterpillars which can cause widespread defoliation among deciduous trees and shrubs, and the larch sawfly. The latter insect is credited with having changed the composition of muskeg forests in the early 1900's in the Clay Belt from spruce-larch mixtures to predominantly black spruce forests (Baldwin, 1958:44). Infestations have occurred since that time. Whatever the final evaluation of the significance of insect diseases on the fire history of the boreal forest in general, and the Waswanipi area, the fact that extensive and repeated forest fires have a critical role in forest dynamics is now established.

After regeneration of young forest cover following fires, the process of maturation and succession further change the forest composition over time. The problems of succession are complex, however data on the various forest types of different ages give a generalized indication of the changes that occur in the first few decades of regeneration.

Following a fire black spruce regeneration does not generally commence immediately because the freshly burned surfaces may become too hot when exposed to sunlight for successful germination of the seeds (Cook, 1972:47). Following fires several species of herbs and shrubs find conditions suitable to recolonize the burn, and trembling aspen, white birch and jack pine are often the first trees to become re-established.

The heat-sensitive cones of jack pine only release seeds when temperatures are above a minimum of 80°F or below -50°F so that burns may be essential to the release of seeds from these cones (Cook, 1972:49). Trembling aspen responds to relatively light or repeated burning by increasing the number of suckers, and following fire young shoots of aspen are common either from shoots or seedlings established from its easily wind blown seeds. In the northern parts of its range fires have been shown to be vital to the continued presence of trembling aspen in their competition with the conifers (Cook, 1972:63). Similar conclusions have been reached for white birch (Cook, 1972:67).

Black spruce, white spruce and balsam fir all find conditions suitable for re-establishment only in the shade of the deciduous trees or jack pine that establish themselves after burns. Many of the pioneering species will not regenerate in the shade they create.

In the Waswanipi area this succession sequence is followed in both dry and wet conditions but it is less clear in the latter. On well-drained sites forest tree growth is often re-established within five years of burns, and birch, poplar and jack pine dominate the initial growth phase for 20 or 30 years. Spruce and balsam develop then and become the predominant species by about 50 years following the fire; and by 70 years the forest is established with mature trees and approximately similar composition to that which preceeded the fires (McBride, pers. comm.). Jack pine predominates on sandy areas permanently. In low lying areas, alders are the first growth followed by spruce. In these areas however the spruce may never, or only very slowly return to former numbers (McBride, pers. comm.).

McBride reports that in forests 6 to 25 years old, after disturbances, hardwoods comprise 28 percent and spruce 46 percent. By seventy years after disturbance the percentages return to the average distributions cited earlier 12 percent hardwood, 14 percent jack pine, 6 percent balsam, and 68 percent spruce. The changes in the mixed-aspen, birch, spruce, fir type are clear in the emprirical yield data calculated from the tables given by MacLean (1962:62) for Ontario Clay Belt forests. Hardwood trees decline from 46.5 percent in the 30 years age class, to 34.5 in the 50 year age class to 26.0 in the 70 year age class.

The decay of the forest following maturity is also clear in the tables provided by MacLean. In the black spruce type the hardwoods and soft woods other than spruce decline in volume per acre after approximately seventy to eighty years, on all but the wet peat sites. In the mixed forest the basal area per acre and volume per acre decline for softwoods and hardwoods after 80 to 90 years, with the exception of balsam fir - for which only volume values are available - which continues to increase (1962). Baldwin, cites the suggested rotation ages for the various species as an indication of the course of maturation on changing the composition of the even aged stands characteristic of the area. The Handbook of Biological Data gives the actual age ranges: trembling aspen 70-100 years, white birch 80-100 years, balsam fir 100-150 years, black spruce 150-250, white spruce 150-350, tamarack 100-200, cedar 300-400, and jackpine 80-150 (Spector, 1955: 185). Using the lower figures, total forest growth could decline with the colonizing species 80 years after fire, and black spruce could be over-maturity after about 200 years.

Other factors also affect the composition and history of the forest on a more limited scale. One of these is windthrow. Many of the tree species of the region are shallowly rooted, and at the edges of dense stands strong gusts of winds can blow-down individual trees and small groups of trees. Even where the wind does no more than tilt trees this may be enough to eventually topple the tree, especially conifers. During the heavy snowfalls in winter, considerable snow accumulates on the branches of coniferous trees. With rains or melts the accumulated weight can be sufficeint to topple a "leaning" tree. Patches of blown-down or "weighed-down" trees are common in the black spruce forests and Baldwin has concluded that windthrow is a considerable factor affecting the composition of the vegetation (1958:42).

The dynamics of the development and history of the boreal forest raise general questions about the overall organization and integration of high latitude ecosystems.

The dynamics of the boreal forest ecosystem indicate that the forests of this region are continually undergoing processes of extensive change and do not exhibit the typical pattern of development toward a stable climax. This has been called by some botanists a moving climax, but the term seems inappropriate because this climax is the phase in forest development which is most likely to undergo radical transformation. The major controlling factors at various stages in the process are physical factors which are beyond the control of the ecosystem. Nutrient cycling goes through a bottleneck and release phase, and the ecosystem as a whole appears to have crude or rough control mechanisms rather than precise controls. The dynamics of the development and history of the boreal forests indicate that high latitude ecosystems do not appear to have evolved towards simple equilibrium maintaining states.

Footnotes for Appendix 9-3:

1. A small and isolated area of limestone outcrop of Paleoeozoic sedimentary origin occurs at Lake Waswanipi.

2. In the various climatic, bioclimatic, biogeographical and life zones proposed for the Quebec-Labrador peninsula, the Waswanipi region would be classed as follows: climate, temperate zone (Villeneuve, 1948); bioclimatology, temperate superior zone (Rousseau: 1952, 1961, 1964 and 1967); life zone, biome coniferien (Ouellet: 1966:184); phytogeography, clay-belt section of the southern spruce region (Hustich 1949b:48 and 52; 1949a, 40 and 42); and boreal forest zonation, forest sub-zone of the main boreal forest (Hare, 1959:24; see also 1950b).

3. Modern study of the vegetation of the Waswanipi region began after the second world war. In 1946 A. Dutilly and E. Lepage descended the Harricana River making botanical surveys and collections. In 1952, Ilmari Hustich collected samples of the Bell River at Cedar Rapids, just to the south of the study area. Also in 1952, W.K.W. Baldwin and A.J. Breitung collected along the Bell River and in 1954 Baldwin made a botanical survey of Lakes Waswanipi and Matagami. This represents the first botanical collecting in the area of our study, to our knowledge, since Robert Bell's exploration at the turn of the century. In 1957, E. Lepage and A. Dutilly traveled from Senneterre to James Bay along the Bell and Nottaway rivers on a vegetational study. The results of Baldwin's work are included in his monograph on the plants of the Clay Belt (1958). Dutilly and Lepage have published a short article (1958), and the major results of their study in 1963 (see also 1952 on the study of a region to the west of Waswanipi).

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APPENDIX 9-4 THE BEHAVIOR OF MOOSE IN RELATION TO THEIR ENVIRONMENT: DISTRIBUTION, MOBILITY AND DAILY ACTIVITY PATTERNS[8]

Scientific knowledge of moose has rapidly increased in the past two decades especially as a result of the adoption of an ecological framework for research. The first major monograph was published in 1955, Randolph L. Peterson's North American Moose, and it indicated the weaknesses and gaps in the data available at that time. That gathering together of the existing data, provoked in part by the decline of North American moose populations during the 1930's and 1940's, was a stimulus to new research. Much of the recent additions to scientific knowledge have been summarized during the 1972 conference on moose held at Quebec City from which the papers were published in Le Naturaliste Canadien (e.g., Bishod and Rausch, 1974; Bouchard and Moisan, 1974; Brassard et al., 1974; Cumming, 1974a, 1974b; Gasaway and Coady, 1974; Geist, 1974; Kelsall and Telfer, 1974; Lent, 1974; LeResche, 1974; Peterson, 1974a; 1974b; Peterson and Allen, 1974; Ritcey, 1974; Simkin, 1974; Wolfe, 1974; and others). Awareness of the significant historical changes that have occurred in scientific understandings of moose ecology, behavior, productivity and management is important for understanding the earlier anthropological studies of Indian moose hunting. Earlier accounts based on the scientific literature, such as Peterson (1955), are now in need of substantial revision in the light of the new research results.

A - Geographical Distribution of Moose

Moose is a circumpolar animal, associated with the expanses of boreal forest that encircle the globe. The species,[1] however, is not associated with extensive stands of the climax coniferous forest, but rather with the sub-climax stages of forest growth and development, particularly the stages of shrubby growth and deciduous stands (Banfield, 1974:396). It also commonly inhabits alder swamps and lake shores in summers. Its primary habitat is therefore mixed woods of coniferous and deciduous growth, and openings in the dense coniferous forest (Seton, 1925-28, Vol.3:172).

While it was formerly thought that moose may still be slowly expanding their range out from the refugia they occupied during the maximum extent of the glacial advances, and that this slow expansion may have been due to the low rate of reproduction (Peterson, 1955), recent studies have concluded that "moose populations are constantly expanding or contracting" (Kelsall and Telfer, 1974:118).[2]

Previously, observers who had been unable to discern a pattern in the records of population fluctuations and changes in the extent of moose range have concluded that moose movements were without pattern and "nomadic". The more recent studies have however concluded that moose behavior does conform to significant, but complex patterns, and can be analyzed as a positive functional adaptation (LeResche, 1974:394).

Summarizing recent viewpoints, LeResche says that moose have evolved as an opportunistic species, adapted to inhabiting and re-inhabiting the temporarily favorable sub-climax habitats periodically created by fires and other disturbances (1974:408). Studies of moose population distributions, home ranges, movement patterns, reproduction and response to climatic variables all indicate features that permit moose to respond to a changing habitat.

Moose behavior itself is highly plastic, but not erratic. Behavior patterns may be different under differing conditions of moose population density, nutritional adequacy of the diet, climatic severity, predation and hunting pressure. When these environmental variables are taken into account the variability of moose behavior appears organized and adaptive.

This is consistent with the general features of sub-arctic ecological systems. As noted above, these systems have been described as relatively simple, but resilient and it has been suggested that the species that inhabit such an environment will exhibit particular features that are adaptive to these conditions. Recent studies of moose behavior have revealed many features that are adaptive in just this sense.

Studies of moose populations in relation to vegetational cover have repeatedly shown that fire and the following early stages of vegetational succession are the major positive influence on moose numbers (Bishop and Rausch, 1974:589). Long-term maturation of the vegetational cover (Peterson, 1953:31) as well as extreme snow conditions (Bishop and Rausch, 1974:590) are the major factors in the decline of moose populations.

Studies of moose foods and food preferences indicate considerable seasonal variations in types of foods eaten and feeding habits. Moose are primarily browsers, in summer stripping leaves off twigs, in winter eating the terminal twigs and branches (Banfield, 1974:396), and many important foods of moose are found only in the early stages of forest growth of the boreal forests (Peterson, 1953:31).[3]

However, the presence and densities of moose in particular habitats is influenced by a number of factors yet to be discussed, including protective cover and snow conditions, and the actual composition of the diet appears to be influenced by the availability of the food species in the habitats occupied by the moose rather than the food preferences as such (Peterson, 1953:22). Nevertheless, the quantity and quality of food available for browsing is a significant factor limiting moose distributions.[4] As the forest approaches maturity large moose populations cannot be sustained on the quantity of browse available (Spencer and Hakala, 1964:15-16). Twenty years following a fire, conditions may start to decline, although suitable and favorable conditions may occasionally continue for sixty to seventy years depending on the regeneration patterns (Spencer and Hakala, 1964:30; Spencer and Chatelain, 1953:546).

Despite the fact that moose find browsing conditions favorable following forest fires, they do not usually frequent large burned areas (Peterson, 1955:159). Moose apparently require access to older forest stands for adequate cover.

Ideal moose habitat is a mosaic of vegetational cover, providing suitable conditions for food, cover and snow conditions (to be discussed below)

(DesMeules, 1964:59; Telfer, 1970b:70; Cowan, Hoar and Hatter, 1950:270). The use of habitat suitable for moose is affected by the patterns of moose home range and migration behavior.

The home ranges of moose in any given season are consistently small, seldom exceeding two to four square miles in any type of habitat (LeResche, 1974:395). Seasonal home ranges are used repeatedly by the same moose, which tend to return year after year at the same season (1974:397). There are limited data to suggest that these patterns may exist over several generations. Routes between seasonally distinct home ranges may be used repeatedly (LeResche, 1974:404). There is some suggestion that routes may follow particular topographic features particularly ridges in winter, and streams or lake shores in summer (Murie, 1934:16). This pattern of localized winter ranges and migration patterns have led to the view that there are segregated, localized breeding groups of moose that should be considered as isolated populations rather than parts of larger, wider ranging populations (LeResche, 1974:409-410).[5] The plasticity of moose behavior therefore appears to be related to the development of distinctive behavioral "traditions" among relatively distinct small breeding populations.

As long as habitat conditions remain relatively stable the movement patterns of the population segments also appear to change little from year-to-year (LeResche, 1974:411). Within each population however, yearling home ranges tend to be larger than those of older moose, yearlings may move about more, and it has been suggested that yearlings may commonly tend to expand into new areas when they become available (1974:396). Such occupation of new habitat, however, occurs relatively slowly, and LeResche suggests that this is likely due to the general traditionality of movement patterns (1974:409).[6]

LeResche suggests that the overall patterns of movement of the different populations and age groups of moose are related to the establishment of favorable energy balances (1974:411), and this suggests that they are related to several factors not only including food and cover, but also to climatic factors that affect energy balances directly or that affect the costs of feeding and movement, most importantly snow conditions.

As the depth of the snow cover increases the energy cost of living for moose also increases, and the efficiency of feeding activity, i.e., the amount of food browsed per unit of energy expanded goes down (Geist, 1974:532). During winter, when only low quality food is available, snow conditions can decrease moose mobility and food intake, and typically result in a negative energy balance for the animals (Gasaway and Coady, 1974:248). To survive, moose use up body deposits of fats and proteins (Gasaway and Coady, 1974:256). This is reflected in a typical patterns of weight loss during the winter and weight gain in summer, re-establishing body stores (Gasaway and Coady, 1974:254; also see discussion in Appendix 8-1).

In the past moose were considered to be animals that had no special morphological or behavioral adaptations to snow, although the species was able to exist in snowy regions. Recent studies have shown that moose have definite morphological and behavioral adaptations to snowy regions (DesMeules, 1964:51, 59).

The critical physical features of moose that are related to snow conditions are leg length, chest height and weight load of the feet (Coady, 1974:422). In general the long legs of the moose are important adaptations to snow. However, moderate snow depths can make movement difficult, and deep snow can significantly affect moose behavior. When snow is sufficiently deep that moose have to "plow" through the snow, the energy cost of movement may be greatly increased (Coady, 1974:422).

DesMeules suggests that moose have evolved a form of behavior that allows them to inhabit the more preferable habitats throughout the winter, even in areas of very deep snow accumulation (1965). Moose inhabit areas favorable for cover and feeding until snow accumulations in these areas become restrictive, and then they tend to move to the most favorable areas among the areas with less restrictive snow cover (DesMeules, 1965).

The drift of moose during the course of winter to more restricted habitats with lower accumulations of snow usually has the consequence of progressively concentrating the moose population. Moose have long been known as solitary animals, with relatively little developed gregarious instincts (Peterson, 1955:107). Behavior in response to snow conditions tends to offset the lack of specific herding behavior and bring moose together into winter yards.

In New Brunswick it was found that moose used 67 percent of the available range in June, but were restricted to only 15 percent of the range in March, and the portion used was related to existing snow conditions (Telfer cited in Prescott, 1968:132). In New foundland winter yard densities five to ten times normal summer densities have been found (Bergerus and Manuel, 1968:745) and similar increases have been reported in the studies in the U.S.S.R. (Nasimovitch, n.d.: 59). The latter study indicated a rough doubling of the number of moose comparing October to February group sizes with March group sizes (Nasimovitch, n.d.:212). Nevertheless, the particular snow cover conditions and distribution in any region lead to locally distinctive redistributions of the moose populations in winter. For example, in Laurentide Park, Quebec, moose groups tended to break up as snow depth increased (DesMeules, 1964:58).

The actual extent of geographical restriction which will be found in moose population in winter, and the particular forest cover and topographical conditions in which the yards will be found depend on the distribution of local snow conditions and other factors. Thus no single pattern of location characterizes all regions. Moose respond to the particular conditions in a given region, the principle being that they seek out the most suitable snow cover conditions as the snow cover becomes restrictive. However within each region the behavior appears to be consistent.

In Nova Scotia the most frequent winter locations were on gentle slopes on the middle and upper one third of hills (Prescott, 1968:35, 38-40). These were areas on the interface between the predominantly hardwood top of the hills and the predominantly coniferous slopes (1968:134). Another study suggested that the surrounding ridges may provide shelter from wind (Telfer, 1967a:488). On

Isle Royale, in Michigan, moose were reported to frequent both spruce-fir forest, and gently sloping south facing successional vegetation, especially along shorelines in mid-winter (Peterson and Allen, 1974:487). They may also be found on higher ground and ridges (Murie, 1934:16).[7]

In recent study of a small number of winter moose habitats in La Grade River Basin in the James Bay region of Quebec, some distance to the north of the Waswanipi region, it was found that eleven sites inhabited by moose in February had a number of distinctive characteristics. The topography of the sites was predominantly upper and middle portions of hills, six and two sites respectively, with a smaller number on low land, three sites (Audet, 1976:23, Tableau 11). The slope was generally medium or low being less than 10 percent in seven cases and less than 15 percent in all but one case. The dominant exposures were west and southwest (three cases each) and the secondary exposures were northwest (two cases) and north (one case); two cases were on flat land (Audet, 1976b:26 and 23, Tableau 11).

The data on vegetational cover were fragmentary and indicated considerable diversity. In nine cases there was a tree cover, seven being spruces or spruces and fir (one case), one case was mixed spruce and birch, and one was poplar (Audet, 1976b:26 and 23, Tableau 11). In two cases the site had no tree cover. None of the forested sites occurred in closed forest, most were in clear forest (5) and in open forest (3) with 30 to 70 percent coverage of the ground. All sites had either large or small shrub cover, the dominant species being deciduous: alder, dwarf birch, willow and Pennsylvania cherry (Audet, 1976b:23, Tableau 11, and 21-22, Tableau 10). The vegetational cover of most of the sites was of fire origin and they were therefore young stands, estimated to be between 10 and 60 years old (Audet, 1976b:26). However, the study area is characterized by lower snow and by a more open boreal forest than the Waswanipi region. This may require a lower degree of selectivity of specific yarding conditions than would be typical of the Waswanipi area.

In a recent mid-winter aerial survey of moose in the southern James Bay territory, which included that section of the Waswanipi area which lies north of

$50^{o}30'$N, the moose yards identified were plotted on forestry maps, and the distribution of moose in relation of forest types determined. However, topographic features were not noted. In the sector that included the northern portion of the Waswanipi traplines the densities of winter moose yards were highest in deciduous forests of all ages (33.6 moose per km^2), and then in young and regenerating forests, both mixed (27.4 moose per km^2), and coniferous forests (17.1 moose per km^2). Densities were lower in mature mixed forests, bogs and denuded areas, mature coniferous forests and burns, in decreasing order of density (Audet, 1976:21, Tableau VI). However, because the coniferous forests, both young and mature, and the bogs and denuded areas were much more widespread geographically than the deciduous and mixed forests and the burns those four forest types accounted for 92.9 percent of the estimated moose population (Audet, 1976:21, Tableau VI). The features which stand out from all these findings are: the relative importance of topography, as well as vegetational cover; the predominant use of the middle and upper sections of gentle hillsides; the use of forests without a closed crown; the presence of shrub growth; the characteristic youth of the vegetational cover in dense areas, and the preference for deciduous forests.

B - Mobility of Moose and Snow Cover Conditions

Several recent studies have shown that winter moose behavior, habitats and movements are related to snow conditions. The major adaptation of moose to conditions of deep snow and/or crusting is a modification of behavior, particularly restricted movement.

During winter moose move less frequently, travel shorter distances, and occupy smaller home ranges than in summer (Coady, 1974:430-1). A study of moose tracks in the Kola peninsula in the U.S.S.R. indicated that in fall with a snow cover of up to four to eight inches, moose travel three to four miles per day. In March, with a snow cover of 26 to 27 inches, the total length of daily movements was 0.4 to 0.6 mile, and the animals spent less than 2 hours a day walking (Nasimovitch, n.d.:56).

The first mobility problem moose encounter as snow accumulates is the difficulty of lifting their feet from the holes they make and carrying them forward in deep snow (Nasimovitch, n.d.:14). This occurs when the snow is deeper than the flexed leg joint. The second problem for mobility occurs when the chest and belly of the moose drag in the deeper snow. A third problem arises when snows are crusted. Crusts that can support the full weights of moose are uncommon. Thus, density cannot offset completely the effects of deep snow cover. However, density is a factor on its own when crusts form. The crusting of the snow creates a danger of abrasion and is probably the most dangerous situation moose face. When the crust is higher than the joints flexed as the moose runs, the legs scrape against the ice at the edge of the hole made by the leg and sever injury to the legs can occur within a short distance (Peterson, 1955:109; Nasimovitch, n.d.:27).

Winter snow cover conditions not only influence general moose mobility they also influence the spatial and temporal distribution of daily behavior pattern.

When moose rest they apparently seek areas with relatively good cover protection from the wind. Studies suggest these areas also usually have a sufficient deep snow cover to have an insulating value for the moose, but a cover that is not deep enough to restrict mobility (DesMeules, 1964:55; Kelsall and Telfer, 1974: 125). DesMeules compared five vegetation cover types in Laurentide Park, Quebec, on a scale with increasing snow accumulation: the area immediately beneath a large coniferous crown in a coniferous or mixed stand, the small space adjoining coniferous crowns, the opening in the canopy of a softwood or mixed wood stand created by a deciduous white birch or trembling aspen, hard wood stands or cutovers - where there are relatively large areas without conifers, and areas covered with a dense stand of young balsam fir saplings (DesMeules, 1964:53). In early winter before deep snow was widespread most beds were located in areas with soft and rapidly accumulating deep snow, where moose were able to exploit the insulating properties of the snow cover to insulate themselves from the windchill (DesMeules, 1964:55). Moose apparently tend to choose the down-wind side of large trees (Prescott, 1968:45). On average the moose beds were located five feet from a tree, and in over two-thirds of the cases it was a balsam fir (Prescott, 1968:45). The conifers were predominantly balsam fir in the study area.

When moose travel in deep snow conditions they tend to follow sites where snow is less deep and less dense (Nasimovitch, n.d.:17). In the Laurentide Park study, it was found that moose tended to walk in the snow depressions that form under the larger coniferous trees, and the deeper the snow was the closer the animals tended to walk to the trunks of the trees (DesMeules, 1964:56).

Because there may be few areas of lower snow accumulation when the general accumulation is high there is a tendency, when high snows restrict moose to a limited area, for packed paths to develop between feeding and bedding sites, through repeated use of the same course (DesMeules, 1964:56). Similar results have been reported from the U.S.S.R. (Nasimovitch, n.d.:16).

Certain local man-made alterations which affect the snow cover may as a result significantly affect moose winter distributions. Railways for example form openings in the forest where winds, at least under favorable conditions, tend to reduce the snow cover, affording easier travel and exposing more browse for use (Rausch, 1959:56). The trains themselves effectively clear a path through the snow. In an Alaskan study, it was found that moose tend to concentrate in the choice browse areas along the railroad right-of-way, and also use the plowed roadbed as a path during deep snow cover (Rausch, 1959:1). Because of this, trains kill a number of moose and in winters with severe snow conditions the rate of use of the roadbed increases and a higher number of moose are killed (Rausch, 1959). Finally, severe snow conditions may not only restrict moose mobility, it is possible certain areas are effectively uninhabitable for moose because of snow depths. Moose will not normally venture into areas with snow depths over about 47 inches, except to cross narrow areas. If moose are in such depths serious difficulties arise and the moose are generally confined to paths and areas where the snow has been packed down (Telfer, 1970a:557, Figure 3). Under such conditions available browse can be quickly consumed and severe negative energy balances can occur. While moose can apparently survive several weeks under such conditions, death from physical deterioration is not unknown under severe snow conditions.

Studies in British Columbia indicate that deep snows appear to be a major factor affecting moose abundance (Edwards, 1956:164), and it has been argued that such conditions are not just an occasional phenomenon but a major and recurring condition (Edwards, 1956:165). It has also been suggested that the actual distribution of moose may be limited by snow conditions and that some of the changes in moose range may be related to changes in snowfall conditions (Nasimovitch, n.d.).

C - Daily Activity Patterns of Moose and Daily Weather Conditions

The scientific reports on moose distributions and moose mobility raise questions about the previous characterizations of moose as highly erratic animals, lacking the behavioral patterns that make other ungulates predictable. It had been stressed previously in scientific accounts of moose that they lacked a well developed "gregarious instinct", showed no clear patterns of migration or seasonal movement and were generally unpredictable (Peterson, 1955:101, 107, 111; Formozov, 1946:85). I have already shown that recent researches indicate that this was not the case with respect to seasonal distribution and mobility behavior, it remains to characterize the general behavioral comportment of moose, and their responses to hunting.

Moose are active both during the day and night, but spend most of their time lying down rather than moving or feeding (Murie, 1934:16-17). During daylight hours moose have been observed to show four peaks of activity, mainly for feeding and movement (Geist, 1963). During summer feeding time comprised ninety percent of the activity periods, which averaged close to thirty minutes each or a total of two hours a day (Geist, 1963:410). In winter activity periods were considerably longer, averaging 90 to 100 minutes, presumably because of slower mobility, but resting periods were of approximately the same length as in summer, averaging between 140 to 160 minutes (Geist, 1963:413). The standard winter pattern is therefore for feeding periods of about one and half hours to occur four times during the day, and to be separated by two to three-hour resting periods during which the animal chews its cud (Geist, 1963: 410).

There is usually pronounced activity at dawn and dusk (Denniston, 1956; Hosley, 1949:15), when two of the daily activity periods typically occur. Because the moose often move at these two times (Murie, 1934:17), these periods tend to be longer than the two mid-day activity periods (Geist, 1963:410). It has commonly been noted that moose are seen more frequently during morning and evening hours than at other times, and this would appear to be the result of these patterns of activity. Indirect evidence suggests moose also move during the night (Geist, 1963:411).

Moose are reported to move about less on windy days and are especially active on days following stormy weather (Banfield, 1974:396). Regardless of temperature, in high winds moose seldom venture into the open, and while evidence is limited, observations indicated that the moose move to thicker stands of trees during high winds (Dodds, 1955:47-48). In Montana, it was also observed that moose withdraw to coniferous timber just before or during winter storms, and that they were more frequently observed on the second morning following a storm in the open areas adjacent to the forest than at most other times (Knowlton, 1960:166). However, scientific data on moose behavior in relation to weather conditions remain fragmentary.

Moose response to disturbances is related to the differential use of the senses. The eyesight of the moose is not good, and of relatively little use in detecting danger, but the sense of smell is highly developed and is used to detect the source of the disturbance and response to it (Murie, 1934:14). Hearing is used to detect disturbances (Murie, 1934:14), sight is used to investigate disturbances, but smell is the stimulus which causes immediate reaction (Peterson, 1955:102). Moose habitually stand up when disturbance is detected and orient themselves toward the source of the disturbance trying to get its scent (Denniston, 1956:114; Geist, 1963:405). It has also been noted that ungulates in general keep their heads and/or sides into the wind, so that the wind penetrates less under the hair (Nasimovitch, n.d.:215). This means, that if disturbances occur downwind of the animal, it will rise and then have to turn toward the disturbance. This delay in taking flight is not common to other ungulates (Denniston, 1956:114).

During the fall rut moose are considerably less wary than at other times of the year. Male moose lose much of their alertness and fear and they eagerly investigate sounds which would have aroused suspicious interest at other time (Murie, 1934:20). During this period bulls travel relatively more widely than at other times (Hasley, 1949:4).

In summer, at least, if an observer is downwind of the moose but is visible to it and avoids loud noises or quick motions, moose may tolerate the observer's presence for hours, and may themselves approach to investigate the observer (Denniston, 1956:114). Distance seems to be a factor affecting moose response as well as the senses involved. Very close approach will usually, but not always, put moose to flight (Geist, 1963:406).

When moose do take flight, they tend to flee over particular habitat or topography, at least in winter. In Laurentide Park moose were observed in early winter to flee into extremely dense coniferous stands in the sapling stage (DesMeules, 1965:85). The moose were able to run well through the tangles of low-lying branches, covered with loosely packed snow which collapses under foot, but potential predators such as wolves would probably have difficulty negotiating such conditions (DesMeules, 1965:90). When snow conditions were high enough to confine moose to yards and to the paths established in them, moose took flight by running into established paths until they come to a dead end, and would turn to face the pursuer (DesMeules, 1965:90; Nasimovitch, n.d.: 17). They would display the "rage" pattern and prepare to defend themselves by kicking with the front feet (Denniston, 1956:111). The flight pattern is probably as pliable as other moose behavior patterns and is responsive to local conditions. In the U.S.S.R., for example, it has been reported that moose use stream and river ice, where snow is less deep and more compact, for escape (Nasimovitch, n.d.:17).

When moose take flight it is characteristic of them to stop and look back periodically (Geist, 1963:406). Moose can run at up to 35 miles per hour (Banfield, 1974:395) although a normal gait is 20 to 25 miles per hour (Peterson, 1966). Moose however, do not usually run for long distances after fright, and when they pause they may stand alert for some time (Geist, 1963:406). When moose are pursued through deep snow, and start become overheated, they eat mouthfuls of snow (Nasimovitch, n.d.:246). Snow appears to be the major source of water for moose in winter (Prescott, 1968:40), and may be a secondary means of regulating body temperatures.

When definding calves or yearlings, cows tend to move to the rear of the young when pursued to protect the area most vulnerable to attack, and the young must break trail which slows the movement of the pair (Peterson and Allen, 1974:489). The unusual pattern of delayed response to disturbance, and the slow retreat of moose with calves, may be related to the fact that there are few predators of moose (Denniston, 1956:114).

The main predator of moose are wolves, but losses of moose to predation are low compared to that of other ungulates (Nasimovitch, n.d.:229). Moose are most vulnerable in late winter when they are in the worst condition, and when snow densities and crusts may be sufficient to confine moose, but support the wolves on the surface of the snow cover (Nasimovitch, n.d.:218; Peterson, 1955:174). Wolves tend to kill older and weaker animals, and also a higher percentage of calves (1955:176). The distinctive fright and flight patterns of moose do not therefore make them especially vulnerable to predation by wolves.

The size and strength of moose seem to protect them, in general, from other natural predators, with the exception of men who may find it easy to hunt moose under the right conditions, because local populations of moose have predictable and "traditional" patterns of behavior.

Footnotes for Appendix 9-4.

1. The moose is the largest living member of the deer family (Banfield, 1974: 395). There are four sub-species recognized in North America, those of Quebec are classified as Alces alces americana, a medium-sized race (Banfield, 1974:398). Full-grown animals stand 5.5 to 6.5 feet high at the shoulders and males weigh 750-1400 pounds, female 500-900 pounds (Peterson, 1966:326).

2. Data from the Waswanipi region support this interpretation. In the recent historical period moose are reported to have entered the area between approximately 1910 and 1920. Although there are no reports of moose from the region in the 150 years previous to 1900, the first European to traverse the area, Père Albanel, reported seeing moose tracks and moose signs at Nemiscau during his descent of the Rupert River, in 1672 (Thwaites, 1896-1901, Vol.56:183). At the present moose extend almost as far north as Fort Chimo, near 57°N latitude in Quebec (Brassard et al., 1974:68).

3. The winter diet generally consists of willows, balsam fir, red osier dogwood, mountain ash, aspen, birch, balsam, poplar, pin cherry, maple and virburnum (Banfield, 1974:396; and Peterson, 1955:127-134). Spruces and pines are not normally moose foods (Peterson, 1955:130). Of the primary winter foods, only the balsam fir is a species of the typical mature boreal forest, the rest are deciduous species most common in the early stages of forest regeneration. The summer diet of moose is composed primarily of aquatic plants, forbs, grasses, and the foliage of the trees eaten in winter time (Banfield, 1974:396), with the exception of the conifers which are eaten very little in summer (Peterson, 1955:116). Aquatics and particularly water lilies are important summer foods (Peterson, 1955:116).

4. Adult moose have been found to consume 35 pounds of dry weight of food daily (Peterson, 1955:114), and in general require five pounds per one-hundred pounds of moose weight per day (Banfield, 1974:396). During the early years of development of the vegetational cover, following fire or other disturbance, the quantity and quality of browse for moose are high. Studies have suggested that following fires heavy browse growth occurs in about seven years, and maximum growth in about fifteen years, so that generally stable conditions continue from about 9 to 20 years after the fire (Spencer and Hakala, 1964:15-16; Dodds, 1955:35). During this period shrubby growth will have been established as well as young deciduous trees. As the deciduous trees continue to grow they start to become so tall that moose cannot reach them to browse (Miller, 1963:27). Coniferous trees start to form an under-growth, eventually replacing the deciduous trees on many sites. In addition, as the forest crown closes, it tends, on many sites, to lead to a reduction of the density of the shrub layer and also of growth and foliage on the lower section of the trunks of trees (Peterson, 1955:153). It has been suggested that moose can browse up to about nine feet above the ground or dense snow level (Miller, 1963:27). In a quantitative study of availability of food

Cowan, Hoar and Hatter compared a six-year old burned site, an intermediate forest site and a mature forest site in Alaska, and found that the browsable vegetation on the site where the forest was mature was less nutritious and smaller in quantity than that in the younger stands (1950:269-270). Scoter has demonstrated supporting results (1964:48, Table 4).

5. For example, in western Canada and Alaska several moose populations may intermingle during one season of the year, but segregate in different habitats at other seasons. There may therefore be considerable variety in seasonal migration patterns and habitat use between different local sub-populations (LeResche, 1974:406). Each movement pattern usually correlates with one climatological or habitat-related factor or another (1974:406), and the different patterns may each be well adapted to exploiting localized favorable habitats and conditions.

6. A study of moose expansion in the Labrador peninsula, quoted by LeResche, has indicated a dispersal rate of about six to fifteen miles per year over large areas and over a period of a decade or more (1974:409). Population dispersals therefore appear to be relatively slow, especially in comparison to increases in density due to reproduction.

7. A study of moose behavior in relation to snow conditions in Laurentide Park, Quebec, indicated that moose progressively drift from open canopy forests to closed canopy forests as winter snowfall accumulates on the ground (DesMeules, 1965:109). In the area under study this meant movement from deciduous and mixed coniferous-deciduous forests into dense coniferous (balsam fir) forests. Data from New Brunswick indicate similar responses to snow depths. In January one-third of moose trails were found in dense deciduous stands and one-third in open coniferous stands, but in March and April 85 percent were found in the dense coniferous forest types and 11 percent in the open coniferous forest types. Snow depths were 44 inches in the open deciduous type, 40 inches in the dense deciduous type, 36 to 38 inches in mixed wood types, open coniferous types and in cut-overs over ten years old, and 30 inches in dense coniferous types (Telfer, 1970a:555-557). In western North America, in mountainous areas moose often move down into valleys during the deep snow periods (Edwards and Ritcey, 1956:492; Harry, 1957:53-54).

8. The references cited in the appendix are listed in the bibliography of natural sciences.

APPENDIX 9-5 THE ADAPTATIONS OF BEAVER TO THEIR ENVIRONMENT: PHYSIOLOGICAL, BEHAVIORAL AND SOCIAL[1]

A - Distribution and General Adaptations

Beaver is one of the most widely distributed large mammal species, occurring from Mexico to the Arctic Ocean, spanning sub-tropical, temperate and sub-arctic zones in North America. The adaptive success of the beaver is based on the ability to create extensive modifications of the diverse habitats in which they occur. Micro-habitats produced by beaver have greater stability with regard to critical water conditions and, in some areas temperature regimes, than do the surrounding habitats. In addition the beaver have evolved a complex metabolic system to assist adaptation to the highly seasonal sub-arctic regions.

Beaver are semi-aquatic animals and have many physical as well as behavioral adaptations to both semi-aquatic life and to northern environments. The head of a beaver is broad, the neck is short, the limbs are short, the hind feed are webbed, and the tail is paddle-shaped and covered with scale (Banfield, 1974:157). The general shape is well adapted for swimming, the hind feet are used for propulsion, the tail for steering. Large incisors and long digits of the front paws are well suited for cutting and handling wood. Furred lips close behind the incisors so that the beaver can cut and peel branches underwater, the nostrils and ears have valvular flaps that close when the animal is underwater (Banfield, 1974:158), and they can stay underwater for up to approximately fifteen to twenty minutes. The fur is well oiled so that it does not mat when wet and sheds water quickly and easily when the beaver leaves the water. Glands in the anal region produce oil which is brushed into the fur first by the forepaws and then by the first two claws of the hind paw which have serrated edges for combing (Banfield, 1974:158).

The eyesight of the beaver is of uncertain quality but its smell and hearing are excellent.

Beaver control water levels by constructing dams made of sticks, stones, roots, sod and mud (Banfield, 1974:159). The dam is constructed to stabilize the stream environment, and to provide suitable conditions for winter habitation. The dam is designed to provide a six to ten foot depth of water at all seasons. In the north, this makes swimming possible all winter under several feet of ice. The pond also provides access to food supplies along the shore (1974:159). The stimulus for dam-building activities appears to be the sound of rippling water. If this sound is played from a recording a beaver can be induced to start building a dam almost anywhere (Novak, 1972:11).

Dams are typically located at narrow points in a stream where the banks are firm. The dam is begun by laying parallel sticks and branches on the stream bed with the butt ends facing upstream. This layer is plastered with mud and row upon row of sticks and stones and mud are layered on. Along the shores the dam is continued on the banks as needed, incorporating boulders, stumps and trees (Banfield, 1974:159). The leading edge of the dam is plastered with a thick layer of mud to seal it, typically with mud from just behind the dam which helps to form a deep channel. The design is such that the spillway is at the position over the old stream bed where the current is swiftest; this reduces the risk of wash out. The finished dam structure depends on local conditions, but typical dams are 50 yards long, six feet high with a 9-foot base. Subsidiary dams may be built downstream of the main dam and may provide back pressure to support the main structure (1974:159).

Lodges are build for habitation in the middle of the pond or on a bank, usually where the bottom is not far below the surface of the water, but on the edge of deeper water. The base of the lodge is a bed of sunken poles and brush ten to twenty feet in diameter (Banfield, 1974:159). When the base has been raised to about six inches above the water level, a platform of mud and twigs is laid and then the layering of twigs and brush is continued to complete the dome. Typically the domed pile is six to nine feet high (1974:159). The conical shape of the structure is instinctive, and in captivity beaver will plaster mud over any irregular identation of the outline of a lodge (Novak, 1972:11).

Underwater entrances to the lodge and the central chambers are then gnawed out of the pile. There are two, or more, plunge holes from the central chamber to the water of about fifteen inches diameter (Banfield, 1974:159). The chamber itself is typically five feet in diameter and two feet high and has a feeding area near the holes and a sleeping-resting area on a higher level. The chamber is uaually lined with shredded wood or grass (Peterson, 1966:134). The dome is thinnest at the top permitting ventilation, while the sides are plastered with mud which washes into the cracks in fall and freezes in winter, "cementing" the structure into a solid home. Lodges take about one month to build, mostly in September or October.

In addition to dams and lodges, beaver typically build bank burrows as well. Bank burrows are tunnels into the shore from underwater in the pond or in a lake or river. Tunnels may be three or five yards long and end at a level above the water level in a cavity up to a yard in diameter (Banfield, 1974:160). These burrows are used for some feeding and as retreats when lodges are flooded or attacked. Some burrows may be more extensive, with larger chambers, and with two or more entrances, and these may be used for permanent habitation, especially where the varying water levels on large rivers cannot be controlled by beaver dams, and lodges would often be flooded. Under these conditions a complex of burrows may be built at different levels in the river bank.

B - Colonies and Territoriality

The beaver that inhabit a particular lodge or burrow complex form a family or colony (Banfield, 1974:158). A family unit normally consists of an adult male, an adult female, and their offspring under two years of age. In general it is found that only the oldest female in a colony will conceive, indicating the existence of a social hierarchy (Novakowski, 1965:71). The colony is based on one breeding adult pair (1965:76) and the colony is the basic population unit (Brandt, 1947:17). Evidence suggests that beaver are monogamous during the lifetime of the mates (Novakowski, 1965:9), but take new mates, often one of their own offspring, if the first one dies. Beaver have been known to live twelve years (Banfield, 1974:160).

Breeding has been reported from January to March (Novaknowski, 1965:9) and gestation from 70 to 90 days or more. Parturition commonly occurs in May and June in temperate and sub-arctic areas (Novakowski, 1965:10).

The young typically live in the colony for almost two years. Evidence suggests that beaver generally leave or are driven from the maternal colony as late yearlings and early two-year olds in the spring before the adult female gives birth. Sexual maturity may be reached at about two years (Novakowski, 1965:10), and the yearlings do not mate before they leave the colony (Brandt, 1947:37-38).

Litter size varies considerably and will be discussed further below. The reported averages from studies in different areas range from 6.1 to 2.5, and individual litters commonly are from two to five kits, although as many as eight have been reported (Novakowski, 1965:11). One variable affecting litter size in several studies was the age of female, the older animals generally having larger litters, up to about the age of six or seven years old (Novak, 1972:6).

Each colony usually has a definite territory along the stream or shore of the water body (Clough, 1972:18). Territories are maked by piles of mud built by the beaver. The animals have a pair of large castor glands that produce a scented oily secretion which is used to mark the mound (Aleksiuk, 1968b). The mounds are most abundant in early spring, when the two-year olds are migrating (Buckley, 1950:50). Studies of these territories have not been very intensive, but the size of the territories appears to vary with the quality of the habitat (Novakowski, 1965:21).

Beaver eat the bark, leaves and twigs of trees and shrubs, primarily deciduous (Banfield, 1974:160). In winter they may eat the wood itself (Seton, 1925-28, Vol. 4:483). In summer they also eat herbaceous pond vegetation (Banfield, 1974:160), berries and marsh grasses (Seton, 1925-28, Vol. 4:483). Favorite foods are trembling aspen, willow, white birch, and balsam poplar. Spruce barks are eaten but only if other foods are in short supply (Seton, 1925-28, Vol. 4:483).

Beaver generally travel only up to 300 to 500 feet on land to obtain food trees (Clough, 1972:11; Fenton et al., 1973:11). In a study in Saskatchewan, Pearson found that on average aspen and poplar had more dry matter than willow and that each unit of weight of dry matter from aspen and poplar contained more calories than the same weight of willow (Pearson, 1960:37). Nevertheless, Clough found on the Fort George River that willow predominated in the diet, providing possibly three-quarters of diet, because of its predominance on lowland sites (1972:11). In the James Bay area Clough found that most birch and alder were situated on higher well drained ground, too far to be available as food for the beaver (Clough, 1972:12). Similar results were reported by Aleksiuk in the Northwest Territories (1970a). Novakowski states that availability is the key in determining the diet (1965:31) at least in more northerly regions.

Recent studies of the habitat of beaver in the Fort George area of James Bay indicated a rapid drop in the utilization of vegetation in zones beyond 132 feet from the shoreline (Traversy, 1975:7; 1976:7), and confirmed the relative importance of willow, alder and birch in the diet (Traversy, 1975:7; 1976:6).

The availability of food for beaver along water courses may be more stable than would be suspected from the cyclical course of forest succession previously discussed. Beaver depend on plants common during the early stages of forest development, and the yearly cycle of spring flooding of the shoreline tends to keep this habitat in a "younger" stage of succession than may be characteristic of adjacent inland forests. The annual spring break-up of the ice often dislodges trees along the shorelines and creates a localized habitat in which deciduous trees can again establish themselves (Haviland, 1927:201). The generally high levels of moisture, erosion, periodic flooding and the sediment deposited along the shoreline also tend to favor some of the species suitable for beaver. Cook has summarized the data on the resistance of the various tree species to temporary flooding and he ranks them in descending order of tolerance: willows, alders, mountain ash, balsam poplar, trembling aspen, black spruce, tamarack, balsam fir, white spruce, pin cherry, white birch, and jack pine (1972:69). The flooding of the pond by the beaver themselves may under certain circumstances, create the conditions for growth of species used as food by beaver, especially aquatic vegetation (Peterson, 1955:179) and willows (Novakowski, 1965). Forest fires, however, temporarily destroy beaver habitat.

To gain access to trees the beaver may dig canals in low terrain (Banfield, 1974:160). These may be up to 100 yards long, and are sometimes formed by deepening and widening small springs.

Beaver travel some 600 to 700 feet along a stream to find suitable food (Novakowski, 1965:22). When the food within several hundred feet of this shoreline diminishes the beaver relocate the lodge and dam in another section of the stream, lake or river (Clough, 1972:11). This may only occur after a few years; or if food remains sufficient, the relocation may not occur for many years. After being cut by beaver, willow and alder shrubs regenerate new shoots rapidly (Clough, 1972:11-12). However, it is only under particularly good conditions for vegetation growth that the food species will grow sufficiently quickly that the total food supply would not be subject to exhaustion (Aleksiuk, 1970:269). Because willows may be used both summer and winter the intensity of their use and rapidity of regeneration may significantly affect how long an area may be used. On the shores of the lakes in the Fort George region the small size of willows and the relatively low density of stems compared to more southerly portions of the James Bay territory led Traversy to conclude that regeneration could not replace the quantities utilized by beaver each year and depletion of particular shoreline stands would be rapid (Traversy, 1975:9-10). On the shores of streams however, willows were sufficiently dense and developed to permit regeneration comparable to levels of utilization by beaver, and depletion would be much slower, and occupation of sites longer (Traversy, 1976:9-10). In the more southerly Waswanipi region conditions may be more favorable. In Alberta, Novakowski estimated that feeding areas provided food for 5 to 10 years at a time (1965:109).

In general, it has been found that beaver prefer deciduous vegetation with branches less than two inches in diameter and adult beaver consume an average of 1.5 pounds of woody vegetation a day. This is the equivalent of 216 trees a year, or one acre of aspen per year (Banfield, 1974:160). Beaver tend to select trees in the under ten-year old age class, when available (Novakowski, 1965:109).

From the few studies available, it appears that the territory of a colony may extend for at least half a mile along the shoreline (Buckley, 1960:81-82), while the feeding areas that will be used from a given lodge site will only extend 1/8 of a mile above and below the lodge. Thus, a territory may include several lodge sites (Clough, 1972:18). The beaver may relocate to alternate sites within the territory when the feeding areas around a given lodge or burrow complex are depleted, and then return to the earlier site some years later after regeneration of the vegetation has proceeded to an early forest stage. Quantitative measurement of such processes have not been well studied, but it appears that there is a system of "cropping" (Novakowski, 1965:109-110). It is not yet clear if this is a common phenomenon. It is, in effect, a rotational use of habitation sites and feeding areas in a defined territory by distinct families of beaver.

The actual location of beaver lodges and burrow complexes along a stream is not necessarily adjacent to feeding areas and is directly related to water conditions and quality, rather than to vegetation (Stanfield and Smith, 1971:59). Most beaver dams and lodges are found on streams (Fenton et al., 1973:10). These are areas where the beaver dams can effectively control water levels. On the main rivers and on lakes, where dams cannot be built, nor water levels effectively controlled, beaver usually occupy bank burrow complexes. In the La Grande River areacomplexes involved 5 to 15 holes in the river bank, at up to two meters range between the levels of the entrances (1973:10). The burrow entrance that occurred just beneath the level of the water at any particular time was the one most frequently used. In these rivers the conventional lodge would be subject to being washed away in the fast current of the spring flood, whereas the low water periods would expose entrances to the lodges (1973:11). The den complexes were found in protected areas such as the lee of islands, and the junction of smaller tributaries.

In northern Ontario it was found that while ponds, creeks and small rivers with slow current comprised only 56 percent of the water bodies, 78 percent of the beaver colonies were located on them. No colonies were found on large rivers with fast current. Lakes with low sheltered shores comprised 24 percent of water bodies, and with steep exposed shores 15 percent, accounting for 19.5 and 2.5 percent respectively of the beaver colonies (Stanfield and Smith, 1971:53 and 54, Tables 2.5 and 2.6). It should be noted, however, that the low percentage of recorded colonies on large rivers may be a function of the fact that dams, lodges and food piles can be seen in aerial surveys, but not bank burrow complexes. Similar results on the distribution of beaver lodges were found by Northcott in Newfoundland (1964:17 and Table 2). The recent aerial survey results from the northern James Bay Territory have indicated similar results, with over 70 percent of the colonies located on streams (Brodeur, Tessier and Cloutier, 1977:13).

The orientation of lodges follows a pattern and they are usually found in the sheltered portions of the lakes or ponds, where waves and windblown ice will not damage the lodge or erode the banks (Murray, 1961:25-26). Where the prevailing winds are northerly and westerly, this would mean locating the lodges on the north shores of lakes and bays and ponds, which might also expose them to greater insolation.

C - Winter Behavioral Adaptations

In September and October beaver collect food for the winter. They cut down whole trees, if available, then trim the branches to convenient lengths and drag them to the pond. Branches are piled in the deep water of the pond, on top of one another until the whole pile sinks to the bottom under its own weight (Banfield, 1974:160).

Beaver are active during dusk and all night through the dawn (Hakala, 1952:108). They are less active in daylight, but may be active on cloudy days (Buckley, 1950:85). However, heavy rains and strong winds were deterrent to work (Buckley, 1950:86) although snowfall was not (Hakala, 1952:108).

When ice starts to form in the fall the beaver may remain active on the shore for a short time, but as the ice thickens the beaver are restricted more and more to life below the ice (Semyonoff, 1957b:76-78). Beaver remain active all winter under the ice. They travel from the lodge to the food pile and the bank burrows for feeding, and also leave the lodge for excretion.

Where the ice is kept open by rapids, or where it breaks open, beaver can come out on the surface but this is very uncommon. Beaver may only do so when the winter food supply fails (Banfield, 1974:159). Deep snow is difficult for beaver to negotiate with their short legs (Aleksiuk, 1970:268). It has also been suggested that the beaver tail and feet, which are mostly without heavy hair, may freeze in temperatures less than -3^{0}C (Aleksiuk, 1970a:268). Beaver seldom leave their underwater world in winter.

Under the ice beaver establish well defined paths, swimming with their backs just below the ice (Semyonoff, 1957b:90). In various ways the activity of the beaver modifies the ice layer. The paths they use are marked by a light brown color, which is apparently due to small amounts of clay carried on the fur of the animal from the burrows (Semyonoff, 1957b:90). These paths can be seen from the surface of the ice when the ice is clear.

When the beaver pass through the lodge entrances it turns the water over, bringing up the somewhat warmer and denser water from below. This water makes contact with the ice and melts it partially, reducing the thickness of the ice near the lodge entrances. A similar thinning of the ice occurs along the "paths" of the beaver, possibly also because of its own body warmth. Inverted troughs form in the bottom of the ice along the usual beaver paths. In Alaska, the ice thickness in the main part of a pond was found to be 14.5 inches near the cache and runways the ice was as little as eight inches thick and near the lodge 2.5 inches thick (Hakala, 1952).

The fur of the beaver also contains air bubbles when it leaves the lodge or burrow, and some of this air collects under the ice. The beaver may also release air from its lungs, but this is not certain (Semyonoff, 1957b:89). In any case, pockets of air collect under the ice above the food pile, and the entrances to the lodge and bank burrows (Semyonoff, 1975b:89) and also, possibly, along the paths.

If the water levels drop during the winter, which is common on the larger rivers, the ice may collapse at the center, but remain attached at the shore. This forms large air pockets or spaces under the ice; these spaces protect the beaver from the exterior temperatures and permit the beaver to move about relatively freely under the ice (Semyonoff, 1957b:87).

Snow cover is also critical to winter beaver survival. If snow is not available the ice freezes deeper and this may result in more of the food catch being frozen into the ice and becoming unavailable to the beaver (Novakowski, 1965:31).

Snow is also an important insulator and is critical to keeping the lodge habitable. Snow permits only a slow heat exchange between the atmosphere and subsurface layer. When the snow cover is greater than eight inches, brief cold spills hardly affect temperature beneath the snow cover (Rikhter, 1954:22). Temperatures beneath the snow layer, in contrast to those above, are characterized by a narrow range of variation and gentle fluctuations (Pruitt, 1957:137). Air temperatures of -50°F (-46°C) to -60°F (-51°C) seldom lower the temperature below the snow cover to less than +20°F (-7°C) (Pruitt, 1960a:66).

A blanket of snow over the lodge is therefore important for keeping the lodge habitable, keeping in the warmth generated by radiation of body heat. With an adequate snow cover, beaver can maintain a relatively stable micro-environmental temperature, despite great fluctuations in exterior temperatures (Stephenson, 1969:136). When ambient temperatures ranged from -20°F (-29°C) to +10°F (-12°C), temperatures within beaver lodges were found to range between a minimum of 28°F (-2°C) and a maximum of 34°F (1°C) (Novakowski, 1965:117). The temperature within the lodge did not correlate with the ambient temperature but with the presence or absence of beaver in the lodge (Novakowski, 1965:117).

The importance of snow cover to assure temperature regulation within the lodge may make the early winter period quite critical. There is a time lapse between the beginning of frigid temperatures and the build-up of the snow cover to the critical thickness for adequate insulation. Pruitt has suggested that temperatures are apparently governed by the decrease in solar radiation, while precipitation is governed by more "fortuitous" climatic conditions which vary greatly from year to year (1957:134). Early and late snowfalls in northwestern Quebec may vary from the median by as much as one month (Potter, 1965:11), as indicated previously. If snowfall is delayed long after average air temperatures become colder, beaver activity may be affected (Novakowski, 1965:31).

During adverse climatic conditions, if lodge temperatures drop below 32^{o}F (0^{o}C), beaver appear to be relatively inactive, infrequently leaving the lodge (Stephenson, 1969:134).

During winter months the beaver undergo a general metabolic depression (Aleksiuk and Cowan, 1969a and b). Several studies of sub-arctic beaver have indicated a sharp decline in the growth rates of beaver in winter. There is a rapid increase in weight during summer, and a leveling off of the rate in winter (Pearson, 1960: 24; and Stephenson, 1956:34). This rapid growth in summer, and absence of growth in winter is not found in southern temperate zone beaver (Aleksiuk and Cowan, 1969a). Thus, this pattern appears to be related to the relatively lower quality and quantity of winter food supplies. In northern Alberta, Novakowski calculated that three of five beaver colonies studied did not have sufficient nutrients stored in the food cache to meet basal nutritional requirements of the colony (1967:1115). It has been suggested however that Novakowski may have assumed more total use of the woody component of the branches and twigs than is common, at least in the Northwest Territories, and that possibly it is common for northern beaver colonies to exhibit such a deficit (Aleksiuk and Cowan, 1969b:479-480).

Novakowski proposed that beaver met the deficit by mobilizing the fat reserves the animal built up during the summer (1967:1116), but Aleksiuk and Cowan have suggested that the beaver has adapted to the restricted food supplies of subarctic habitats by evolving a depression of its basal metabolism (1969b:479). They have shown that growth and general activity decline along with a decline in thyroid activity, and that food intake declines by about 40 percent, even under experimental conditions where food was readily available (Aleksiuk and Cowan, 1969a). The low standard body metabolism response appears to be triggered by the light intensity (Aleksiuk and Cowan, 1969a:978), and would therefore be initiated in early winter. The pattern has some general similarities with hibernation, but body temperature appears not to drop; and, although less active, beaver do remain active all winter. There are more similarities perhaps with the patterns exhibited by bears, which will be discussed in another appendix.

Aleksiuk and Cowan point out that while it might be expected that northern beaver under these conditions would grow to a smaller body size, or take longer to reach maturity, this is not the case (1969b:474). At the end of each summer sub-arctic beaver reach weights and sizes comparable to those of temperate zone beaver. The beaver seem able to compensate for the lack of winter growth by increased summer growth rates (Aleksiuk and Cowan, 1969b:477) as has been noted in Appendix 8-1. One mechanism appears to be the maintenance of the fat storage accumulated in the fall through the entire winter so it can be mobilized in early spring (Aleksiuk and Cowan, 1969b:489) to assure an early start to growth. In summer beaver eat only foods with the high protein and general nutritional value, consuming leaves and growing tips of trees, but generally ignoring bark and wood (Aleksiuk, 1970a:267-268). This concentration on high protein foods permits as rapid a growth possible during the short period conducive to growth (1970a:267-268).

Since only the leaves and buds are used during the summer, this adaptive pattern fails to use the considerable potentially usable energy stored in bark and other edible portions of the trees. Aleksiuk suggests that this "wasteful" utilization pattern, in combination with the low plant species diversity and the use of the same species in winter and summer can result in the depletion of stands in northern habitats (1970a:268-269). In the taiga zone at the limits of the sub-arctic forests where Aleksiuk's study was conducted, he found evidence of such depletion. It may be expected that this causes population instability in the beaver. However, several studies in the main boreal forest regions have indicated that beaver populations may reach levels that are stable over periods of several years (Nash, 1951; Pearson, 1960; Novakowski, 1965). In these areas periodic relocation of the lodges, and the territory system may work to stabilize populations in the context of depletion of particular stands.

D - Trapping of Beaver

Human interference is clearly the major factor affecting the stability, density and growth characteristics of beaver populations in northern latitudes (Novakowski, 1965:62). In isolated areas trapping is critically important, in less isolated areas forest cutting may be equally important. Beaver are relatively easy to trap out and are difficult to protect (Peterson, 1966:136; Bailey, 1922:14). Trapping out has been known to happen throughout the range of the beaver with the advance of farming, and also at various periods in the history of the fur trade (Hodgdon and Hunt, 1955:3-7; Innis, 1952:325 ff.).

The season of trapping, age and sex of the animals caught affect the short-term survival and size of the colony. If the adult male or female of a colony is trapped in the fall or early winter before breeding, then reproduction that year will depend on whether there is a sub-adult of appropriate sex in the colony that can mate (Novakowski, 1965:151). If it is a young colony, reproduction is lost for the year (Hodgdon and Hunt, 1955:78-79). If a sub-adult female mates in place of a lost adult female, the litter size will generally be smaller than would have been expected from the adult female. Spring trapping, after litters are born, allows birth of the young, but may endanger their survival. Mid-winter trapping of males, after mating, may permit female productivity to continue unaffected (Longley and Moyle, 1963:47). For these factors to be taken into account, trapping must be selective for adults, and between males and females, and trapping must occur only at certain seasons.

Selectivity for age and sex in trapping is possible to some extent. Damage to the dam is quickly detected by beaver, even in winter. They may either hear the outflow of water or may notice the dropping water levels (Novak, 1972:12). In either case, the colony is usually quick to repair the damage, and the work is socially organized. Several studies have indicated that the adult male is the first member of the colony to examine and to attempt repairs on a dam (Hakala, 1952:43; Bradt, 1947). If more work is needed or the male is removed, repairs tend to be made by other adults, although sub-adults including yearlings may also join (Hakala, 1952:43; Haseltine, 1950:11). Setting traps at the dam is apparently selective for the adult male, and secondarily for adults and sub-adults in general.

Other trapping procedures are also selective for age. Adult beaver have a greater cruising radius under the ice than do sub-adults. In Alaska, Hakala found that bait set 50 feet from a lodge attracted adults, those set 25 feet from the lodge attracted all colony members (Hakala, 1952:159-160). Bait sets further away took longer to attract animals (1952:160).

Kits are least active and generally will not repair a dam or travel far under the ice. If the older members of a colony are all trapped out, the young do not show signs of activity and appear to become confused and inactive (Haseltine, 1950:28). It is doubtful whether they survive. It has been suggested that a colony is trapped out when the dams are no longer repaired and there is no activity for a week (Bradt, 1947), but young may remain untrapped and unnoticed (Haseltine, 1950:11).

Adjusting trapping to the composition of a colony requires means of determining the occupancy and composition of the lodges. Several studies have indicated that there are relatively effective means for determination of the occupation of a lodge by a colony and for estimation of the composition of the colony. Active colonies keep dams in repair and collect food supply caches in fall. Surveys on the ground at this time can relatively easily indicate the location and distribution of active colonies (Bradt, 1947:41). Food caches are probably the best indicators because they will be found even where dams and lodges are not constructed. Aerial surveys in the fall can effectively count and locate colonies as well, but have been found to under-estimate the number because of food caches under over-hanging vegetation, and the difficulty of otherwise locating burrow-living colonies (Hodgdon and Hunt, 1955:76).

In winter, when snow covers the cache, lodges can be checked for occupancy by examining the peak of the lodge where the body heat of beaver melts the snow and either forms a breathing hole through the snow or occasionally a conical hollow in the snow above the dam (Hakala, 1952:48; deVos et al., 1959:41).

The composition of a colony can be judged on the basis of the history of the colony, the size of the food cache, the condition of recent cuttings, and tracks and tooth marks can indicate the presence of young (Haseltine, 1950). Tooth marks are quite reliable indicators of age, since incisors continue to grow in width (Buckley, 1950:78).

It is therefore possible to evaluate the number and distribution of lodges, and something of the composition of the colonies. Nevertheless, trapping is far from an easily managed activity. Beavers are sometimes reported to have become "trap shy" (Hay and Rutherford, 1963:65).

The social scientist Alexander H. Leighton who made studies of beaver behavior and mental characteristics reported that the occurrence of an apparently knowing avoidance of traps did occur but was sporadic and unpredictable (Leighton, 1935:191). The combination of shrewdness and stupidity on different occasions was exemplified by a report of a Norwegian trapper with whom Leighton worked. He reported having seven traps on a lake sprung with sticks night after night presumably by beaver until he gave up. On several other occasions, when using a pit-fall, he repeatedly caught the same beaver in the pit-fall, even after the beaver had itself escaped (1935:191). Leighton's own observations on Nova Scotia beaver confirmed the erratic "shrewdness" of the animals (1935:191).

The effectiveness of trapping is also not uniform at all seasons. In summer, when vegetation is lush, the beaver in a colony disperse over their territory and can be found in many parts. They are, as a result, more difficult to trap in summer (Pearson, 1960:11 and 13). In winter, the metabolic depression, discussed above, means that beaver are less active during the period of the shortest daylight and for some period thereafter, that is, in mid-winter. Novakowski calculated on the basis of trapping results that beaver may leave the lodge only every two weeks during this period (Novakoswki, 1965:120; see also deVos, et al., 1959:18). This significantly reduces trapping efficiency. As a result of these factors the best time commercially to trap beaver is in the late fall, before breeding.

The commercial quality of a beaver pelt depends on the density and color of the underfur. This fur is generally fine and dense in regions where the mean annual temperature is less than 30^{o}F (Novak, 1972:5). In these regions the underfur develops as cold weather sets in, it is in its "prime" in the late fall and early winter. Later in winter it may shed, or the longer guard hairs may be worn off the pelt (Novak, 1972:5). Pelts are graded by size and quality and priced accordingly.

In summary, beaver are species that have a number of highly specialized and effective adaptations that appear to uniquely buffer them from many physical perturbations of the sub-arctic and long-term vegetational cycles, while at the same time not eliminating the possibilities for responding opportunistically to new environmental possibilities. They modify and stabilize the microhabitat on which they depend, they use relatively stable resources and have a territorial system that may allow long-term use of the forestry resources. The territorial system, in conjunction with colony organization and reproductive responsiveness to habitat conditions, limit population growth, but also provide opportunities for rapid population expansion under appropriate conditions, see Chapter 10. Beaver probably have the most extensive complex of biological controls of any species inhabiting the sub-arctic and are a dominant species as a result. Certain of their adaptations, however, make them particularly vulnerable to human harvesting and vulnerable to over-harvesting, but at the same time provide opportunities for effective management by men.

Footnote for Appendix 9-5

1. The references cited in this appendix are listed in the bibliography of natural sciences.

APPENDIX 9-6 THE FISHES OF THE WASWANIPI REGION IN RELATION TO THEIR ENVIRONMENT[1]

The fish of the Waswanipi region are secondary and tertiary consumers in the food chains of the lakes, streams and rivers of the territory. Primary producers are the aquatic plants and macroflora which produce living matter from solar energy and from nutrients in the water. The primary consumers are the macrofauna in the water and on the bottoms which feed directly on the primary producers. The secondary consumers, including several fish species, feed upon the primary consumers, and the piscivorous fish are tertiary consumers. The waste products and the dead bodies of the vegetable and animal organisms generally collect on the bottom where they are transformed by decomposing bacteria which release the nutritive elements to be used again by the primary producers.

The aquatic ecosystem is not closed and important interactions take place with terrestrial ecosystems. Many of the dissolved nutrients are derived from the sediments and rocks of the surrounding land drained by the system as well as from decaying of terrestrial vegetation that collected in the water. Other sources include the production of nutrients by bacterial action on air and gases dissolved in the water.

The physico-chemical characteristics of the water are critical to the capacity of the water to support life. Dissolved mineral salts, especially of nitrogen and phosphorus, are particularly important for plant production, and dissolved gases are critical for plant and animal respiration. Penetration of sunlight through the water is limited by turbidity or color of the water, imparted primarily by the sediment load and phytoplankton (plant plankton) density. The higher the turbidity, the less deep the sunlight can penetrate into the water body.

In the James Bay region, in general the number of species of fishes is limited and the productivity of fish is relatively low. The region is assumed to have a relatively low fish productivity because of a relatively low primary productivity, which results from low levels of nutrients, and a short growing season.

Recent studies of water quality in the James Bay area indicate that dissolved solids in the water are low in most water bodies. This is probably a function of the short time since glaciation and of the low temperatures which limit the weathering of phosphorus from rocks and which limit the bacterial action necessary to fix nitrogen from the air; thus, nitrates and phosphates in biologically usable forms are limited. It has been reported that the total dissolved solids in the lakes of the northern portion of the James Bay region (between 10 and 21 parts per million) are as much as 35 times less than the total dissolved solids (which include nitrates and phosphates) found in more temperate waters, such as the Yamaska River near Saint-Hyacinthe, southeast of Montreal (JBDC-JBEC, 1974:167). The figures for the Waswanipi area waters (20 to 54 ppm) are, however, 2 to 4 times higher than those of other parts of the James Bay region (JBDC-JBEC, 1974: Tableau 58, p. 172; Tableau 59, p. 173). Nitrates and phosphates were similarly higher. The Waswanipi lake waters would then have approximately one order of magnitude less dissolved solids than would more temperate lake waters.

Nevertheless, the lakes of the Waswanipi region have some features characteristic of the mesotrophic type rather than obgotrophic type lakes. Oligotrophic lakes are typically deep geologically, young, with relatively low concentrations of nutrients. Lake depth measurements are not extensive in the region surrounding Waswanipi but only a few lakes are known to be deep, such as Mistassini Lake. One study showed that depths exceeding fifty feet were rare, whereas measurements under twenty feet in depth were common. Two stations measured in each of eleven lakes in the Nottaway, Broadback and Rupert River basins gave the following distribution of depths: four between 40 and 55 feet deep, two between 20 and 40 feet deep and sixteen less than 20 feet deep (Lehoux and Rosa, 1973:81). These features suggest a somewhat higher primary productivity, and hence fish productivity than might otherwise be expected for the region. Nevertheless, the productivity at all levels will be substantially lower than at more southerly latitudes. Several estimates of fish productivity have or can be made. Kask, cited by Hunter, estimated the productivity potential of several lakes for management purposes, concluding that productivity decreased from south to north: 5,000 pounds per square mile of lake per year for Lake

Erie, 1,000 pounds per square mile per year for Lake Winnipeg, 500 pounds per square mile per year for Great Slave Lake and 200 pounds per square mile per year for Great Bear Lake (Hunter, 1968:373). For the James Bay and Hudson Bay areas to the north of Waswanipi, Hunter proposed a figure of 320 pounds per square mile (1968). More recent studies by Ryder of lakes in northern Saskatchewan, Ontario, Alberta, and the Northwest Territories indicate actual yields from 685 pounds per square mile per year to 1280 pounds per square mile per year (Ryder, 1965).

From his studies Ryder has developed a "morphoedaphic index" of yield for north-temperate lakes of North America, based on total dissolved solids and mean depth of the particular lake (Ryder et al., 1974). Ryder uses these two variables because they are indexes of nutrient availability. The total dissolved solids are an index of the total amount of nutrients available in the water. The mean depth is an index of the rapidity of turnover of the nutrients, because in shallow lakes wind action mixes the water and brings up to the productive surface waters the nutrients from the decaying material deposited on the lake bottom. Ryder's index is not yet in common use, but it has been tested on a wide body of the available data, and appears to be the best estimator available at the present time.

The available data on the total dissolved solids in the lakes of the Waswanipi region are summarized in Table A9.6-1. Using as a mean value of total dissolved solids in the lakes sampled in the Waswanipi area 35 ppm, and assuming the mean depth is not more than fifty feet and more likely thirty-three to twenty feet, the approximate fish yield can be read from Ryder's curve. Converted to English units, the yield would be at least 1300 pounds per square mile of lake per year, and a more probable fish yield would be between 1550 and 1950 pounds per square mile of lake per year (Table A9.6-2). Using the minimum total dissolved solids value of 20 ppm the minimum fish yield would be 1000 pounds per square mile of lake per year. In the Waswanipi region as a whole, a total water surface area of 1000 square miles has been estimated. Considering this area and the minimum fish yield estimates of say 1000 pounds per

Table A9.6-1 Total Dissolved Solids in Waters of the Waswanipi Region

Location (Station No.)	Year (Date)	Total Dissolved Solids	Total of Individual Measurements of Dissolved Solids[5]	Conductivity	Source
Lake Soscumica	1968 (9 March)	29	43.8	49	1
(08070A)	(7 April)	53	46.9	62	1
	1969 (27 Feb.)	-	36.7	49	2
	(29 March)	-	45.6	63	2
	(28 June)	-	24.5	32	2
Lake Soscumica	1972 (29 Jan.)	-	52.2[6]	63	3
(08070K)	(23 March)	-	67.3[6]	164	3
	Mean	41	45.3		
Lake Matagami (North Arm) (08070L)	1972 (23 March)	-	54.0[6]	73	4
Bell River 4.8 mi. above Lake Matagami (08070D)	1969 (7 Feb.)	-	56.8	74	2
	(29 March)	-	49.5	75	2
	Mean		53.2		

(CONTINUED)

Table A9.6-1 Total Dissolved Solids in Waters of the Waswanipi Region (Continued)

Location (Station No.)	Year (Date)	Total Dissolved Solids	Total of Individual Measurements of Dissolved Solids[5]	Conductivity	Source
Waswanipi River between Lakes Matagami and Olga (08070G)	1969 (27 Feb.)	-	36.6	50	2
Lake Olga (08070P)	1972 (24 Jan.)	-	34.9[6]	40	4
Lake Gull (08070R)	1972 (24 March)	-	44.4[6]	52	4
Lake Waswanipi (08070T)	1972 (24 March)	-	29.9[6]	36	4
Waswanipi River	1968 (27 March)	38	40.4	48	1
0.3 mi. below	(17 Dec.)	44	35.7	47	1
Lake Opawica	1969 (20 Jan.)	-	32.4	44	2
(08070B)	(3 March)	-	34.9	43	2
	(26 March)	-	16.6[7]	22	2
		41	32.0		

(CONTINUED)

Table A9.6-1 Total Dissolved Solids in Waters of the Waswanipi Region (Continued)

Location (Station No.)	Year (Date)	Total Dissolved Solids	Total of Individual Measurements of Dissolved Solids[5]	Conductivity	Source
Broadback River	1968 (3 March)	-	20.6	29	1
1 mi. below	(3 April)	-	27.4	39	1
Lake Ouasouagami	1969 (19 Jan.)	-	17.1	24	2
(08080A)	(24 Feb.)	-	23.2	29	2
	(22 March)	-	19.8	25	2
			21.6		
Broadback River	1969 (19 Jan.)	-	19.0	28	2
1.3 mi. above	(24 Feb.)	-	21.9	25	2
Lake Evans	(22 March)	-	20.4	26	2
(08080B)			20.5		
Lake Evans (08080E)	1972 (22 March)	-	32.7[6]	33	4

Footnotes:

1. From: Quebec, 1970.
2. From: Quebec, 1971d.
3. From: JBDC-JBEC, 1974, for water from the surface.
4. From: JBDC-JBEC, 1974, for water from the bottom.
5. Includes, unless otherwise noted: calcium, magnesium, sodium, potassium, bicarbonates, sulphates, clorides, fluorides and nitrates.
6. As in footnote 4, minus fluorides, and including phosphates and silicates.
7. As in footnote 4, minus sulphates.

Table A9.6-2 Estimated Potential Fisheries Yield for Waswanipi Region Using Differing Assumptions, Based on the Morphoedaphic Index[1]

Assumed Mean Depths of Lakes (Feet)	Estimated Potential Fisheries Yield for Mean Total Dissolved Solids - 35 PPM. (Pounds Per Square Mile)	Estimated Potential Fisheries Yield for Minimum Total Dissolved Solids - 20 PPM. (Pounds Per Square Mile)
50	1300	1025
33	1550	1200
20	1950	1475

Footnote:

1. Ryder *et al*., 1974:667, Figure 1.

square mile, the total fish yield of the lakes of the territory would be expected to be a minimum of 1,000,000 pounds per year.

The yield of fisheries of the Waswanipi region is divided among approximately twenty fish species found in the area. To date, there has been no study of the biomass or productivity of the individual fish species population and no direct estimate can be made. Nevertheless, it seems important to indicate the probable relative importance of the productivity of the different species.

Two studies have provided evidence of the relative abundance of the various species (Table A9.6-3). The relative abundance of the fish species in the two samples had some important differences but considering that different lakes were fished, and that probably the fishing was done at different times of the year and possibly with different methods, the results do not discrepant. The relative order of importance of the species is similar although not identical, with one exception, the radical difference in the percentage of goldeye in the two samples. This presumably reflects an important difference in the geographical distribution of this species. A falls at the east end of Lake Matagami may impede the passage of fish of some species further up the Waswanipi River system. Because most Waswanipi fishing occurs in the Waswanipi and Broadback River systems, as opposed to the Bell River system, I will give priority to Magnin's results. In Magnin's results as well as those of the JBEC, walleye are the most common species, and pike, suckers and the white-fishes are next most important, excluding goldeye, followed by sturgeon. All other fishes account for less than 5 percent of the samples.

The study by Magnin provides the data for an estimate of the relative bio-masses of the major species harvested from Waswanipi Lake and River. Magnin sampled the fish populations with some fishing lines and nets of various sizes: ¾, 1½, 3, 4, 4½ and 12 inches. Discussing the number caught for each species and its percentage of the total of all species caught, he says that his har-vest probably does not correspond to the real percentage of fish in the area, but it does give a first idea of the relative importance of the different species (Magnin, 1964:278).

Table A9.6-3 Relative Numbers of Fish Species Caught During Fish Studies in the Waswanipi Region

Species	Waswanipi Lake and River[1]		Matagami and Taibi Lakes[2]	
	Number Caught	Percentage of Total Catch	Number Caught	Percentage of Total Catch
Lake Sturgeon	156	7.35	63	7.36
Mooneye	7	0.33	31	3.62
Goldeye	3	0.14	141	16.47
Brook Trout	1	0.05	0	-
Lake Whitefish	202	9.52	59	6.89
Cisco	70	3.30	79	9.23
White Sucker	203	9.57	120	14.02
Longnose Sucker	100	4.71	60	7.01
Fall Fish	49	2.31	1	0.12
Northern Pike	298	14.04	85	9.93
Burbot	3	0.14	9	1.05
Walleye	788	37.13	162	18.93
Sauger	177	8.34	45	5.26
Yellow Perch	61	2.87	1	0.12
Mottled Sculpin	3	0.14	0	-
Ninespine Stickleback	1	0.05	0	-
	2122	99.99	856	100.01

Footnotes:

1. From: Magnin, 1964:276.

2. From: JBDC-Environment Canada, 1974: Figure 12.

Keeping his comment in mind, I have calculated an estimate of the relative biomasses of the respective species in his harvest. Magnin does not provide average weights, but rather a graph of the equation that expresses weight as a function of length for each species. From the graphs I have estimated the weight that corresponds to the average lengths he reports. This is possible for ten of the species harvested (Table A9.6-4). As the relationship between length and weight is not linear, the weight of the average length will not correspond to the average weight. In all cases here we would expect this weight to be lower than average weight. For this reason the biomasses number (a x e x 100 = f) is considered a pure number, not an approximate measurement, that is indicative of the expected relative biomass of the various species for which it was possible to estimate the weights.

The predominant species in the catch, nearly twice as important as the next most important species is the walleye, which accounted for 33.2 percent of the total biomass number. This predominance however would not be so strong had we used the relative numbers of fish caught in Lakes Matagami and Taibi (Table A9.6-3). The second most important species was sturgeon, which accounted for 16.7 percent. Three other species accounted for between 10 and 15 percent of the harvest, northern pike, white sucker and lake whitefish. No other species accounted for more than six percent of the biomass number.

These estimates of biomass are not estimates of the relative productivity of the fish species. The age structure of the population, growth rates of the fishes, age at reproduction, fecundity, etc. will determine the rate of production of new biomass, and fish populations vary significantly from each other along these dimensions. Even within a particular species these parameters may vary significantly between populations under different climatic and ecological conditions, and also under different harvesting conditions.

In general, in northern habitats where temperatures are lower, insolation is lower, the growing season is shorter and nutrient materials may be in relatively short supply, fish have longer life cycles, slower growth, delayed sexual maturity, and lower reproductive potential. Nevertheless, not all

Table A9.6-4 Sizes, Relative Numbers and Estimated Relative Biomass of Fish Species Caught in Waswanipi Lake and River

Species	Number Caught a[1]	Percent of Total Catch b	Average Length (Inches) c[1]	Extremes of Length (Inches) d[1]	Weight for Average Length(Lbs.) e[2]	Biomass Number f[3]	Percentage of Total Biomass Number g
Lake Sturgeon	156	7.35	28.75	12-56	3.96	618	16.7
Mooneye	7	0.33	10.75	8.25-11.75	-	-	-
Goldeye	3	0.14	16.25	15.5-17.75	-	-	-
Brook Trout	1	0.05	6.5	-	-	-	-
Lake Whitefish	202	9.52	15	12.25-18	1.88	380	10.3
Cisco	70	3.30	12.75	7.5-17	1.25	88	2.4
White Sucker	203	9.57	16.5	10.25-21.25	2.50	507	13.7
Longnose Sucker	100	4.71	15.5	12-19	1.88	188	5.1
Fallfish	49	2.31	12.5	7.5-17	1.06	52	1.4
Northern Pike	298	14.04	19	11.5-4.6	1.76	524	14.1
Burbot	3	0.14	-	3-23.25	-	-	-
Walleye	788	37.13	15.5	8.25-28.75	1.56	1229	33.2
Sauger	177	8.34	11.25	8.25-15	0.58	103	2.8
Yellow Perch	61	2.87	7.75	5.5-10.75	0.26	16	0.4
Mottled Sculpin	3	0.14	2	1.5-2.5	-	-	-
Ninespine Stickleback	1	0.05	2	-	-	-	-
						3705	100.1

Footnotes:

1. From: Magnin, 1964:276.
2. Estimated from graphs of the equations expressing weight as a function of length for each species, Magnin, 1964.
3. A pure number derived from a x e x 100 = f, which allows an estimated relative comparison of biomass (see text).

species show this pattern, and compensatory mechanisms of various degrees of effectiveness are found in many species of fish as well as other animals (Wynne-Edwards, 1952:2).

As an example, the whitefishes are well adapted to northern ecosystems. The whitefish (Coregonus clupeaformis) has a range from the Great Lakes in the south to the Arctic Islands in the north. Individuals and stocks in the north do not grow any less slowly than those in the south (Healey, 1975) and their optima occur in the middle north.

Whitefish are a cold water species spawning in the fall, as temperatures decline. In summer, the whitefish are generally found in deeper and cooler waters where they feed on insect larvae, mollusks, and amphipods and a wide variety of other foods (Scott and Crossman, 1973:273).

As the water temperatures of the upper layers drop in the fall the whitefish move from deeper waters to shallow water (Scott and Crossman, 1973:272). Spawning usually takes place in less than twenty-five feet of water, often over hard or stony bottoms and sometimes over sand (Scott and Crossman, 1973:271). Whitefish often school and aggregations occur as the fish move onto the spawning areas. The exact date of spawning is thought to depend on the water temperature, and varies from year to year and from area to area, generally taking place earlier in the more northerly areas (Scott and Crossman, 1973:271, 273). Near the southern end of its range in Lake Erie, whitefish spawning begins when the water temperatures drop to approximately 46^{o}F (8^{o}C), but the peak of spawning occurs at somewhat lower temperatures (Lawler, 1965:1197). In the James Bay area spawning most likely occurs in late September and October and may continue until November.

Eggs develop over the winter and hatch in April or May. The degree of success of embryonic development is closely related to winter temperature conditions, the optimal being about 33^{o}F (1^{o}C) (Weinstein, 1976:75). Winter conditions significantly affect the number of larvae hatching and surviving. Strong fluctuations in reproductive success have been found in different years, giving rise to a pattern of strong and week year-classes (Lawler, 1965:1197). The age distribution of the total population of whitefish for an area therefore often exhibits year-class dominance. In Lake Erie it was found that particularly successful year-classes were associated with temperature changes, an early and steady drop in water temperature, without fluctuations in the fall, a cold winter, and a slow, late increase in water temperatures in the spring (Lawler, 1965:1197). No direct correlation between wind, precipitation or normal water-level fluctuations was found. It is unclear if year-class variations would be as significant in populations further north and more in the center of the range of distribution of whitefish. Available studies suggest less prominant year-class differences (c.f., Weinstein, 1976:76-77).

The growth rate of unexploited whitefish populations varies considerably from water body to water body, and changes in the growth rates are an important mechanism by which whitefish compensate for the effects of exploitation (Healey, 1975:432, 435, 436). Heavy exploitation of whitefish results in an increase of growth rate, and populations that are heavily exploited have growth rates near the biological maximum for the species (Healey, 1975:436-437). For example, in an Alberta lake heavy exploitation led to an increase and then decline in the growth rate, and fish matured at younger ages. Before heavy exploitation maturity was reached at five years of age, after exploitation at two years of age. Because the fishery selected for the larger fish, the number of year-classes of mature fish were reduced when the population was heavily exploited (Miller, 1956:145). Under these conditions most fish only have one chance to spawn. By increasing growth and maturing younger the population was able to sustain heavy exploitation, but at a cost. The reduced number of year-classes of reproductive age made the population vulnerable to collapse due to a few weak year-classes in a row, and when this happened the population collapsed (Miller, 1956). Under less heavy exploitation more of the older fish would have been present, and one or a few weak year-classes would not have endangered the population's reproductive capacity. Cessation of heavy exploitation led to a return of growth rates and age composition to pre-fishing values (Miller, 1956).

This pattern appears to be general (Healey, 1975:443-445). Whitefish populations can compensate for exploitation and can even provide the best yield under conditions of heavy exploitation, but heavy exploitation leaves the populations vulnerable to considerable instability due to variations in reproductive success linked to environmental variations. It has been suggested that the best strategy for fisheries management, given these conditions, is to maintain the fishery at a moderate level of exploitation, where some increased yields resulting from compensation will be achieved, without high risk of population collapse due to climatic variability (Healey, 1975:444).

In contrast to the situation of the whitefish is the sturgeon, which is near its limits of northern distribution at Waswanipi (Scott and Crossman, 1973: 83-84). The sturgeon have compensatory mechanisms, but they are not likely to compensate for exploitation in the north as readily as the whitefish species can because temperature would set an upper limit to the growth rates (e.g., Magnin, 1965, 1966a).

Studies by Roussow and Magnin of the biology and reproduction of sturgeon in the Waswanipi area compared to more southerly populations indicated that growth was slow, sexual maturity was late and spawning did not occur every year. Both studies were conducted during times when the populations were being harvested by commercial fisheries. Magnin found that there was a great variation in growth rate between individuals, and that the length and weight of fish, for any given age was substantially lower than for sturgeon taken in the St.Lawrence River. At five years of age St.Lawrence River sturgeon average 50 centimeters long and weigh an average 0.5 kilogram, while Waswanipi River sturgeon average 43 centimeters long and average 0.38 kilogram in weight (Magnin, 1965: 203). By twenty years of age the St.Lawrence River sturgeon average 106 centimeters and 7.6 kilograms, whereas the Waswanipi fish are averaging 90 centimeters and 3.5 kilograms. At fifty years of age the differences are 172 to 135 centimeters and 38 to 12 kilograms. The weight differences are especially remarkable (Magnin, 1965:201) and indicate an especially slow growth rate.

The Waswanipi sturgeon were found to reach sexual maturity slowly and first spawning was quite late in life. Development to sexual maturity begins at about nine years of age and is complete for females between 20 and 23 years of age and for males between 18 and 20 years of age (Magnin, 1966a:262) at which times first spawning occurs. Individual fish did not spawn each year, the average period between spawnings being six years for the females and two years for the males (Magnin 1966:1022).

These features indicate that although the total biomass of sturgeon may be high, the productivity of the population will be relatively low because the reproductive potential appears to be low. This means that considerable care must be taken to manage the species when it is being harvested (Magnin, 1966a:262), because it may be easy to harvest the population so intensively that insufficient numbers of fish will survive to the age of sexual maturity (Roussow, 1957:553).

The harvesting of the fish is significantly related to their annual behavior cycle. Sturgeon are bottom dwellers, feeding on various crayfish, mollusks, insect larvae, fish eggs, nematodes, amphipods and a few plants (Scott and Crossman, 1973:86-87). They generally live and feed at moderate depths in both summer and winter, typically on shoal areas of large lakes and rivers in 15 to 30 feet of water (1973:86). Winter activity and feeding is limited and little growth occurs in this season (Roussow, 1957:556). Two sub-species of lake sturgeon, _Acipenser fulvescens_, are known and occur in the Waswanipi region, _acutirostris_ brown or lake sturgeon, and _obtusirostris_, black or rock sturgeon (Roussow, 1957:555). Behavior of both sub-species appears to be similar.

Spawning occurs in late May and the first three weeks of June in the Waswanipi area, when water temperatures rise to between 48°F (9°C) and 64°F (18°C) (Roussow, 1957:555), with the spawning optimum occurring between 55°F (13°C) and 64°F (18°C) (Scott and Crossman, 1973:84). Spawning occurs in areas of swift water or rapids, in depths of two to fifteen feet of water (Scott and Crossman, 1973:84). Fish congregate at sites before spawning temperatures are reached and are known to migrate as much as 80 miles to spawning sites in parts of Canada (Scott and Crossman, 1973:84 and 87), although such sites are relatively common in the Waswanipi region and fish probably do not migrate far.

The early summer aggregation of fish at spawning times, and the active feeding in relatively shallow areas during the summers make the harvesting of sturgeon relatively easy during the ice-free period and emphasize the need for careful management. This pattern of slow growth, low productivity and easy over harvesting is not, however, typical of all fish populations of the region.

The different patterns of adaptation to northern conditions exhibited by sturgeon and whitefish are reflected in their different growth rates, ages at sexual maturity, reproductive potential, productivity and responses to exploitation. The biological characteristics of other northern fish populations have been less well studied and are not as well known. Those species which have a uniquely northern distribution may be expected to show special adaptations to northern conditions that make them relatively productive and resistent to exploitation. Among the major species these might include the cisco, pike and burbot. Other species such as the white sucker and the pickerel would be expected to exhibit features closer to those of the sturgeon. While we have no firm evidence for this suggestion, the general habits and biology of the species suggest such groupings.

Cisco, pike and burbot all spawn in cold water, just before, during or just after the period of ice cover. Cisco spawn approximately two weeks after the whitefish and are a closely related species of the same genus, with many biological and particularly behavioral similarities to whitefish.

Pike have a circumpolar distribution. They spawn immediately after ice melts in April or early May in water temperatures of 40°F (4°C) to 52°F (11°C) in shallow water, often less than seven inches deep. Pike spawn in the vegetation of the flood plains of rivers or bays of lakes (Scott and Crossman, 1973: 357-359). Generally eggs hatch in 12 to 14 days, although the period can be shorter (Scott and Crossman, 1973:360). They remain active during the winter and are important in winter ice fisheries. They are piscivorous, eating any vertebrate within the size range they can consume. Diet is typically ninety percent fish, but they also can feed on frogs, crayfish, mice, ducklings and small muskrats (Scott and Crossman, 1973:360-361). The growth rate of pike decreases northward, longevity increases and age at sexual maturity increases from 2-4 years in the south to 5-6 years in the north (Scott and Crossman, 1973: 359-360).

Burbot spawn in mid-winter under the ice cover, usually between January and March. They spawn in a few feet of water, over sand or gravel in shallow bays. Eggs hatch from late February to June. In summer the burbot stay in deeper and cooler parts of lakes and in large cool rivers, rising to the upper layers and shallower waters to feed at nights. Large burbot feed on fishes, the small on aquatic insects, crayfish and mollusks (Scott and Crossman, 1973:642-644)). Burbot are readily caught in winter when concentrated for spawning.

Walleye spawns in spring or early summer after break-up, at water temperatures of 44°F (7°C) to 48°F (9°C), on rocky areas in falls or on gravel shoals of lakes. Young hatch in 10 to 15 days. It is very sensitive to light intensity and shields itself from the sun in clear water, using sunken trees, boulders, etc. In more turbidal water it is more active. It is active all winter and can be taken in ice fishing. It feeds primarily on other fish and also on crayfish, frogs and insects. Growth is slow in the northern parts of its range, and the maximum age increases from 10 to 12 years in the south to as much as 20 years in the north. Sexual maturity occurs at 2 to 4 years of age for males and 3 to 6 years of age for females. Walleye are generally most abundant in large, shallow, turbidal lakes (Scott and Crossman, 1973:771-773), such as many of those found in the Waswanipi region.

White suckers usually spawn in spring, from early May to early June, when water temperatures in streams reach 50°F (10°C), they usually spawn in shallow water over gravel bottoms. Adults home on certain streams and at spawning are highly concentrated. Suckers are fish of warmer, shallow lakes and bays and their tributary rivers, where they are usually found in the top 20 to 30 of water. They actively feed near sunrise and sunset on invertebrates on the bottom in shallow water. Small suckers are an important food item of pike and pickerel. The flesh of suckers is bony, but the upper muscle groups can be used and most of bones avoided. Growth rates are extremely variable and sexual maturity is at 5 to 8 years.

No productivity estimates for particular fish species have been made for the area under study. However, if the assumption is correct that pike, cisco and burbot have compensatory mechanisms that are relatively effective at northern latitudes, similar to those found in whitefish, and if walleye and sucker are more like the sturgeon, then we would expect exploitation of the fish populations to increase the productivity of the former species group and to also increase the productivity of the latter, but within narrower limits. And, we would expect that whereas the latter species group would be easily subject to over-exploitation, the former group would be able to withstand environmental perturbations relatively well under moderate levels of exploitation, and to be subject to over-exploitation only under heavy exploitation. Thus, despite the high biomass numbers for walleye, sucker and sturgeon, we would expect that it would be the pike, whitefish, cisco and burbot which could provide relatively high and stable harvests.

Footnote for Appendix 9-6

1. The references cited in this appendix are listed in the bibliography of natural sciences.

APPENDIX 9-7 OTHER LARGER MAMMALS OF THE WASWANIPI REGION IN RELATION TO THEIR ENVIRONMENT[1]

A - The Organization and Dynamics of Sub-Arctic Trophic Structures

Probably no other aspects of northern ecological systems are more widely known than population fluctuations and cycles that characterize many of the northern animals, and possibly no other aspects of these systems are so incompletely understood. What agreement there is on an explanation points increasingly to the importance of two factors, the limited number of species present and the frequent physical control or perturbation of the system.

The limited number of species, itself probably a function of the frequency of perturbations as we have indicated before, is critical to the impacts of population fluctuations of species on other components within the system. The periodic abundance and catastrophic decline of some of the hibervorous animals, such as hares, are directly linked to the population fluctuations of some of the primarily carnivorous animal species which prey upon them, most notably the lynx. The small number of species which are found in the sub-arctic region limits the number of prey species that each predatory species can effectively be adopted to use as a major source of food. In system terms the food web linking each predator to its prey species is relatively simple. Since many predatory species have only one or two major prey and since many prey species have only a small number of major predators, significant fluctuations in the population of any one of these prey species can result in a fluctuation of the population of specific predator species. There are, in the simple ecosystem, few mechanisms for buffering the effects of fluctuations in any of the component populations. This helps to explain the population fluctuations of the predatory species, but the underlying causes of the fluctuations in the herbivorous species also require explanation. These appear to be related directly to the effects of physical factors.

It has already been suggested that one effect of a high frequency of physical perturbations in an environment will be to give advantage, in general, to opportunist species and to any species which can adapt to survive in a fluctuating environment. One feature which appears to be common to many species that are major influents in such an environment is that they have a high fecundity, biological potential to reproduce large numbers of offspring. The major questions for such species, and to a lesser degree for almost all species, is not only how do population numbers increase, but how are they limited (Colinvaux, 1973:498) and why they fluctuate. That they must be limited is clear, but the mechanisms of that limitation may be diverse. One mechanism is for fecundity to change with those environmental conditions that directly affect individual survival and the capacities of the environment to support the offspring. Such a mechanism is highly efficient, and is an important biological as opposed to physical control on population numbers. In the sub-arctic many of those herbivorous species which do not exhibit great short-term population fluctuations have a mechanism of this kind, such as moose and beaver. However, for those species which exhibit the major population fluctuations such a mechanism does not appear to be the major regulator of population numbers.

Predation was long thought to be the critical mechanism, but studies of predator-prey interaction, such as that of the lynx and hare, have shown that the link does not operate as previously expected. The populations of lynx start to rise following a population increase of hare, but the lynx population may start to decline before the population of hares decline, suggesting that lynx predation is not the limiting factor in hare population peaks (Gilpin, 1973). Many other mechanisms are available to limit populations, including systems of territoriality and social hierarchies, but these are not commonly the major mechanism found among the sub-arctic animals, with exception of beaver, wolves and birds. The most likely mechanisms for population regulation in a region characterized by a seasonal and unpredictable climate are likely to be linked to the accidents of weather themselves (Colinvaux, 1973:502). In fact, much of the recent work on the fluctuations of sub-arctic herbivorous species has in fact revolved around the importance of climatic variations. The basic principle appears to be that in most years population increases are limited by climatic factors, particularly the length of the seasons, and the severity and stability of temperatures and/or snowfalls. I will discuss the possible mechanisms when discussing the individual species. Massive increases in the populations are then linked to the periodic abatement of the severity of the climatic conditions and the realization of the full reproductive potential of the species. Declines may be a function of the return to normal climatic conditions or of density-dependent factors.

In short, there is no single mechanism or pattern of population regulation among sub-arctic animals, although the variability of the physical environment and the resultant simplicity of the ecological system make physical controls of population relatively common. Climatic controls are associated with those species which are characterized by great fluctuations in their populations, and the simplicity of the system assures that such fluctuations will ramify on to the predatory populations as well. It appears that evolutionary adaptation solves the problems of population regulation in a fluctuating environment with whatever behavioral and morphological resources each species has, and where those resources are limited the resolution is for control to rest mostly outside the ecological system with the physical environment. The populations that comprise the ecosystem are then adopted to surviving the physical perturbations, but not to regulating them. The result is a highly variable ecosystem. Each species has a characteristic mechanism or group of mechanisms, but almost none can survive under all conditions found in the sub-arctic. Just as there are some typical population problems and solutions common to the sub-arctic region, there are also other adaptational problems common to the region. The two most obvious being seasonal temperature and ground cover variability. The range of adaptations for dealing with these conditions is considerable, but within that range a number of adaptations are common to several species in the sub-arctic.

Homoiotherms must maintain body temperatures within relatively narrow limits despite exceptionally wide variations in air temperatures throughout an annual period. Migration from the region during the season of temperature stress is a solution adopted by many bird species. Alternatively, hibernation is common along some rodents and bats. But survival during hibernation may be uncertain in the sub-arctic, so that several species appear to have adapted a pattern of seasonal lethargy rather than hibernation as has been reported for beaver. Other animals adapt to winter cold by living under the snow, building dens and tunnels sufficient to feed and even mating under the insulating layer. Other animals adapt in a similar way by living under the ice in and near the water during the winter, beaver, muskrat and otter (Macpherson, 1968:476). Still other animals, too large to live under the snow, have generally adapted to living outside in the cold. Animals above the size of fox maintain sufficient body temperatures by having an effective layer of insulating fur and by lowering surface skin temperatures, but maintaining higher internal temperatures for normal body organ functioning (Macpherson, 1968:478; and Scholander _et al_., 1950a and b).

Just as there is a limited number of adaptations for temperature, there is also a number of common adaptations to snow - avoidance, large paws or feet relative to body weight, to "float" on snow, long legs to stand through it, and packing and using trails to assist movement are the most common.

To see how different animals have adapted to these different problems, to see how these adaptations affect other aspects of the animals behavior and survival, and to see how the pattern of the ecosystem is the result of these individual adaptive responses, it is necessary to examine the species individually.

B - Hare

The mammals previously discussed have all adapted to sub-arctic conditions in ways that permit the maintenance of relatively stable populations in the short-run. This is in contrast to the highly variable populations of many of the other mammals of the region. The snowshoe (or varying) hare is probably the best known species among those which have population cycles.

The cyclical fluctuations of the boreal forest region generally have a periodicity of about eight to eleven years. To the north, in the tundra areas, cycles are of shorter duration, averaging three to four years. The cycle in the boreal forest is based on fluctuations of the important herbivores of this zone, the hare, grouses, muskrat and some rodents. In the tundra the cycle is based primarily on lemming population variability. To the south of about $45^{o}N$ the pattern of the sub-arctic populations becomes less cyclical and more random or irregular, presumably because of the interaction of an increasing number of species in the food webs (Kendeigh, 1961:237).

The existence of a cycle has been questioned by several researchers who have attempted to show that high and low fluctuations also occur in random number series (cf., Cole, 1951, 1954). The cycles have however been demonstrated to exist and to differ statistically from random cyclical phenomena (Butler, 1953; Davis, 1957; Keith, 1963). In addition the careful examination of the cyclical patterns have revealed a number of distinctive geographical and intra-species relationships that characterize the cycles.

The period of the hare populations has varied at a continental level from seven to twelve years in length, but when the pattern is examined for smaller geographical units the variation is reduced (Keith, 1963:62). The Hudson Bay watershed as a whole displayed an eight-to eleven-year cycle during the latter half of the nineteenth century and in small local areas the cycles vary from eight to nine year periods only. There are then regular cycles of local populations with a narrow range of variation of period (Keith, 1963:62). These local cycles are also sufficiently synchronized that the pattern of periodicity can generally be seen at the regional and continental levels, although the synchronization is not perfect (Keith, 1963:62).

Geographically, the amplitude of the hare population cycles has been found to vary with latitude and location. In the northern United States the ratio of population densities from peak to low point generally range from 20:1 to 25:1. In the Canadian north ratios of 3400:1 have been reported and ratios of 1000:1 are common in the literature. Fur returns show ratios of about 250:1 (Keith, 1963:73).

These values correspond in general to the density of the population per square mile. At the low point in the cycle densities may be in the order of one hare per square mile, at the peak densities reach 250 to 1000 per square mile and values as high as 3400 to 10,000 per square mile have been reported from some localities (Banfield, 1974:82).

In addition to a latitudinal gradient in the amptitude of the cycles it has been suggested that there is a gradient out from regions near the center of the hare's range, with the highest peaks occurring in the prairie provinces (Keith, Rongstad and Meslow, 1966:959-960).

This gradient appears to correspond to the well established geographical sequencing of the population peaks. Comparing reports of peak cycles from the fur trade records of 63 different geographical areas in Canada, it has been shown that the first peak years occur in the northern section of the prairie provinces (Butler, 1953:254). Peak years occur first in Saskatchewan and Manitoba, then in Alberta, the Northwest Territories and British Columbia, then in Ontario and Quebec and finally in the Yukon (1953:253). The peak in Alberta was about 1.8 years after the peak in Saskatchewan, in Ontario 2.8 years and in the Yukon 3.3 years later than Saskatchewan (Keith, 1963:72). The hare populations of the Waswanipi region would therefore peak about two to three years after peak in Saskatchewan (Butler, 1953:254), Figures 5 and 6). The geographical variation indicates why there is more variation in the periodicity at a continental level than at the local level, as indicated above.

An examination of the geographical timing of the peaks also indicates that there is a spread of the peak populations out from the center in northern Saskatchewan and Manitoba. Three questions that arise are: What determines the center of the increase? How does the increase spread? And, why is the pattern one with a regular periodicity? Widely acceptable answers to these questions have not yet been proposed. Some recent proposals are reviewed here.

Somewhat similar patterns are apparently found in many population fluctuations of insects, such as the periodic budworm epidemics mentioned earlier. In these studies it has been found that centers of population irruption often have unusually unstable weather in especially those months and for especially those variables most critical to reproductive activity and population size. These conditions are usually sub-optimal, but become optimal occasionally, and when they stay optimal for long enough periods, possibly several successive years, a population build-up may occur (Watt, 1968:149). Applying this model to the case of the hare, Watt has recently pointed out that the northern Saskatchewan and Manitoba area has a particularly variable climate and that the peak hare populations have occurred when there were low number of storms, relative to the long-term mean for the region, i.e., a relative drought, and that peak populations follow two or more winters of lighter than median snowfall (Watt, 1968:150 and 152). Assessment of this proposal is not yet extensive in the literature.

It is clear from the reproductive data on hare that the populations have a great capacity for rapid increase, at least under favorable circumstances. Hares mate in summer and females can mate within one day of parturition so that up to four litters may be bred in the course of a single summer. The average however is 2.75 litters per female per year (Banfield 1974:83). It is not clear whether the number of litters may be larger in years with less severe winters and longer summers. Litter size is highly variable, between one and eight young per breeding, with an overall average of just under four. The number of young per litter appears to vary with population increases and decreases. During years when the population is rising litter size may be over four, during years when it is declining litter size may drop below 2.5 young per litter (Banfield, 1974:83).

In total, the reproductive data indicate the considerable reproductive potential of hare populations. The breeding potential of one doe is about ten young per year, or five per mating hare (2.7 litters times 4 per litter), but may be as high as sixteen per doe. Average litter size also correlates with latitude, being larger at latitudes between 60° and 66°N than between 43° and 49°N (Keith, 1963:76). In general, fedundity is higher to the north (Bookout, 1965:301) suggesting the effectiveness of the hare's adaptation to northern conditions.

The reproductive capacity of hare to increase populations at least one order of magnitude per year is clear and, if such an increase were to extend over two or three breeding seasons, most of the population increases cited in the literature would be within the ranges of possibility.

The reasons for the geographical expansion of the regions of peak populations over a period of years are less clear. Watt has suggested that as local populations increase they are subjected to severe density dependent pressures, crowding, and the population expands geographically by migration (1968:150). It is known that at low points in population cycles hares generally persist in favorable local habitats, particularly coniferous forest lowlands - swamps, thickets and mixed young deciduous and coniferous forest edges and openings (Banfield, 1974:83). At periods of peak densities dispersal occurs into less favorable habitats (Keith, 1963:88-89). However the data on mass migrations are contradictory, the existence of such movements is uncertain, and hares are generally considered to be a relatively sedentary species (Keith, 1963:89-90).

The reasons for the final decline in the population are also unclear, but are most likely related to some density dependent factor. Die-offs are rapid and generally take place in the late winter or early spring, and may follow high mortality among young animals in the first few weeks of life the previous summer (Keith, 1963:79). Diseases may be implicated in the die-offs, including the psycho-biological "shock" disease associated with the stress of living at high densities (Keith, 1963:83-87).

Why the population cycles have a ten-year periodicity has also remained an elusive point. Various climatic or astronomical cycles have been sugested for correlation from sunspots to lunar cycles, but all have either proved to have a different periodicity from the hare cycle, or there have been no convincing linkages proposed between the astronomical and biological cycles. Recently Watt has attempted to show that there is an appropriate cyclicity in the weather variables and that these are kept in phase by massive perturbations of hemisphere or world-wide weather patterns such as volcanic eruptions (Watt: 1968). The details need not be reviewed here. The reason why this explanation is attractive is that it could explain the continent-wide synchronous character of the cycles, and the synchronization of the cycles exhibited by several species, which I will discuss below.

Before turning to other species however, it may be useful to review some of the linkages that have been proposed on the basis of field research between local climatic conditions and hare behavior and populations.

The winter food of hares are the buds, twigs and bark of bushes and of the lower branches of trees (Banfield, 1974:83). During the course of the winter snow accumulation may help or hinder their feeding. As the snow accumulates throughout the winter the hares stand on the snow to reach fresh supplies of food (Pruitt, 1966:19). Hare can normally reach about 18 inches for browsing when standing on their hind legs, but with the help of the accumulated snow they may be able to feed on branches from the ground up to four or more feet from the ground (Bider, 1961:91-92). This suggests that a steadily increasing snow cover may assist hare.

Hare are nocturnal and activity is governed by the intensity of light (Banfield, 1971:81). Hare may be active on cloudy winter afternoons. High winds restrict activity, either by limiting the range covered by hare (Bider, 1961:89), or restricting movement completely. Throughout the year hare seek shelter in forms, natural or constructed hollows or crevices under the snow, stones or branches, where they can shelter themselves. During windy weather hares may stay in the forms, generally facing into the wind to keep the fur down and reduce chilling (Aldous, 1937:50). It has been found that activity levels can be related to changes in daily barometric pressure, especially during mid-winter, movement toward higher pressures being associated with higher activity levels and declining pressure with lower levels (Hanson, 1943: 92). Precipitation may therefore be related to activity at least at some seasons.

Hares have especially large and well furred feet which assist them to travel on top of the snow. During the period of fluffy early winter snow, hares travel by packing down runways by repeated and common use, and they do not venture off these runways very much. As the snow cover in general gets more dense during the winter hares travel more widely and single trails become more common in dense vegetation, although runways are still used in the open. Towards the end of winter, during thaw, hares may again use runways almost exclusively (O'Farrell, 1965:413). These patterns of seasonal use of runways have the effect of concentrating hare movement at particular seasons.

The trails made by hare are used not only by them, but by other animals and also by the predators of hare. Hares are preyed upon by a number of predators including lynx, red fox, wolf and owls (Banfield, 1974:83), and are the prime prey of some of these carnivores. The seasonal concentration of hare activity along trails is also used by researchers and hunters to increase trapping success (Keith, Meslow, Rangstad, 1968:802). Human harvesting does not, however, present serious management problems in the case of hare and has relatively little impact on the cyclical course of the population fluctuations (Dodds, 1965:314).

C - Muskrat

One of the most striking features of the cyclical population fluctuations in the sub-arctic region is that they are not limited to the hares and their predators. Other primarily herbivirous species also exhibit cyclical populations, particularly the muskrats and the grouses. The grouses will be referred to briefly later.

The muskrat is an aquatic animal, spending most of its time in the water and inhabiting a wide variety of water habitats. It usually requires water four to six feet deep to prevent freezing to the bottom and less than twelve feet deep to assure an ample supply of submerged vegetation (Banfield, 1974:199). Muskrats live in family units in houses made of aquatic vegetation or in bank dens. Both houses and dens may have several feeding platforms, tunnels and underwater entrances, the houses being more common in ponds, the burrows in rivers and lakes (Banfield, 1974:198).

In summer muskrats eat vegetation around the edges of water bodies and also feed on mussels and amphibians. They do not store food for winter and hence feed during the period of ice cover on submerged vegetation. A peculiar construction of muskrats is the push-up or feeding platforms built through the ice between the bank dens and houses. Typically they are about twelve yards apart and run in straight lines between the more permanent habitation sites (Banfield, 1974:198). The push-ups are frozen domes of vegetation covering a plunge hole through the ice and insulated by the snow cover over the vegetation. Muskrats eat their harvests in these during the feeding searches for submerged vegetation. The push-ups are formed by breaking through the thin ice in early fall and then pushing vegetation up through the hole and forming a little platform under the snow and on the ice. They are kept operational by frequent visits to break the ice and circulate the water. The number of active push-ups usually diminished through the winter (Banfield, 1974:198).

Muskrats defend their territory, but the populations disperse in spring, especially males and young. Densities of three per acre of open ponds to 35 per acre of marsh have been reported and Ontario harvests have been as high as eight per acre (Banfield, 1974:198). In the Waswanipi region populations are probably relatively low because of a lack of extensive suitable marsh lands and because of the relatively great thickness of the ice (JBDC-JBEC, 1974:165).

Muskrat populations show dramatic long-term fluctuations, usually with a ten-year periodicity in northern Canada (Banfield, 1974:198). Litter size and the number of litters vary with latitude. A smaller number of litters, but larger litters, occur in the north. Muskrat have been trapped for their furs throughout the fur trade period in North America. They are trapped primarily at the push-ups in the winter, or are trapped and shot in the spring during the migration period, although the pelts may not be prime.

Fur trade records provide an important historical documentation of the cyclical population fluctuations. On the basis of these records it has been found that muskrat cycle is roughly synchronous with the hare cycle (Butler, 1953).

Errington has claimed that the litter size, reproductive rates and disease syndromes of muskrat populations in Iowa all correlate with hare fluctuations and must be linked thereto by some mechanism, most likely climatic (1957).

The most likely mechanisms would be linked to water levels and particularly drought, as a possible control on the populations of muskrats.

D - Predators - Mink, Marten, Fisher, Lynx, Fox and Wolves

The cyclical populations of the main herbivorous species of the sub-arctic are closely linked to the cyclical fluctuations of the populations of their predator populations, as has been noted previously. A careful analysis of the timing of the population highs of the various species indicates that they follow a general sequence (Butler, 1953). The lynx highs begin about midway in the period of good hare years, typically a couple of years after hares are increasing. Fox highs commence in the same year as lynx on 49 percent of the occasions, but follow lynx on thirty-six percent of occasions. The commencement of lynx and fox highs are followed a year or two later by fisher and wolf highs (Butler, 1953:257-258). Mink highs, on the other hand, appear to follow the good years for muskrats more closely than they do the good years for hare (Butler, 1953:258-259). These patterns all make sense when examined in relation to the feeding habits and reproductive behavior of each species.

The smallest of the carnivorous species that occur in the territory are weasels, four species of which are the ermine, the least weasel, mink and marten. They range in size from an average of 41 grams to 2 kilograms (Banfield, 1974). The first two are small enough to enter small rodent burrows and depend primarily on mice and shrews as a diet, whereas mink also depend on young muskrats, fish, frogs and crayfish and the martens eat squirrels and hares (Banfield, 1974). Ermine, mink and marten produce one litter a year and least weasels more, but the latter are extremely rare.

Mink can attain populations of 8 to 22 per square mile, primarily along stream banks and forest edges, or 3 to 4 per square mile in less favorable habitat

(Banfield, 1974). The population cycles of mink follow those of the muskrat, its principal prey. Ermine populations fluctuate drastically, depending on populations of mice (Banfield, 1974:321), and inhabit a wide range of habitats including boreal forests and water shores. Marten are found in coniferous forests where they attain densities of 1 to 4 per square mile in good habitat. In the last century they may have exhibited cycles, but do not do so today. Marten are curious and easy to catch, are easily over-hunted and populations are low in many areas.

All weasels are primarily nocturnal, active in winter (Banfield, 1974) and less active during severe weather. All are preyed upon by some of the larger carnivores to varying extents. Northern Quebec is a region where marten fur is especially dark and the pelts are highly valued. There are three larger weasels and weasel-like animals, the fisher, otter and wolverine. They range in size from 2 to 15 kilograms (Banfield, 1974). The latter two are notoriously intelligent and difficult to catch (Banfield, 1974). All have one litter a year with about 1 to 4 young. Banfield indicates that the wolverine is extinct south of the Rupert River (1974:334). Otter are adapted to an amphibious way of life along the shores of deep waters, whereas fisher inhabit the coniferous forest. Both are active all winter, and both seek shelter during severe weather. The otter feed primarily on fish, invertebrates and amphibians, the fisher on mammals, mainly red squirrels, voles, hares and shrews (Banfield, 1974). Both species have few natural predators. The wolverine is exceptional of several counts - they are omnivorous scavengers known to follow traplines destroying trapped animals, sometimes removing bait and breaking into caches. When they find food they may "mark" it with a scented spray that makes it unattractive to other animals and useless to men (Banfield, 1974:333-334). Finally, they seldom seek shelter, even during extreme weather conditions (1974:333).

Fisher populations are the only populations of this group of animals which undergo cyclical fluctuations with a ten-year periodicity. Fisher have an exceptionally long gestation period, breeding occurs in March and April and the young are born six to eight days before the next oestrus in March and

April the following year (Banfield, 1974:319). Sexual maturity is reached at two years of age. These two features, long gestation and relatively late maturity, explain the delayed response of fisher populations to increases in the populations of hare, one of their major prey species.

The other primarily carnivorous species are the lynx, fox and wolf. Lynx are hunters of the deep coniferous forests, foxes are hunters of open country, and wolves range widely over diverse habitats. Lynx populations have dramatic fluctuations with about a ten-year periodicity linked to the peaks in the hare cycles (Banfield, 1974:350). Hares are the primary food of lynx occurring in 73 percent of digestive tracts and scats (Saunders, 1963a:386), the annual catch averaging 170 to 200 hare per lynx (Banfield, 1974:350). Their exceptionally large paws, the size of a man's palm, allowing them to traverse fluffy snow in pursuit of the hare. Lynx are active all year. They will bed down during the severest weather, are generally most active at night but are also active during the day. Lynxes hunt primarily by sight, and are quite inquisitive, often following a man's showshoe trails. Lynx have one litter a year averaging two or three young, but ranging up to five (1974:351). Lynx are apparently sexually mature at one year.

Fox populations also have regular fluctuations of similar periodicity which are probably linked to small mammal cycles which are their principal winter food, including moles, squirrels, mice, muskrats and hares. One litter a year is born, averaging five young and ranging from 1 to 10 (Banfield, 1974). Wolf population densities vary from area to area, with the densities of the moose and caribou their main prey, which they supplement with hares, beaver and muskrat.

In areas where big game is unavailable wolves depend more heavily on small game and their population cycles are more closely linked to those of the hares. Female wolves do not reach sexual maturity until two years of age and males until three years, which delays the response of population to increasing populations of prey species.

Wolves hunt in family packs averaging four to seven animals. Wolf predation tends to cull the big game populations of calves, aged or sick animals, those most easily caught (Pimlott, 1967). Common densities are one wolf to 40 to 80 square miles (Banfield, 1974; Pimlott, 1976). Like lynx and fisher, they will often follow regular hunting circuits (Banfield, 1974).

E - Black Bear

There have been fewer studies of the black bear than of any other widely distributed big game species and relatively less is known about the bears.

Black bears are more omnivorous than any other animal native to the North American continent with the possible exception of man (Peterson, 1966:221). They will eat berries, fruits, grasses, fish, small game, insects, frogs, and all kinds of carrion, the latter often being scavenged at garbage dumps around human settlements (Peterson, 1966:222 and Rausch, 1961:18). Throughout the summer the body weights of bears increase, as they develop a thick layer of fat.

In the autumn feeding declines the bears become lethargic and they seek out a den (Cowan, Wood, Kitts, 1957). Dens may be sheltered crevaces under stumps, logs or rocks or just brush pulled over the animal. Denning occurs between October and early December depending on the region (Banfield, 1974:306). When they retire they typically take some vegetation with them for bedding. Bears may use the same den site for several years in a row, but typically abandon it after a number of years (Rausch, 1961:28).

In the den bears enter a state of dormancy. They have a decreased metabolic rate (Rausch, 1961:15) and breathing drops to four to five respirations per minute (Peterson, 1966:221). But, they do have a relatively high heart rate for at least thirty minutes of most days, and a daily pattern of warmer body temperatures during the daylight hours (Folk, 1967:84). This is in contrast to the true hibernators, such as some rodents, where rates may be depressed for days or weeks at a time (1967:84).

The dormancy period of the bear appears to be an adaptation to the winter period when bears would probably find it difficult to feed themselves and would probably experience a serious negative energy balance. Those bears that are in poor physical condition at the end of the summer are not able to den and remain active into the late autumn. Similarly, cubs appear to be unable to den by themselves in northern latitudes if separated from their mothers. Rausch has commented that all such bears must soon starve (1961:29). However, in the dormant condition bears seem well able to maintain themselves nutritionally, and little wieght loss is apparently experienced throughout the winter (Peterson, 1966:221).

The bears remain conscious regularly during the dormancy, and apparently may rouse themselves during mild periods and even leave the den and feed if foods are readily available (Matson, 1954:32). Although their movements remain fairly sluggish when roused, this pattern may have adaptive significance allowing the bears to respond to favorable or dangerous winter conditions. During this time bears may also be roused by human activity and it is said they show neither fear nor animosity if approached judiciously (1954:32), which may be less adaptive.

As the winter progresses the den of the bear usually becomes covered over with snow, the only indication that may remain at the surface being a breathing hole (Banfield, 1974:306) distinguished by frost that often forms around it. In the spring, April generally, the melting snow and flooding rouse the bears out of their dens as the snow melt commences (Banfield, 1974:306). At this period, movement may still be difficult and little new growth of vegetation has commenced so that the bears may find only limited food. Insect larvae, carrion and spruce needles may be particularly important at this season, until break-up and fish runs begin and vegetative growth commences. It is during this late winter active period that the weight of the bear declines rapidly as stored fat is used to support active metabolic needs and the condition of the bears is usually lowest at this point in the year (Banfield, 1974:306).

Oestrus occurs in the black bears from mid-June to mid-July (Banfield, 1974: 306) and there appears to be little variation in the timing from region to region (Rausch, 1961:24). The oestrus in a female usually occurs only every second year, apparently because the location in the winter for the cubs suppresses oestrus (Rausch, 1961:24). If the cubs are lost early however oestrus will occur. After mating, the egg lies dormant for several months and delayed implantation occurs in October or November. The young are born mid-January to early February in the dens (Banfield, 1974:306). The average number of cubs per litter is 2.4 (range to 5) (Banfield, 1974:306). Cubs live with the mother through the second winter and disperse before she mates again. Females mate at four to five years old, males a year later. The reproductive potential of bears is therefore relatively low and they are slow to increase their populations.

Bears are characteristically animals of the forest, coniferous or deciduous, although they feed in a wide variety of habitats throughout a year. Densities may be about one bear per five to six square miles (Banfield, 1974:305).

Bears have very strong senses of smell and good hearing, but poor eyesight. They are active at all hours, but especially at night and are good climbers and swimmers (Banfield, 1974:305). Bears are notoriously cantankerous and their behavior in specific situations is often difficult to predict. They tend to be solitary animals and to avoid each other. It is suggested that they remain in fairly well-defended territories, apparently marked by scratches on "bear-claw trees", but the territories overlap extensively and there is little good data on this topic.

In short, the bears appear to have adapted to sub-arctic ecological conditions by maintaining an extremely plastic set of behaviors with regard to summer food and shelter. They cannot rapidly respond to meet new opportunities, but they are somewhat insulated from environmental variability by the fluidity of their responses. Bears effectively avoid the winters, but remain sufficiently alert to respond to disturbances. Reproductive potential is low. Bears have few, if any, predators, and the territorial system and/or the failure of bears to successfully den in winter may serve to limit the populations.

Footnote for Appendix 9-7

1. References cited in this appendix are listed in the bibliography of natural sciences.

APPENDIX 9-8 BIRDS OF THE WASWANIPI REGION IN RELATION TO THEIR ENVIRONMENT[1]

Most of the birds of the Waswanipi region are seasonally migratory and are only present during part or all of the summer season. The birds may be classified as (a) migrants, which pass through the region in spring and/ fall on migrations between their southern wintering grounds and more northerly nesting grounds, (b) the summer nesting birds, which migrate to the region from more southerly wintering grounds and that nest in the region and are summer residents, (c) the resident species, which are found in the region throughout the year, and (d) a few winter residents which live primarily to the north of the region, but that may migrate south to the Waswanipi region in some winters. The studies of bird habits and migrations for this region are limited.

The largest birds of the region are the ducks, geese and loons, raven, crow, several hawks and eagles, the grouses and the gulls. Some idea of the relative abundance of the species can be obtained from records of the frequency of observation of the various species. Available records from the region and from immediately to the east and north are listed on Table A9.8-1. All observations are for summer canoe travel periods and do not include observations of grouses and ptarmigans.

Geese pass through the region in migration, but are generally not common nor do they stop for long (Hanson and Griffith, 1952:19). This is in sharp contrast to the areas along the James Bay coast where hundreds of thousands of geese migrate past twice a year, and where small numbers nest inland. Densities of waterfowl at the coast may be of the order of 120 per square mile, whereas inland the average may be 1.2 per square mile (Curtis, 1973a). In the Waswanipi region the most common large birds in summer are the ducks and, of these, only three species are common breeders, the black ducks, goldeneyes and mergansers. During the summer they are concentrated along the water courses, especially the lakes, rivers and streams (Curtis, 1973a).

Black ducks are common along smaller rivers (Hanson, Rogers and Rogers, 1949:190). They feed on vegetable foods primarily grasses, seeds and sedges, but also eat

Table A9.8-1 Frequency of Sightings of Duck and Other Species in the Waswanipi Region

Species	Sightings per 100 Miles of River or Lake Travel	Observer and Date
Black Duck	4	Smith, June 18-July 9[1]
Black Duck	16	Rogers, August 7-21[2]
Black Duck	43	Rogers, Sept. 5-9[3]
Common Goldeneye	34	Smith, June 18-July 9[1]
Common Goldeneye	6	Rogers, August 7-21[2]
Common Goldeneye	11	Rogers, Sept. 5-9[3]
Common Merganser	11	Smith, June 18-July 9[1]
Common Merganser	93	Rogers, August 7-21[2]
Common Merganser	6	Rogers, Sept. 5-9[3]
Sharp-shinned Hawk	0.8	Smith, June 18-July 9[1]
Broad-winged Hawk	1.2	Smith, June 18-July 9[1]
Bald Eagle	1.2	Smith, June 18-July 9[1]
Ospreys	2.0	Smith, June 18-July 9[1]
Spotted Sandpiper	14	Smith, June 18-July 9[1]
Northern Raven	17	Smith, June 18-July 9[1]
Crow	1.2	Smith, June 18-July 9[1]

Footnotes:

1. Observed in 1954 on or along Lake Waswanipi, Waswanipi River to Lake Matagami, Bell River up to Rapides-des-Cêdres near what is now Quévillon (Smith, 1957).

2. Observed in 1947 along Rupert River from outlet of Lake Mistassini to Hudson's Bay Company on Lake Nemiscau (Hanson, Rogers and Rogers, 1949).

3. Observed in 1948 from Baie du Poste, Lake Mistassini through Lake Obatogamaw (Hanson, Rogers and Rogers, 1949).

insects, mollusks and fish. The northern limits of breeding range are probably determined by the length of summer season. Breeding can commence after break-up when the mean temperature is above 38°F. The reproductive cycle takes 92 days to complete, plus time to find and prepare suitable nesting sites, possibly another 15 days (Lehoux and Rosa, 1973:14-15). These conditions are regularly met in the Waswanipi region, although it is possible that in years with particularly late springs and early falls breeding would not be successful. Black ducks nest on the ground and females lay from 6 to 12 eggs, which take 28 days to hatch. Migration southward begins as the feeding areas freeze over, and groups fly south gradually as the freeze-up progresses. There is no mass migration.

Mergansers are fish-eating ducks and they prefer clear water which may be necessary for feeding (Godfrey, 1966:83). Nesting occurs in tree cavities or holes in banks.

Goldeneye nest on woodland lakes and muskeg in natural tree cavities. They are versatile feeders consuming aquatic insects, mollusks, fish and aquatic weeds. Goldeneyes are diving ducks which migrate in small flocks early and late in the season. In spring they follow closely the retreat of the ice and in fall some do not leave until ice has began to form.

The common loons return to nest each summer as soon as the winter ice breaks up on lakes. In smaller lakes there is usually only one pair to a lake and the nest is made very near to the shoreline. Two eggs are usually laid, and incubation takes 29 days (Godfrey, 1966). Loons probably do not breed until after their second year and have a low reproductive potential. The loon is an excellent swimmer and diver and can pursue fish under water propelling itself by its feet and occasionally with its wings. Food also includes crustaceans, mollusks, frogs and vegetation. Loons can, when pursued, stay underwater up to three minutes or more. Loon are notoriously awkward on land and spend most of their time on the water. They cannot take off from land and have a labored half-walking half-flying take-off from water that covers at least twenty yards (Godfrey, 1966:10). At freeze-up the loons congregate into loose flocks of

2 to 15 birds and move to their wintering grounds on the Atlantic coast.

The most important winter birds are the grouses and the ptarmigans. The most common species is the ruffed grouse. Spruce grouse and willow ptarmigan also occur, and sharp-tailed grouse are rare.

Ruffed grouse are a species of the young deciduous and mixed woodlands of the forest edges and openings. The ruffed grouse is commonly known as the "partridge". When frightened it bursts into the air, flies quickly using available cover and disappears into the forest. Its behavior is in sharp contrast to that of the spruce grouse which is ridiculously tame, not fearing men (Godfrey, 1966:108-110). The spruce grouse can often be killed with sticks or stones. It inhabits the coniferous forests mainly, but also mixed wood forests and forest edges and openings. The spruce grouse feeds on needles and buds of coniferous trees, especially in winter, and berries when available.

Ruffed grouse show widely variable fluctuations in population that are fundamentally similar to those of hare. The intervals between consecutive peaks are eight to ten years, high and low years are generally synchronous across the continent (Keith, 1963:23). The limited harvest data available on spruce grouse and ptarmigans show peaks synchronous with those of ruffed grouse (Keith, 1963:35-36; 57), and these cycles as a whole are synchronous with the cycle for hare (Keith, 1963:62). The grouse also appear to expand from optimum habitat into marginal habitat during peak years, and to remain only in the most suitable habitats after the decline. The ratio of peak to low densities of ruffed grouse populations runs from 3 to 1 to 15 to 1, suggesting that peaks are much less eruptive than are those of hare (Keith, 1963:135). Peak densities are also lower than for hare ranging from 80 to 350 grouse per square mile (Keith, 1963:135). The ratio of peak to low year hunting-kills for ptarmigan and spruce grouse is in the same range as that for ruffed grouse. Studies of the management of ruffed grouse indicate that harvests by hunters of one-third to one-half of population of grouse do not significantly alter the fluctuation of the population level of the species. The reproductive potentials are high and the cycles of population are not significantly altered by human harvesting

(Palmer, 1956:342-343). During winter storms grouse regularly seek shelter in coniferous trees or beneath the snow (Edmister, 1947:188). They will dive into the snow and form a roost in which they may stay for several days until weather conditions clear. If, during this period, a crust forms on the snow due to precipitation and/or temperature conditions, they may be trapped under the snow and be unable to surface. Winter mortality, other than under these conditions, appears to be infrequent (Edmister, 1947:189) because the birds feed on arboreal foods during this season. During cold windy periods the birds tend to aggregate in dense coniferous cover, whereas during sunny weather they may use more open types of vegetation (Bump, 1947:162).

Many of the birds of prey found in the Waswanipi region, including goshawk and horned owls, have been found in other regions to have population fluctuations that roughly correspond to the fluctuations in their prey species, particularly hare and small mammals (Keith, 1963:52). However, data on these species are very limited and no detailed accounts are available.

Footnote to Appendix 9-8

1. References cited in this appendix are listed in the bibliography of natural sciences.

APPENDIX 9-9 GEOGRAPHICAL PATTERNS OF BEAVER AND MOOSE HARVESTS IN RELATION TO MOBILITY, CAMP LOCATION AND THE SIZE OF HUNTING TERRITORIES

The analysis of the productivity of moose and beaver hunting activities indicates that the efficiency of these activities is related to the time that must be spent travelling to kill sites, and returning carcasses to the camps. This is affected by the distances between camp sites and animal kills and by differences in transportation between seasons. Thus although the effect of distance as such varies with the season, the distances involved at any season are an important factor determining the efficiency of harvesting activities. The winter period is the most critical given the increased transportation difficulty.

Moose hunting involves a substantial input of time for hauling moose back to camps, on an average of one man-day per moose harvest in winter. But, the farther a moose is killed from the site of the camp the more time and energy must be expended transporting it to the camp. These distances are often moderated because hunters often specifically locate the post-January bush camp near good moose hunting areas. However, the hunters consciously take the distances and work involved into consideration when deciding whether to pursue given moose signs as indicated in the main text. The age of the sign found, and the general knowledge of topography and sites allow hunters to make evaluations of where a moose may be going, and how far the likely kill may be from the site of the camp.

To examine the relationship of kill sites to distances from camps I have listed the direct line distances between moose kill sites and main camps for the sample of moose kills made in 1968-69 and 1969-70 hunting seasons which were marked on maps by the hunters (Table A9.9-1). Occasionally men will have an overnight camp from which they hunt, but as moose meat must be hauled back to the main camp, this distance is the mileage used. Waswanipi hunters do not move their camps to the site of big game kills, the camps are located in midwinter to be in good moose hunting areas, as mentioned previously.

Table A9.9-1 Distance From Moose Kill Sites to Main Camp Sites, Fall and Winter Harvests, 1968-69 and 1969-70

1968-69			1969-70		
Hunting Territory Number	No. of Moose Killed at Site	Distance to Main Camp (Miles)	Hunting Territory Number	No. of Moose Killed at Site	Distance to Main Camp (Miles)
III	1	4	II	2	7
	1	2	IV	1	0
	3	3		2	1
VIII	2	2	VII	1	3
	1	4	X	1	4
	1	3		1	10
VII	1	4		2	9
XVI	1	3		2	2
	1	13		1	1
	1	12		1	3
XVIII	1	4		3	4
	1	3		3	5
				1	6
			XIII	1	5
			XIV	2	9
				1	2
				1	3
				1	5
			XVa	1	5
				2	4
			XVI	3	6
				3	7
			XVII	1	0
			XVIII	2	2
			XIX	1	2
				2	5
				2	7
				1	1
			XXI	2	5
Average	1.3	4.7	Average	1.6	4.2

The longest winter hauled distances were thirteen and twelve miles made by a group of men operating from a secondary men's hunting camp and hauling supplies to the main camp by skidoo. When human and dog traction alone are available moose were not killed more than ten miles from the main camp.

On Table A9.9-2 moose kills are grouped by distance of kill from the main camp site. Seventy percent of the sampled kills in 1969-70 and eighty-seven percent in 1968-69 were made within six miles of the camp. None of the kills in 1969-70 and thirteen percent in 1968-69 were made beyond ten miles from the camp. The data suggest that the range for reasonably efficient moose hunting is up to six miles with a small percentage of moose kills occurring beyond ten miles from the main camp.

In beaver hunting the distances between camp sites and colonies trapped is a critical factor as well. The number of beaver traps that can be set and checked within a given day is an important factor affecting the number of beaver that will be caught. Each day a hunter must walk from his residential camp to the beaver colonies at which he is hunting and then return, a trip which usually covers a considerably larger portion of the time available than the actual checking and setting of the traps, see Chapter 8. Since travel and transportation between camp sites and beaver colony sites takes up a significant portion of the time involved in trapping beaver, a key dimension will be the distance between colony and camp, especially as nearly all kinds of winter beaver hunting require several visits to the colony site over a few days or a one to two week period.

The maximum distances between beaver colonies and the nearest camp site and the percent of all beaver colonies hunted within a six-mile radius of any of the camp sites used by a hunter during the season recorded are listed on Table A9.9-3. The list is complied for all hunting territories for which we had comprehensive records of camp sites and beaver colonies hunted. The longest distance between a hunted beaver colony and a camp was 15.8 miles and was done in a group with a skidoo. A similar distance of 14.5 in a group

Table A9.9-2 Number and Percentage of Moose Kill Sites Grouped by Distance From Main Camps, 1968-69 and 1969-70

Fall/Winter Hunting Season	Distance From Kill Site to Camp (Miles) 0 to 5	6 to 10	11+	Totals
1968-69				
- Number	13	0	2	16
- Percentage	87	0	13	100
1969-70				
- Number	33	14	0	47
- Percentage	70	30	0	100

Table A9.9-3 Greatest Distance From Hunted Beaver Colony Site to Main Camp Site, and Percentage of Beaver Colony Sites Within Six Miles of Main Camps, 1968-69 and 1969-70

1968-69			1969-70		
Hunting Territory Number	Distance of Farthest Beaver Colony to a Camp Site (Miles)	Percent of All Hunted Beaver Colonies Within 6 Mile Radius of a Camp	Hunting Territory Number	Distance of Farthest Beaver Colony to a Camp Site (Miles)	Percent of All Hunted Beaver Colonies Within 6 Mile Radius of a Camp
V	5.8	100	II	14.5	46
VII	11.5	85	VI	4.8	100
XI	10.5	85	X	12.0	80
XII	9.1	90	XIII	12.1	87
XIV	4.8	100	XVa	5.1	100
XVI	15.8	89	XVI	8.0	90
			XVII	8.5	87
			XVIII	5.5	100
			XIX	6.2	95

without a skidoo was recorded, but was a group which several men left in the middle of the season precisely because it was too far from the areas that were being hunted. The more frequent upper limit for groups without skidoos was approximately 12 miles. Where the distances were over large lakes or rivers, as was usually the case for the longer distances, return journeys of thirty miles a day are possible, and indeed greater distances are sometimes covered in a day when visits are made. For hunting, however, such distances are not common, they must be relatively unproductive for the time and effort involved.

From the data it is clear that a significant proportion of the groups do not travel distances greater than six miles. Five of the fifteen groups did not hunt beaver outside a six-mile radius. For all but one of the groups, no more than twenty percent of the colonies hunted were outside the six-mile radius. It is suggested that this is the effective limit Waswanipi find productive for most beaver hunting, although particular conditions, topographic or otherwise, may double this limit for a limited percentage of hunted colonies.

The survey of both beaver and moose hunting sites indicate that about six miles is the radius within which the most extensive and efficient hunting activity occurs. A second range of activity extends to approximately double that distance and beyond that very limited hunting occurs. These distances are perceived by the Waswanipi hunters as an important dimension of their hunting activity, and are considered in establishing the location of camps when hunting in a given area. The hunting territories used in the 1968-69 and 1969-70 hunting seasons for which I have complete data on the camps used are listed on Table A9.9-4.

Within a six-mile radius of a point 114 square miles are encompassed. Because travel in all directions is not equally easy somewhat less than 114 square miles is all that can be used in full while travelling only six miles from the site of a single camp. Camp locations however are usually on larger water bodies for easy travel so that camps cannot be located in the center of the

Table A9.9-4 Number of Main Winter Camps Used Per Hunting Territory, and Area Used Per Camp, 1968-69 and 1969-70

1968-69			1969-70		
Hunting Territory Number	Number of Main Camps	Area Per Main Camp (Sq. Mi.)	Hunting Territory Number	Number of Main Camps	Area Per Main Camp (Sq. Mi.)
V	6	20	II	1	240
XI	1	182	VI	4	35
XII	4	57	X	8	137
XIV	2	57	XIII	2	45
XVI	3	135	XVa	2	42
			XVI	3	93
			XVII	2	51
			XVIII	1	37
			XIX	3	61
Average	3.2	65		2.9	87

area to be hunted. The actual areas of land being hunted per camp used in 1968-69 and 1969-70 are listed on Table A9.9-4. On four territories the area per camp exceeds 114 square miles, II, X, XI and XVI. In each of these cases a particular circumstance can help to explain the lack of more camps. Territory X is a very large area that was not used equally intensively, and the light and geographically extended use from relatively limited number of camps was made possible by the use of snowmobiles for transportation. Territory XVI is also used by hunters with a skidoo and they also generally hunt a large section of the area only in the spring by canoe.

Territory XI represents a case of a large territory being used from a single camp, and this group apparently does use it in this pattern regularly. The longest possible one-way distance within the territory is 20 miles, but as the far end of the territory is cut by logging roads and visited by cars it is used relatively less frequently. In 1968-69 the longest distance travelled to a beaver lodge was 10.5 miles and 85% of the lodges hunted were within six miles of the camp, although longer distances were covered for moose. Territory XI probably represents the limiting case.

Territory II was hunted by people living in one camp from which an area of 240 square miles was hunted. This situation was found intolerable by the hunters involved. The territory is actually two territories belonging to two brothers and in the fall of 1969-70 they travelled together with a son each and another man to the territories. Each intended to establish a separate camp on his own territory. They were caught by freeze-up on the southernmost territory, and attempted to work the two territories from a single camp. The further territory had not been lived on for five years, and the owner and his wife were not in good health, so no attempt was made to set up a camp on this area after the freeze-up. The second territory was worked from the main camp, the son working the most distant sites. The longest distance walked to a beaver house was 14.5 miles, and the shortest distance to a beaver house on the section was 5.8 miles. This group was as a result unusual in that only 46 percent of the beaver lodges trapped on both sections together were within six miles of the camp. The situation proved intolerable, although a long and serious effort to use the second hunting territory was made. In March the owner of this second hunting territory left to join a step-son, his son joined another group near a town and a third man left to trap with his father and brothers. A man who had come at Christmas time stayed on with the owner of the section on which the camp was located.

A camp therefore is usually established for somewhat less than every 100 square miles and most of the territory used remains within a six mile radius of the camp, although up to approximately 150 square miles may be used from a single camp by particular groups. Given that two camp moves per season can be used relatively easily, in association with the holiday breaks at Christmas and Easter time, Waswanipi hunters would have little trouble utilizing a territory of up to three hundred square miles per hunting season. In fact, the average size of a hunting territory is 231 square miles (Table 11-11). A more complete survey of hunting camps conducted by the Grand Council of the Crees (of Quebec) in 1974, confirmed these findings (Table A9.9-5).

Table A9.9-5 Number of Winter Hunting Camps Per Hunting Territory, and Square Miles of Territory Area Per Main Winter Camp[1]

Hunting Territory	Number of Main Winter Hunting Camps	Number of Mens Winter Hunting Camps	Area Per Main Winter Camp (Square Miles Per Camp)
III	3	0	60
V	2	3	136
XA	3	4	140
XC	2	4	144
XD	1	4	141
XG	6	0	68
XI	1	1	182
XV	3	0	108
XVIA	1	3	240
XVIB	2	3	209
XVIII	2	2	69
XX	4	2	66
XXII	1	2	187
XXIII	4	0	34
XXIV	1	0	125
XXV	2	3	81
XXVII	1	5	144
XXIX	1	3	113
XXX	3	1	96
XXXI	3	0	198
Average	2.4	2.1	95

Footnote:

1. Source: Grand Council of the Crees (of Quebec). 1974. Waswanipi Land Use and Occupancy Questionnaires.

APPENDIX 10-1. HARVESTS OF MOOSE, BEAVER AND OTHER FUR-BEARERS BY HUNTERS, FALL, WINTER AND SPRING, 1968-69 AND 1969-70

These data include fall and spring harvests, and are based on interviews with 100 hunters, supplemented by diary records and official fur trade records when available.

Table A10.1-1 Harvests of Moose, Beaver and Other Fur-Bearers, by Hunters, Fall, Winter and Spring, 1968-69 and 1969-70

Hunter No.	Fully Active Hunter	Moose		Beaver		Otter		Marten		Mink		Weasel		Muskrat		Lynx		Bear	
		1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70
1		-[2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2		0	0	25	20	4	0	6	8	5	5	15	15	0	0	0	0	0	0
3		0	0	100	30	2	1	5	1	0	3	11	11	45	25[1]	1	0	0	0
4		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5		2[10]	2[10]	15[1]	10[1]	0[1]	0[1]	3[1]	0[1]	0[1]	1[1]	0[1]	1[1]	0[1]	44[1]	0[1]	0[1]	0[1]	0[1]
6		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7		0	0	10	25	0	2	0	3	0	0	0	0	0	23[1]	0	1	0	0
8		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9		-	0	-	2	-	0	-	0	-	0	-	0	-	0	-	0	-	0
10		-	0	-	3	-	0	-	0	-	0	-	0	-	0	-	0	-	0
11[3]	A	2	1	30	20	2	1	3	2	6	3	2	0	3	15[1]	0	0	0	0
12		0	0	20	22	0	0	4	2	0	1	0	0	12	10[1]	0	0	0	0
13	A	0	2	25	0	1	0	1	1	0	1	0	1	18	0	0	1	0	0
14	A	0	-	37	-	0	-	1	-	0	-	0	-	0	-	0	-	0	-
15	A	3	2	30	70	3	1	0	0	0	2	1	0	25	35[1]	0	0	0	0
16		0	1	20	30	1	0	0	0	0	1	0	0	10	15	0	0	0	0
17		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18		-	0	-	6	-	0	-	0	-	0	-	0	-	0	-	0	-	0
19		-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-
20		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(CONTINUED)

Table A10.1-1 Harvests of Moose, Beaver and Other Fur-Bearers, by Hunters, Fall, Winter and Spring, 1968-69 and 1969-70

Hunter No.	Fully Active Hunter	Moose		Beaver		Otter		Marten		Mink		Weasel		Muskrat		Lynx		Bear	
		1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70
21	A	3	1	70	80	0	2	2	9	3	2	10	0	30	22	0	0	0	0
22	A	0	0	35	20	2	1	2	6	2	4	10	10	4	20	1	2	0	0
23	A	0	0	25	30	1	1	2	6	1	6	8	10	6	30	0	3	0	0
24		0	0	10	15	0	0	0	0	0	0	0	0	25	35	0	0	0	0
25	A	2	3	70	75	6	4	4	3	5	3	15	20	0	0	0	0	2	0
26		0	0	8	14	0	0	0	2	0	6	0	0	98	15	0	0	0	0
27	A	4	2	90	46	4	0	4	3	3	1	2	0	0	0	0	0	0	0
28	A	4	2	50	54	5	2	5	2	2	1	4	5	20	5	30	10	0	0
29		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30		1	-	25	-	4	-	2	-	0	-	10	-	15	-	0	-	0	-
31	A	1	0	28	23	0	2	1	0	4	4	7	4	9	10	0	0	0	0
32		2	-	44	-	1	-	0	-	0	-	0	-	60	-	0	-	0	-
33	A	0	2	11	10	0	1	0	0	0	2	1	3	5	8	0	0	0	0
34	A	3	2	100	99	10	5	16	20	2	3	10	10	0	0	0	0	0	0
35		-	1	-	30	-	1	-	17	-	2	-	0	-	0	-	0	-	0
36[4]	A	2	3	35	40	1	1	5	4	3	2	2	4	40	35	0	0	0	0
37	A	2	1	90	89	2	1	5	2	5	2	6	3	33	10	0	0	0	0
38		-	0	-	20	-	1	-	2	-	2	-	3	-	12	-	0	-	0
39[5]		1	0	35	5	1	0	8	1	0	1	0	0	0	3	2	0	0	0
40		2	0	36	26	0	0	0	1	2	3	7	5	20	10	0	0	1	0

(CONTINUED)

Table A10.1-1 Harvests of Moose, Beaver and Other Fur-Bearers, by Hunters, Fall, Winter and Spring, 1968-69 and 1969-70

Hunter No.	Fully Active Hunter	Moose 1968-9	Moose 1969-70	Beaver 1968-9	Beaver 1969-70	Otter 1968-9	Otter 1969-70	Marten 1968-9	Marten 1969-70	Mink 1968-9	Mink 1969-70	Weasel 1968-9	Weasel 1969-70	Muskrat 1968-9	Muskrat 1969-70	Lynx 1958-9	Lynx 1969-70	Bear 1968-9	Bear 1969-70
41		0	0	20	10	0	0	8	0	0	0	0	1	5	0	0	0	0	0
42[6]	A	2	5	70	122	2	1	0	1	3	1	15	5	50	30	0	10	0	0
43	A	0	0	48	60	3	0	1	1	2	3	1	0	10	15	0	0	0	0
44	A	2	2	25	52	0	2	0	0	3	0	10	0	0	20	2	0	0	0
45	A	1	3	50	42	0	0	5	0	2	0	0	0	12	10	0	0	0	0
46		0	0	15	25	1	2	4	5	4	5	20	16	15	5	0	1	0	0
47		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
48		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
50	A	2	1	42	36	1	0	4	1	0	3	3	7	28	20	2	1	0	0
51		0	0	16[1]	28[1]	2[1]	0[1]	2[1]	0[1]	0[1]	0[1]	0[1]	0[1]	30[1]	0[1]	0[1]	0[1]	0[1]	0[1]
52		2	0	29	20	1	1	6	0	2	0	2	0	20	5	0	0	0	0
53		2	2	23	60	1	0	7	10	0	4	1	0	14	5	0	0	0	0
54		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
55	A	1	2	53	49	3	0	0	5	0	0	0	0	0	0	0	0	0	0
56	A	0	0	60	48	0	0	10	10	1	2	3	4	5	6	0	0	0	0
57	A	4	3	36	40	0	0	6	5	0	0	3	1	4	7	0	0	0	0
58	A	1	0	45	15	0	0	5	3	0	1	3	3	0	0	0	0	1	0
59		0	2	15	35	0	0	4		0		0		0		0		0	
60[7]		0	1	20	35	0[1]	2	1[1]	3	2[1]	0	0[1]	1	4[1]	15	0[1]	0	0[1]	0

(CONTINUED)

Table A10.1-1 Harvests of Moose, Beaver and Other Fur-Bearers, by Hunters, Fall, Winter and Spring, 1968-69 and 1969-70

Hun-ter No.	Fully Active Hunter	Moose		Beaver		Otter		Marten		Mink		Weasel		Muskrat		Lynx		Bear	
		1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70	1968-9	1969-70
61	A	3	0	40	30	2	0	2	0	0	0	2	0	7	0	0	0	0	0
62		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64		-	0	-	16	-	0	-	6	-	1	-	3	-	10	-	0	-	0
65	A	2	2	70	40	0	0	0	2	6	0	4	0	50	15	0	0	0	0
66[6]		0	-	30	-	0	-	5	-	0	-	15	-	20	0	0	-	0	-
67		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
68	A	0	0	25	32	0	0	2	6	1	11	4	0	12	15	1	0	0	0
69	A	-	1	-	50	-	0	-	0	-	2	-	7	-	30	-		-	1
70		-	0	-	10	-	0	-	0	-	1	-	5	-	15	-	0	-	0
71		1	0	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0
72	A	4	3	19	30	3	2	1	2	3	1	0	0	34	25	0	0	3	0
73	A	4	3	50	134	5	1	6	5	12	10	0	0	40	50	1	1	0	0
74	A	4	0	75	35	2	2	0	1	0	0	1	0	10	0	0	1	0	0
75	A	0	2	25	15	?	0	?	2	?	0	?	3	?	0	?	0	?	0
76[4]	A	3	6	15	20	0	1	0	0	1	1	0	0	20	25	0	0	0	0
77		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
78		0	0	5	21	0	0	0	2	0	0	0	0	0	0	0	0	0	0
79		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
80		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(CONTINUED)

Table A10.1-1 Harvests of Moose, Beaver and Other Fur-Bearers, by Hunters, Fall, Winter and Spring, 1968-69 and 1969-70

Hun-ter No.	Fully Active Hunter	Moose 1968-9	Moose 1969-70	Beaver 1968-9	Beaver 1969-70	Otter 1968-9	Otter 1969-70	Marten 1968-9	Marten 1969-70	Mink 1968-9	Mink 1969-70	Weasel 1968-9	Weasel 1969-70	Muskrat 1968-9	Muskrat 1969-70	Lynx 1968-9	Lynx 1969-70	Bear 1968-9	Bear 1969-70
81[9]		0	-	8	-	0	-	9	-	2	-	7	-	6	-	0	-	0	-
82		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
83	A	3	3	100	70	3[1]	1	4[1]	6	1[1]	12	6[1]	15	28[1]	60	2[1]	0		0
84	A	6	4	60	35	2[1]	3	2[1]	2	0[1]	3	0[1]	13	21[1]	36	0[1]	0	0[1]	0
85	A	0	0	50	60	1	0	8	6	6	10	15	10	13	30	0	0	0	0
86		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87		1	0	35	28	0	0	3	1	4	13	8	10	14	16	1	0	0	0
88		2	1	87	41	5	0	1	3	7	7	15	7	0	10	2	0	0	0
89		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
90		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
91		1	0	30	20	0	0	10	5	2	0	2	2	20	0	0	0	0	0
92		-	0	-	20	-	?	-	?	-	?	-	?	-	?	-	?	-	?
93	A	1	2	56	35	2	2	13	5	0	5	6	4	15	13	0	3	0	0
94	A	2	0	67	35	1	0	12	7	1	2	3	0	29	32	0	6	0	0
95	A	2	2	30	23	0	0	3	2	2	0	6	4	70	60	4	0	0	0
96		2	0	20	25	0	0	1	1	0	1	2	0	60		2	0	0	0
97	A	8	1	100	40	4	0	28	1	2	1	7	0	18	10	0	0	1	0
98		2	1	44	9	3	0	1	1	1	1	0	0	56	0	0	0	0	0
99	A	1	0	25	37	4	6	0	0	2	0	1	0	30	30	0	0	0	0
100[8]		2	1	50	22	1	1	3	0	3	0	3	0	30	25	1	0	0	0

(CONTINUED)

Table A10.1-1 Harvests of Moose, Beaver and Other Fur-Bearers, by Hunters, Fall, Winter and Spring, 1968-69 and 1969-70

Hunter No.	Fully Active Hunter	Moose 1968-9	Moose 1969-70	Beaver 1968-9	Beaver 1969-70	Otter 1968-9	Otter 1969-70	Marten 1968-9	Marten 1969-70	Mink 1968-9	Mink 1969-70	Weasel 1968-9	Weasel 1969-70	Muskrat 1968-9	Muskrat 1969-70	Lynx 1968-9	Lynx 1969-70	Bear 1968-9	Bear 1969-70
101		-	0	-	20	-	0	-	2	-	3	-	10	-	15	-	0	-	0
102		-	0	-	18	-	0	-	0	-	0	-	0	-	18	-	0	-	0
103	A	2	3	20	30	1[1]	1	3[1]	5	2[1]	5	0[1]	8	48[1]	7	0[1]	0	0[1]	0
104		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
105		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
106		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
107		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		107	81	2778	2614	103	55	259	213	120	170	289	244	1326	1067	52	40	8	1
Average Per Hunter		1.00	0.76	25.96	24.43	0.96	0.51	2.42	1.99	1.12	1.59	2.70	2.28	12.39	9.97	0.49	0.37	0.07	0.01

Footnotes:

1. From official statistics of Fur Division, Quebec Department of Tourism, Fish and Game.
2. A dash (-) indicates that no harvests of any species were made in that year.
3. Reported by #50.
4. Reported by #99.
5. Reported by #95.
6. Reported by #65.
7. Reported by #97.
8. Reported by #21.
9. Sick after Christmas.
10. Estimated.

APPENDIX 10-2 FUR PURCHASES, WASWANIPI POST, HUDSON'S BAY COMPANY, 1886-1890, 1916, 1917, 1925-1965

Data for 1886 to 1990 and for 1916 and 1917 come from the Hudson's Bay Company archives. Data for 1925 to 1965 were kindly provided by the Northern Stores Department, Hudson's Bay Company in Montreal and Winnipeg. Note that some changes in quantities purchased represent changes in purchasing policies. Thus, after trapping of beaver recommenced on the beaver reserves the pelts were officially auctioned for the trappers by the Fur Service of the Quebec Department of Tourism, Fish and Game. The Hudson's Bay Company acted as a processing agent for Quebec, both in the field and at the auctions. Thus, with the creation of the Nottaway reserve in 1938, and recommencement of trapping there in 1946, the Hudson's Bay Company was no longer purchaser of beaver pelts from that portion of Waswanipi traplines. With the creation of Mistassini reserve in 1948, the Hudson's Bay Company ceased to be the official purchaser of any beaver pelts at Waswanipi Post. Purchase records for black bears, skunk, squirrels and wolves may reflect changes in purchasing policies. All foxes, red, cross and silver phases, and a rare arctic fox, have been grouped under the label "Fox".

Table A10.2-1 Fur Purchases, Waswanipi Post, Hudson's Bay Company, 1886-1890, 1916, 1917, 1925-1965

Species	Number of Pelts Purchased Per Year[3]											
	1886[1]	1887[1]	1888[1]	1889[1]	1890[1]	1916[2]	1917[2]	1925	1926	1927	1928	1929
Beaver	652	456	820	442	536	682	685	703	764	479	403	284
Black Bear	57	41	56	72	57	28	59	43	36	29	40	46
Otter	66	41	67	61	68	45	29	39	28	52	32	37
Marten	387	510	519	251	225	247	358	220	232	371	241	111
Mink	103	104	36	32	29	73	13	158	208	69	31	39
Weasel "Ermine"	-	-	-	-	-	96	95	11	80	464	235	413
Muskrat	735	464	500	239	550	217	286	720	131	181	324	1021
Lynx	194	225	354	308	156	287	111	207	142	57	32	18
Fox	4	8	29	8	19	51	39	27	71	88	46	7
Timber Wolf	-	-	-	-	-	-	-	-	-	-	-	-
Fisher	7	25	14	28	15	10	11	3	11	49	31	17
Squirrel	-	-	-	-	-	-	-	-	202	387	124	-
Skunk	-	-	-	-	-	-	-	17	6	6	-	-

(CONTINUED)

Table A10.2-1 Fur Purchases, Waswanipi Post, Hudson's Bay Company, 1886-1890, 1916, 1917, 1925-1965 (Continued)

	Number of Pelts Purchased Per Year[3]										
Species	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940
Beaver	244	249	273	165	90	52	38	35	-	5	121
Black Bear	34	45	27	53	8	-	-	36	-	-	-
Otter	35	50	59	26	46	39	33	19	44	41	43
Marten	102	64	65	98	57	54	21	69	112	112	41
Mink	101	126	238	319	200	334	276	50	49	52	111
Weasel "Ermine"	314	219	722	730	201	217	199	239	1018	1140	444
Muskrat	1772	2908	2027	1587	879	576	468	598	1142	2371	3680
Lynx	22	17	50	109	112	207	451	381	78	50	29
Fox	2	3	10	21	68	117	151	95	39	22	16
Timber Wolf	-	-	-	-	-	-	-	-	-	-	-
Fisher	12	6	7	8	9	20	58	89	30	21	1
Squirrel	-	-	-	-	-	-	-	-	316	946	681
Skunk	-	-	-	-	-	4	1	3	5	4	16

(CONTINUED)

Table A10.2-1 Fur Purchases, Waswanipi Post, Hudson's Bay Company, 1886-1890, 1916, 1917, 1925-1965 (Continued)

	Number of Pelts Purchased Per Year[3]											
Species	1940-41	1941-42	1942-43	1943-44	1944-45	1945-46	1946-47	1947-48	1948-49	1949-50	1950-51	1951-52
Beaver	161	108	85	70	79	141	237	288	51	-	-	-
Black Bear	-	-	-	-	-	-	-	-	-	-	-	-
Otter	37	48	41	48	46	48	28	37	43	46	25	24
Marten	26	28	39	36	21	22	9	11	-	-	-	-
Mink	175	356	593	336	95	73	22	23	80	161	79	75
Weasel "Ermine"	528	702	1193	638	599	639	204	217	1301	1559	784	142
Muskrat	3777	2787	2090	1712	1877	1302	794	2687	5127	3574	2320	1790
Lynx	11	33	55	95	58	57	73	35	91	131	66	69
Fox	17	16	113	541	683	373	260	143	30	44	43	9
Timber Wolf	-	-	-	-	-	-	-	-	-	-	-	-
Fisher	-	-	-	-	-	-	-	-	-	6	5	3
Squirrel	726	1798	1119	478	1555	3197	1030	1962	1545	651	899	215
Skunk	-	-	-	-	-	-	-	-	-	-	-	-

(CONTINUED)

Table A10.2-1 Fur Purchases, Waswanipi Post, Hudson's Bay Company, 1886-1890, 1916, 1917, 1925-1965 (Continued)

	Number of Pelts Purchased Per Year[3]												
Species	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65
Beaver	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Bear	-	-	-	-	-	-	-	-	-	-	-	-	-
Otter	31	35	39	70	38	63	54	65	78	84	39	33	13
Marten	-	-	-	-	-	-	-	-	-	-	57	142	88
Mink	79	98	47	82	80	140	140	251	375	241	86	121	52
Weasel "Ermine"	288	488	212	247	447	238	258	267	404	144	76	87	199
Muskrat	1979	1697	1403	1540	2389	2544	2300	1662	1399	912	1166	651	231
Lynx	56	56	25	43	33	26	37	216	140	92	111	104	50
Fox	20	3	6	4	-	6	-	-	1	-	-	2	-
Timber Wolf	3	-	-	-	-	-	-	-	-	-	-	-	-
Fisher	7	-	5	9	4	6	6	4	2	1	5	1	1
Squirrel	535	602	196	204	311	117	206	123	222	41	89	66	28
Skunk	-	-	-	-	-	-	-	-	-	-	-	-	-

Footnote:

1. D.25/14 Inspection Reports, 1891.
2. D.FTR/8 Annual Reports From District Officers, Outfit 1917.
3. From 1925 to 1964-65 from: Hudson's Bay Company, Northern Stores Department, Winnipeg and Montreal.

APPENDIX 11-1 CORRESPONDENCE OF THE GEOGRAPHICAL LOCATION OF HUNTING TERRITORIES IN 1970 WITH THOSE IN 1915

Sixteen of the forty hunting territories studied in 1970 are reported to have been inherited from a parent or grandparent who appears on the 1915 list of hunting territory owners, and whose hunting territory in 1915 was located in the same general area as the hunting territories of their descendents in 1970. These cases are listed in Chapter 11. For the remaining twenty-four hunting territories data are more diverse, and sometimes incomplete, and a more detailed review and analysis of the available data are needed. These are given below. The conclusions of this analysis are included on Table 11-4 in the main text of this study.

Hunting territories IIA and IIB which are adjacent and owned now by two brothers, were received as one territory by one of the brothers from Joseph Ottereyes, an "uncle" of the present owners. On the 1915 list there is no Joseph Ottereyes, but a "Joseph Edwards" who appears on the 1915 list and is remembered by the Waswanipi today as the same Joseph Ottereyes, his full name being "Joseph Edwards Ottereyes." This is confirmed by the parish records of St. Barnabas Anglican Church at Waswanipi, where "Joseph Ed. Ottereyes" name appears in the records of the numerous events of his family. Joseph Edwards Ottereyes' sister was the mother of the present owners. According to the 1915 list this "Joseph Edwards" had a hunting territory at "Optawaga Lake" (Table 11-3). Present day hunting territory IIB includes part of the shoreline of Opatawaga Lake and it and territory IIA extend north from there to include Salamandre Lake. The present area includes the immediate location at which the former owner was hunting on the 1915 map, but it is not apparent whether the 1970 and 1915 hunting territories actually coincide extensively. It is likely that Joseph Edwards hunted to the north of Opatawaga Lake in 1915, because there were two locations to the south of his location in 1915 (locations 8 and 5 on Map 11-4) but there is no direct evidence of this for 1915. If he did hunt to the north of the location marked then the hunting territories coincided extensively, if he did not, then they overlap at least in part.

For a somewhat latter date however there is evidence of Joseph Edwards Ottereyes having used land to the north of Opatawaga. His son is now the owner of hunting territory XA, which is located immediately to the north west of territory IIA (Map 11-1). In 1932 or 1933 when John Cooper gathered ethnographic information on the hunting territories of the Nemiscau people from a Hudson's Bay Company employee he found two "Ottereyes brothers" who had a hunting territory on the Broadback River and who sometimes hunted as far as "Evans Lake."[1] The 1936 band list for the Nemiscau band indicates that Joseph Edwards Ottereyes was a member of that band at the time. By 1943 all his sons were back in the Waswanipi band when the first official membership list was made. Hunting territory XA today, is the land southwest of Evans Lake, including a part of the Broadback River. The entire stretch from Opatawaga to Evans Lake therefore appears to have been used by Joseph Edwards Ottereyes at least at various times. The entire area is said to have been passed on to his sons (XC), and to the second husband of one of his son's widows (IIA), and to the latter's brother (IIB). Hunting territories IIA, IIB and XA are therefore continuous with the ownership and geographical location of Joseph Edwards Ottereyes' hunting territory from 1915 to 1933, from whom the present owners trace their inheritance.

In the case of hunting territory III, it is known that the present owner received it from Charlie Gull, his father, but it is not known from whom the father received the territory. The territory today is adjacent to territories IIA and IIB and Charlie Gull was a brother of the present owners of territories IIA and IIB. However, I am in fact unable to demonstrate any definite geographical or social continuity between this hunting territory and the data available for 1915 because I failed to record from whom Charlie Gull inherited.

Two hunting territories appear to have been inherited by the present owners through the Hudson's Bay Company personnel. As was indicated earlier, the Hudson's Bay Company Post was located on an island at the northern end of Waswanipi Lake. In 1915 Cartledge noted, in the memo dictated by Cooke, that the man who was made hunter for the Hudson's Bay Company Post that year, and whose job it was to secure as much fresh meat as possible for the use of the Post, was shifted from his own hunting grounds to "Waswanipi Lake." In 1895, O'Sullivan found "an old servant of the Hudson Bay Company" was hunting and living on the southwest bay of Lake Waswanipi at Iserhoff River, which O'Sullivan named after him (O'Sullivan, 1901:49). These data, as well as contemporary report of the Waswanipi indicate that the lands surrounding Waswanipi Lake formed a hunting territory for the use of the Hudson's Bay Company and its staff during the early decades of this century. It was also an area used heavily in summertime by Waswanipi band members who camped for various periods around the Hudson's Bay Company store.

One present owner directly traces his inheritance of his hunting territory to this fact. A retired employee of the Hudson's Bay Company, and the most steady employee of the Hudson's Bay Company among the Waswanipi, he inherited the hunting territory from a non-Native employee of the Hudson's Bay Company. His territory XXX, includes the lands surrounding the northern half of Waswanipi Lake, and is continuous with the location identified in 1915 as used by the post hunter.

A second contemporary hunting territory XI appears also to be related to the former Hudson's Bay territory. I have no definite statements from the present owner on inheritance, but was told by others that this area was transferred to the present owner by an employee of the Hudson's Bay Company. The present owner was a young child when his father died, and his widowed mother and her children were looked after by the Hudson's Bay employee. The present owner learned to hunt on this territory, and when he grew up the land was transferred to him. This hunting territory consists principally of the drainage basin of the Iserhoff River and is therefore continuous with the former Hudson's Bay Company employee's hunting territory identified in 1895.

The only case of the transfer of a hunting territory that explicitly involves the intervention of government agents occurred at the time of establishment of the beaver reserves. Hunting territory VI was inherited by the present owner through the mutual agreement of the hunters of the band and the government agents. The present owner notes that at the time the land was given to him the land belonged to the grandfather of another man, who had been dead for some years, without the land being transferred to anyone else. The man's name was not given, but his son was Daniel Pehen. The 1915 records list a Peter Robert Pehen, who hunted with a married son, Daniel Pehen at a hunting territory at Matagami Lake, location 14 (Table 11-3, and Map 11-4). The present territory is comprised of the land at the east end of Lake Matagami and is therefore considered continuous with the former area. An interesting feature of this case, in which there was some government involvement, was that it is the only case of inheritance of a hunting territory by hunters who had no historical tie to the hunting territory involved.

For two hunting territories, XVIA and XVII, only circumstantial evidence linking inheritance data to an owner listed in the 1915 lists is available. The present owner of hunting territory XVII received the territory from James Otter a half-brother of the present owner's father, the two having the same mother and different fathers. In 1915, James Otter was hunting at location 13c and his step-father and his half-brother, the father of the present owner, were living at location 13d. Both locations were on the territory of Peter Nayahsett, and James Otter was married to Peter Nayahsett's daughter (Table 11-3). The 1915 hunting territory was called "Opawikah River" and the present hunting territory XVII is immediately south of the River on Lake Germain and Father Lakes, the boundary coming within less than 5 miles of the Opawica River at several points. The geographical areas therefore appear to be continuous. What I do not have is any datum on how James Otter inherited the territory. It is possible that he received a part of his father-in-law's hunting territory, and if he did then this territory is a case of geographical continuity, but I cannot confirm this with the data available.

The inheritance of territory XVIA is closely related. The present owner received it from an unrelated man, who himself is said to have received it from his wife's first husband. I am unable to determine who the wife's first husband was. What is known is that she was a daughter of Richard Grant who, as I have noted above, was living on Peter Nayahsett's territory in 1915 with his son and his step-son. Territory XVIA is adjacent to territory XVII and is just a few miles to the south of the Opawica River, including Lakes Margry and Nicobi. The location appears to be continuous with Peter Nayahsett's hunting territory. But, I have no clear evidence of who was the first husband of Richard Grant's daughter, or whether he inherited a portion of Peter Nayahsett's territory.

For the two other territories IX and XXI, I do not have any explicit statements available from the owners or their close kin concerning the history of the inheritance of the hunting territory. Nevertheless, on the basis of available data from statements collected from other informants, and from the situation on adjacent hunting territories, the likely inheritance patterns can be postulated.

The first wife of the present owner of hunting territory IX was the sister of the present owner of hunting territory XXIII and she was the daughter of Peter Eagle. A man named Joseph Frenchman (Eagle) was at location 15 in 1915 (Map 11-4). His hunting territory was described as "Gull Lake" (Table 11-3) the east side of which is now territory XXIII and the west side is territory IX. Peter Eagle is reported to be the same person as Joseph Frenchman (Eagle) and the parish records of St. Barnabas Anglican Church confirm this, offspring of Peter Eagle being alternatively listed as offspring of a "Peter Eagle" or a "Joseph Eagle." One of his sons is now the owner of hunting territory XXIII. It is not however clear exactly from whom the present owner of territory IX inherited, although it is likely to have been Peter Eagle or one of his sons, and therefore to also be a case of geographical continuity.

In a somewhat similar case, the grandfather of the present owner of territory XXI was Peter Robert Pehen who was listed at location 14 in 1915, "Matagami Lake" (Table 11-3). The present territory lies immediately to the south-west of Matagami Lake, and is presumably a portion of what was formerly a larger territory including the same area. Nevertheless, I have no statements by the present owner on who he inherited from. If it is correct he inherited from his father and grandfather then this territory too has been geographically continuous since 1915.

All the cases discussed so far, are either clear instances, or highly probable instances of the geographical continuity of the hunting territories. However, not all cases indicate such extensive continuity.

For a group of four related hunting territories, XD to XG, there is a probable geographical discontinuity of location. All four territories were formerly a single hunting territory, owned by the present owner of hunting territory XD. The other territories are now owned by this man's sons. On the 1915 list this man does not appear, but his brother is listed as an owner of a hunting territory located near the "Lake at the end of Victoria River." The Victoria River is now the Broadback River. The offspring of this man remembered his land as having been inherited by his brother on his death because the man who was an owner in 1915 has left no offspring who married. There is therefore a clear chain of inheritance. The present territories are not however entirely continuous with the 1915 location of the territory. The present territories include the lands north and south of the Broadback River, for over 35 miles of the river length, roughly from Evans Lake to seven miles to the east of Keniapiscau Lake. The actual location, number 2, marked on the 1915 map (11-4) is to the west of Keniapiscau Lake at the end of the Broadback River, i.e., Assinica Lake. It is definitely to the east, by about twenty miles, of the eastern boundary of the present hunting territories owned by the heirs of the owner in 1915. In this case then it seems probable that there has been a geographical shift. Either the territory as a whole has shifted to the west or an eastern portion of a once larger territory has been excluded. The territories are therefore probably not entirely discontinuous, but they probably have undergone a significant shift to adjacent lands.

Another case of a probable shift occurs in the same general area. The father of the present owner of hunting territory XC was Samuel Happyjack, and the present owner of the adjacent hunting territory XXV reported that he received his territory from Samuel Happyjack. Although I have no explicit statements on transfers from the owner of hunting territory XC it is likely that both territories were inherited from his Samuel Happyjack. The owner of territory XXV was living with Samuel Happyjack, and was taught how to hunt by him, his own father having been an employee of the Hudson's Bay Company.

Samuel Happyjack is reported to have had a territory on "Chensagi River" in 1915, at location 6 (Map 11-4). This location is to the south of the Chensagi River on a present map, although, on the original published map it was actually located in an open area east of Lake Chensagi in which the River course was not drawn. The present hunting territories XC and XXV extend from the Chensagi River north to include Amiskwumiska Lake. These lands are to the north of location 6, and this may indicate a northward shift of these hunting territories. On the other hand it is possible that the 1915 location was not located with precision for lack of a detailed map of the area, and this could explain the present location of territory XXV and possibly XC. It is also possible that Samuel Happyjack's son, from whom I have no statement on inheritance, and who owns the territory most removed from the 1915 location, XC, actually did inherit an adjacent hunting territory from someone else. However, since I do not have direct evidence on either of these possibilities I will, having noted them, consider these two territories to be probable cases of geographical shifts of hunting territories into adjacent lands.

Finally, there are six other hunting territories for which I lack adequate data for comparison. Two of these XXXI and XXXII are cases of hunting territories that were not owned by Waswanipi men in 1915, and for which I therefore have no historical data. In both cases the present owners transferred into the Waswanipi band.

For hunting territories IV and VII, I am also unable to indicate any link between the present hunting territories and independent historical data on the locations of previous owners territories because these territories are not now owned by Waswanipi band members, nor were they owned by Waswanipi hunters in 1915.

Finally, I have inadequate data on transfers in two cases. I have no data on transfers for hunting territory XH and the transfer of the present owner into the band prevents comparable data for 1915. In the case of territory XX, I cannot trace the inheritance of the territory back more than one step, and the former owner does not appear on the 1915 list. Furthermore, the area of the hunting territory itself is one on which there were no point locations marked in 1915. The area falls between several adjacent 1915 locations, but it cannot be clearly identified with any one of the surrounding locations. The data are therefore inadequate for analysis.

Footnote for Appendix 11-1

1. John M. Cooper fieldnotes: "Houston-Nemiskau-32, Fam. Hunt. Grounds" and "Houston-Nemiskau-32, Territory" and "Map-Family Hunting Territories of Nemiskau Band - Data from Houston. Aug. 7, 1933." I am indebted to Regina Flannery Herzfeld for kindly making these data available to me.

APPENDIX 11-2 HISTORY OF THE FORESTS OF THE WASWANIPI REGION

The reports of the earliest geological explorers in the area in the last decade before this century indicate that the forests of the Waswanipi region were either mature or second growth following fires that had occurred a number of decades earlier, and that there had been few fires during the years immediately previous to 1900.

Henry O'Sullivan gave a general description of the forests of the Waswanipi region in the last years of the last century:

> "There is an abundance of spruce and tamarac, wherever the country has not been burnt, but the larch fly is rapidly destroying the latter timber, and more so towards the height of land than in the vicinity of James Bay."
>
> "Here and there, areas, more or less extensive, have been swept by fire, from 20 to 50 years ago, and are now well grown up with poplar, white birch, spruces, tamarac and cypres of fair size according to age....." (1898:12).

Along the course of his exploration O'Sullivan gave an account of the land adjacent to the bodies of water he traversed with descriptions of the forests. There are thirty-one such descriptions, twenty of which are of mature forests, eight are references to second growth forests, and three are references to burnt hills or areas he believed had burned several times, for which he gives no comments on forests, but which I assume had not yet regenerated to forests.

Dr. Robert Bell made brief comments to the same effect as those of O'Sullivan:

> "The timber is almost everywhere of mature age, or consists of old second-growths, and it will be of great importance to preserve these extensive forests, as far as possible, against fires, which have wrought such havoc in so many other districts. A few square miles have been destroyed by fire in recent years on the east side of Siskumika Lake, on the Noddawai, but with this exception we noticed only insignificant patches which had been burnt" (Bell, 1897a:80a).

One other burned patch he reports is on Mount Laurier:

> "A short range of greenstone hills, from which the timber has been burnt off, runs along the south side of Lake Mattagami and forms a conspicuous feature of the landscape. The highest of these, which I have called Mount Laurier..." (Bell, 1897b:10).

In 1896 Bell travelled north from Gull Lake to the Rupert River, and here too he suggests the land was covered with both mature forests and advanced secondary growth.

> "The country between Gull Lake and Rupert River became poorer in a general way, as we proceeded northward... The timber on the whole became smaller as we went northward from Gull Lake, even where it had attained its full size, but much of the forest consists of second growths of various ages" (Bell 1898:70a).

The reports of A. Bancroft and H.C. Cooke of the explorations that they made in the Waswanipi region from 1912 to 1916 indicate that extensive destruction of the mature forests had occurred in the years between Bell and O'Sullivan's explorations and those of Bancroft and Cooke. The main agency was fire, and the recent burns were quite distinguishable from the fires that had occurred before the time of Bell and O'Sullivan.

Bancroft reports that the area east of Suscamica Lake, which Bell had seen as a recent burn, was by 1912 covered in second growth:

> "In areas which have been burned some years ago, as to the south of Matagami lake and to the east of Soukumika lake, there is a profuse second growth of small polars and birches" (Bancroft, 1913:143).

Bancroft also noted a return of larches:

> "A widely scattered growth of thrifty young tamarac (larex laricinia - Du Roi - Koch) is appearing, but all large trees of this species were killed by the ravages of the grub of larch saw-fly from 1893-96" (Bancroft 1913:143).

In contrast to this regeneration are Bancroft's reports of frequent and sometimes extensive burns which he reports have occurred within the decade previous to his exploration, i.e., between 1902 and 1912:

> "Forest fires have devastated large areas. Some of the areas which apparently have been burned over during

> the past six or seven years may be mentioned....Within the past three years, a fire burned a wide area eastward from Matagami lake to Olga and probably to the northern end of Gull lake. Along a stream entering the eastern end of Matagami lake, which was ascended for 12 miles, there is scarcely a green tree to be seen. Here this fire has been so vigorious that it would require comparatively little labour to make the land ready for cultivation. Mt. Laurier to the south of Matagami lake and the Dalhousie mountains, south of Gull lake, have been swept by fire. An extensive brule crosses the Nottaway river in the vicinity of Bull rapids. Other burned areas within the region might be mentioned, but sufficient has been written to emphasize the serious damage that has been done" (Bancroft 1913:145-146).

> "Considering the area between Soskumika lake and the transcontinental railway, it seems a conservative estimate that owing to the ranges of fire and the presence of muskegs where the trees are small and scattered, within about forty percent of this area the forests are of no (commercial) value at present" (Bancroft, 1913:144; brackets mine).

Bancroft also commented on the severity of the fires.

> "Practically the whole of this northern country is heavily covered with mosses....Where fires have burned the forests it is remarkable over what large areas they have completely removed the mosses and have exposed the soil beneath" (1913:139).

H.C. Cooke surveying in the northern portions of our region of study made similar reports for the same period.

> "Around Kenoniska lake and for a distance of about 10 miles up Broadback river the original forest exists" (Cooke, 1914:338).

> "Farther up broadback river the country was swept so thoroughly by fires 6 or 8 years ago as to be now almost bare for long distances, except for a few islands of spruce uninjured by the fire. Over these fire-swept areas the blueberry grows in great profusion, and second-growth jackpine is beginning to spring up. Not until the most eastern point of traverse was reached did this burnt area come to an end" (Cooke, 1914:338).

The length of the area mentioned by Cooke is, by our calculation, nearly 70 miles. The width of the burned region is unknown. Extensive but undefined fires are also reported for "recent" years in the region between the Broadback and Waswanipi lake (Cooke, 1916;172).

Cooke also surveyed the southeast corner of the area of study in 1916, including the Opawica river. Of these lands and those to the south of them as far as the transcontinental railway, he reported that, "It is probably not too much to state that one-third to one-half of the timber north of the National Transcontinental railway has been destroyed by fire in the last fifteen years" (1917:228).

Some parts of the region appear to have been burned more than once in the brief span of years. Of the basin of the Laflamme River, then called the Notagagon, which flows into the Bell river to the immediate southwest of the study area, Cooke reported:

> "The Notagagan basin has been repeatedly swept by fires and as a result, it bears very little timber. Up to the summer of 1914 much of it was almost impassable to the pedestrian by reason of the dense tangle of fallen logs and second growth which covered it. At that time, however, another fire passed through, and, while it destroyed most of the timber which then still remained, it almost completely consumed the dead wood and second growth, leaving the ground entirely clear over large areas. On this account this district should be attractive to settlers, since the amount of labor necessary to complete the clearing of the ground prepatory to cultivation would be extremely small" (Cooke, 1916:171).

The regions closer to the railway appear to have been burned more extensively than those farther north. Even so, it is clear from the reports that extensive, frequent and intensive fires swept the study area in all sectors - southeast (Opawica river and south), central (along the route from Waswanipi lake to the Broadback River, south west (Olga Lake and Bell River), and north (Broadback River). These fires appear to have begun in the decade from 1900 to 1910, but reports by the survey teams in the region from 1910 to 1920 indicate that fires were still occurring and were still considered a threat. These reports are in contrast to those from the earlier period which suggest that the forests were in advanced second growth or mature development stages at the turn of the century.

Published reports of geological surveys of the region did not appear again, so far as I have been able to determine, until a flurry of new activity between 1930 and 1950. And this activity was apparently almost entirely limited to the southern portion of the Waswanipi region.

These reports generally confirmed the presence, and sometimes the extent, of the fires of the earlier period, which were by then generally young second-growth forests, and indicated that while some areas new fires were still occurring, the vegetation was predominantly second growth forest.

Around Pusticamica Lake and east MacKenzie reported that in 1935:

> "The timber over the greater part of the area is regrowth after one or more firest fires, none of which have been very recent. It consists of small poplar, spruce, jack pine, and birch. Many of the swampy areas that were swept by the fires are thickly grown with alder. In many places near the lakes, creeks and larger rivers, and in the muskegs not burned over in earlier years, the timber is of good size" (1935a:51).

However to the east and south of Pusticamica, just at the boundaries of the study area, 49^{o} 15'N, 76^{o}30'W to 77^{o}30'W new fires did occur:

> "A large part of the area, especially in the east, has been burned over by recent fires. Extensive forests still remain however...." (W.W. Longley, 1937:65).

Referring to the region immediately north of that surveyed by Longley, MacKenzie cites other new fire belts apparently separated from that mentioned by Longley by a green belt of varying width, the description indicating that new fires were occurring in relatively small patches:

> "Somewhat over half the area examined is covered by green timber. The remainder has been swept by forest fires, which have ranged fairly well-defined east-west belts. One such belt, with a width of six miles in the central part of Desjardins township runs eastward across the area, narrowing to a width of three miles at the east boundaries of Currie township, north of the Duplessis River. Green timber occurs north of this strip, and southward from it for nearly two miles in the western part of the area, and up to eight miles in the eastern part, south of which brulé is again encountered" (MacKenzie 1936:86).

The extensive burn that Bancroft reported at the east end of Matagami Lake up to Olga Lake and to the north of Olga and the east of Miacasagi was reported by P.E. Auger to be regenerating to forest when he saw it in 1938:

> "Cette partie de la région n'est pas favorable à la culture. Elle a été ravagée par des feux de forêt et se couvre d'une deuxième croissance de pin gris, de peuplier et d'épinette" (P.E. Auger, 1942:5).

P.E. Imbault apparently surveyed another portion of this burn that lies between Olga Lake and Waswanipi river on the south and 50^{O}N in 1947. He reported that the "forests consist mostly of young spruce, jack pines, alder, with some poplar and Tamarack" (Imbault, 1947a:1). Of the Canet River and Frederick Creek running through this same area between Matagami and Miacasagi Lakes, Imbault reported that in 1947-1948 he found the area "difficult of access." "Travel in the woods is quite difficult in the swampy areas because of extensive growth of alders, and a dense second growth of coniferous trees" (Imbault 1949a:3).

Areas that were swampy or otherwise not suited for quick regeneration, were developing more slowly. Laurier, which is one of the highest hills in the region and which may have been burned twice, was reported in 1938 by Auger to have some regeneration but it was still sparsely covered.

> "Les pentes et les sommets rocheux des collines n'ont qu'une mince couverture de sol et les arbres y sont clairsemés" (Auger, 1942:5).

This appears to be a minimal rate of growth owing to either the exposed surface of the hill and its shallow soil or to the fact that it may have been burned twice, or both.

Examining the entire west end of Lake Matagami, south of which Bancroft had reported an old burn, W. Warren Longley reported on his 1938-39 observations that there was a second growth of conifers:

> "La majeure partie de la région est couverte d'épinette, avec du sapin. En général, les arbres sont rabougris ou de deuxième croissance peu avancée, mais il y a une étroite bande de grosses épinettes le long des cours supérieurs

> de la rivière Kitchigama et de certains de ses tributaires" (Longley, 1943:5).

René Béland who reported on the geology of the Allard River area to the southwest of Lake Matagami in 1948 reported specifically on the development of the forest in this neighboring area.

> "... la région... est recouverte d'une végétation de vieux brûlé, constituée d'aulnes; de trembles et de jeunes conifères très touffus. A en juger par les souches noircies et la grosseur des trembles, les feux ayant ravagé certaines parties de cet immense brûlé ne dateraient que de 25 à 30 ans. Ailleurs, cependant, il y a des sapins baumiers et des pins gris de bonnes dimensions et les feux doivent être beaucoup plus anciens. Bancroft en 1912 mentionnait l'existence de quatre "brûlés" en travers du bassin de la rivière Allard. La carte du géomètre A. Sullivan en 1909 indique plusieurs brûlés le long de la rivière Allard, probablement ceux-là même qui sont mentionnés par Bancroft. Sauf quelques peuplements de pin gris, très restreints d'ailleurs, il n'y avait pas en 1948 de bois exploitable dans ces brûlés" (Béland, 1953:b).

Farther to the east Jacques Claveau has similarly reported a burn of thirty-five or more years of age at the Isheroff River, which he observed in 1946.

> "Les feux de forêt qui, antérieurement à 1912 dévastèrent la région sous étude et la région avoisinante, ont laissé des marques profondes. La seule étendue importante de haute futaie restant, formée surtout d'épinette, qui pourrait être utilisée par l'industrie forestière, couvre la région au sud de la rivière Isheroff et se prolonge jusqu'au lac Madeleine..." (Claveau, 1953:9).

> "Ailleurs dans la région, les épinettes et les sapins baumiers qui ont poussé depuis les feux de forêt sont petits et sont supplantés par des croissances contemporaines de pin gris, de tremble et de bouleau blanc" (Claveau, 1953:10).

Similar reports of regenerated forest on burned areas are included in geological reports on Matagami River, Opawica River, Bachelor Lake, and Capississit Lake.

These reports then indicate that in the southern portions of the Waswanipi region forest regeneration had been established almost everywhere by the 1940's, that is by approximately forty years after the fires that occurred in the first decade of the century. Further, the reports indicate that there were relatively few new fires in this southern area, and that second growth was the most common vegetational cover.

These data on the southern portion of the Waswanipi area indicate that thirty to forty years after fires the jackpine and poplar were well established and spruce and balsam fir were often a heavy but young undergrowth, sometimes accompanied by a dense understory of shrubs. Projecting this outline of development on the basis of general knowledge of forest development in the region reported earlier in Appendix 9-3, these observations suggest that by fifty years of age i.e., 1950 to 1960, the spruce too would be reaching the height of the poplars and becoming the predominant trees over the next twenty years, 1960-1980. These projections are reflected in the composition of the forests as surveyed by the Quebec Department of Lands and Forests and reported below.

Unfortunately, there are no comparable observations for the northern portions of the Waswanipi region in the 1930's and 1940's and the history of fires that probably existed in that area during these decades can only be inferred from the maps of the present conditions of the forests at Waswanipi.

I have examined the forest cover of the Waswanipi hunting territories as it was in the 1960's with respect to the extent of coniferous and deciduous trees and with regard to the age of the forests. Table 11-31 summarizes the distribution of the major forest and cover types on the hunting territories in ten percent classes. The table was complied from forestry maps provided by the Forest Inventory Service of the Quebec Department of Lands and Forests.

On the northerly hunting territories i.e., north of 50°N latitude, only maps of 1/125,000 were available. The forests were coded in a seven-type classification on these maps: mature spruce forest with ericaceous shrubs (Ee); mature spruce forest with moss layer (Em); mature mixed coniferous and deciduous forest (M); burn without forest regeneration (Br); coniferous regeneration after a burn, in the "gaulis" stage i.e., stems, 5 to 30 feet high (R3); mixed coniferous and deciduous regeneration after a burn, in the "gaulis" stage (M3), and bog or swamp. Ee and Em have been classed together in my analysis as mature coniferous forests, and R3 and M3 have also been classed together as second-growth forests. This generates a five-fold classification: mature coniferous forests; mature mixed coniferous and deciduous forests; second growth forests (coniferous or mixed); burns without forest regeneration; and bogs or swamps.

For the more southerly hunting territories only 1/50,000 maps were available, which give considerably more detail. I have generally grouped these codes to correspond to those used on the maps of northern sections. Two sets of codes were grouped, one on the development of the forest cover, one on the type of forest cover. The four structural classes of forest development have been grouped into two stages, "gaulis" which is the equivalent of the second-growth stage above, and mature which includes "perchis", "sciage" and "surann̄é" classes, coniferous trees over 4.0 inches in diameter, and deciduous trees over 3.6 inches in diameter. The thirty-odd categories of forest types have simply been aggregated by the three more inclusive categories provided: bogs and swamps; coniferous forests, mixed forests, and deciduous forests. None of the latter group actually cover any extent of land in this region. I have then combined the two sets of aggregated categories to produce the same five-fold classification used on the northern hunting territories. The difference in the detail of the coding means that small differences may have occurred in the evaluation of northern and southern regions. However, given the range incorporated in the ten percent classes I believe the figures are all essentially comparable.

It should be noted that the classification used by the Forest Inventory Service stresses the primary tree species present in a crown and does not reflect other minor species. Thus a spruce or pine forest may contain ten or twenty percent of deciduous species and this will not appear in the classification, not until there are sufficient deciduous species to call it a mixed forest. For our present purposes however the classification system is sufficiently detailed, because it provides information both on the general composition of the forest and on the developmental stage of the cover. The percentages of the various classes were arrived at by color coding areas and visually estimating percent of coverages. Double checks indicated good replicability. There was incomplete coverage for some hunting territories. The results of the classification appear on Table A11.2-1. Hunting territories are listed according to latitude of the geographical center of the territory, as visually determined.

As mentioned earlier there is an important difference in glacial history and soil types between the northern and southern regions of the Waswanipi area, the dividing line falling, more or less, along 50°N lattitude. This is reflected in the distribution of the forest types. The differences along latitude are particularly clear in the percent of mixed deciduous and coniferous forests. The 50°N latitude passes through territories VI, VII, and XXII. All of the hunting territories with more than ten percent of this forest type occur in the area south of the 50°N latitude. This is what would be expected on the basis of the better soil quality in the southern area.

The forests types of the southern Waswanipi hunting territories also reflect the expected pattern of particularly high percentages of mature forests, both coniferous and mixed coniferous and deciduous. What is of importance here is that the more northerly forests have a somewhat different pattern. There is no hunting territory in the southern third of the list with over 40 percent of the area with second growth forests following burns (Table A11.2-1). In contrast, three of the six most northern territories have over forty percent of second growth forests, and three of the four territories straddling the 50°N latitude have 40 to 60 percent of the area with second growth forests.

Table A11.2-1 Distribution of Forest and Cover Types on Waswanipi Hunting Territories

Hunting Territory Number	Mature Forest Cover: Coniferous Cover (Ee+Em) Percentage of Area	Mature Forest Cover: Mixed Decidous and Coniferous Cover (M) Percentage of Area	Second-Growth Forest Cover After Burns (R3+M3) Percentage of Area	Unregenerated After Burns Percentage of Area	Swamp or Bog Percentage of Area
XB	30-40	0-10	20-30	10-20	0-10
XA	40-50	0-10	40-50	0-10	0-10
II	60-70	0	30-40	0	0-10
XC	30-40	0-10	40-50	0-10	0-10
III	40-50	0	40-50	0-10	10-20
XIX	70-80	0	10-20	0-10	0-10
IV	20-30	0	50-60	0	10-20
XXII	70-80	0-10	0-10	0-10	0-10
VII	30-40	0	50-60	0-10	0-10
VI	40-50	0-10	40-50	0-10	0-10
VIII	70-80	0-10	10-20	0-10	0-10
XX	30-40	20-30	30-40	0-10	0-10
XXIII	50-60	20-30	10-20	0-10	0-10
IX	50-60	10-20	20-30	0-10	10-20
XI	80-90	0-10	0-10	0-10	0-10
XVI	30-40	40-50	10-20	0-10	10-20

This would appear to imply that forest fires were occurring somewhat later in time in northern area than in the southern area.

The Quebec Department of Lands and Forests estimates that in areas of good fertility, classes I and II, forest cover in the "gaulis" structural class, what I have been calling second growth forest, will be a forest that corresponds to the 30 years or less age class. The other structural classes, which I have been grouping as mature, will all correspond to the 30 to 120 years and over age classes.

On the basis of these very general correspondences of structural classes to age classes, the forests of the Waswanipi hunting territories from about 50^{o}N latitude would have been burned by forest fires fairly extensively up to at least the 1930's. It is possible that part of the difference in the stage of development of the forests between the northern and southern hunting territories are due to the differences in soil conditions and resulting forest types, as indicated above because regeneration may be slower in the less productive northern area. Nevertheless, a difference in the period of relatively intensive forest fires also seems likely. In the southern area the most extensive forest fires appear to have occurred between 1900 and 1920, in the northern area it appears that extensive fires may have continued through the period from 1920 to 1940.

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APPENDIX 11-3 ESTIMATED CASH INCOME FROM THE SALE OF FUR PELTS, 1924-25 TO 1963-64

Estimates have been made of the cash incomes derived from the sale of fur pelts by Waswanipi Hunters based on: a. recorded purchases of fur pelts by the Waswanipi Post Hudson's Bay Company Store (see Appendix 10-2), supplemented after 1952-53 by official sales of beaver pelts through the Quebec Fur services; b. the average auction price of each kind of pelt in each year in Quebec and Montreal from Minville et al., 1946, and Brochu, 1970; and c. an assumed correction factor for adjusting acution prices downward to estimate prices actually received by the hunters. The results of the calculations appear on Table A11.3-1, supplementary data on Tables A11.3-2 to A11.3-4.

The use of the official fur pelt sales records from the Waswanipi Post Hudson's Bay Company Store is a minimum estimate of fur pelts sold by the Waswanipi because following 1915 some Waswanipi had access to fur traders along the trans-continental railway line and some pelts were regularly sold there by-passing the store at Waswanipi Post.

The average fur prices at auctions were for all Quebec pelts from 1924-25 to 1943-44 and for pelts from northern Quebec after that date. It should be noted that these are not the prices the Hudson's Bay Company actually got at auction for the pelts it purchased at Waswanipi. For many years the pelts purchased by the Hudson's Bay Company were shipped to London and were auctioned off there rather than in Montreal. Presumably prices were higher in London.

The adjustment to Montreal acution prices in order to estimate prices paid to hunters is not therefore not an estimate of markups of the Hudson's Bay Company, it is simply a correction factor for estimating local prices. These correction factors used are based on three years or periods for which it is possible to make direct comparisons between prices paid at Waswanipi Post and auction prices.

For 1924-25 the District Officers' Annual Report, available in the Archives of the Hudson's Bay Company lists the average prices paid at Waswanipi Post (Table A11.3-2). For the furs the Waswanipi sold in that year the total income they earned would have amounted to 59 percent of the auction price of the same number of each kind of pelt sold in Quebec. I have therefore used a correction factor of 59 percent for 1924-25.

In 1939-40 the Waswanipi Post Journal, also available in the Archives of the Hudson's Bay Company, records the prices paid for most, but not all, of the pelts bought that year (Table A11.3-3). The total cash paid was 72 percent of the price the same number of these kinds of pelts would be worth in Quebec. I have therefore used a correction factor of 72 percent for 1939-40. Between 1924-25 and 1939-40 I have arbitrarily assumed that the correction factor increased one percentage point per year from 1924-25 to 1937-38 when it reached 72 percent.

There is no comparable data from 1939-40 to 1952-53, so I have simply assumed the 72 percent correction factor throughout this period. When the governments took over the marketing of beaver pelts in the mid-1950's the difference between prices paid to hunters and average auction prices declined to an average of 18 percent (Table A11.3-4). I have therefore assumed that following 1952-53 beaver prices were 82 percent of auction values. For lack of comparable data I have continued to use a 72 percent correction factor for other furs, but beaver generally accounts for over 80 percent of fur pelts sales incomes during this period.

Table A11.3-1 Estimated Cash Income From the Sale of Fur Pelts, 1924-25 to 1963-64[1]

Species	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36
Beaver	$16169.00	$15280.00	$ 9580.00	$12896.00	$ 8520.00	$ 6100.00	$ 5478.00	$ 6279.00	$ 2145.00	$ 630.00	$ 364.00	$ 304.00
Ermine, Weasel	9.90	92.00	510.40	235.00	330.40	125.60	164.25	541.50	255.50	60.30	65.10	59.70
Fisher	150.00	440.00	2940.00	2633.76	1105.00	720.00	330.00	385.00	440.00	405.00	893.60	2596.08
Lynx	4554.00	2414.00	1995.00	1440.00	810.00	836.00	595.00	1750.00	2180.00	1680.00	4140.00	9020.00
Marten	3740.00	4176.00	11130.00	9640.00	3330.00	2040.00	1408.00	1495.00	1960.00	627.00	648.00	630.00
Mink	2054.00	3744.00	1380.00	1082.83	1363.83	1515.00	1890.00	3405.78	4408.58	1600.00	3921.16	4062.72
Muskrat	828.00	229.25	334.85	567.00	1786.75	1329.00	2181.00	1520.25	952.20	659.25	576.00	585.00
Otter	1170.00	784.00	1560.00	1440.00	1480.00	1050.00	1250.00	1534.00	520.00	920.00	858.00	825.00
Skunk	21.25	6.00	3.00	0	0	0	0	0	0	0	1.40	3.85
Squirrel	0	-[2]	-[2]	-[2]	0	0	0	0	0	0	0	0
Fox - silver	0	75.00	324.87	112.00	0	0	0	0	0	33.59	0	32.03
- cross	320.00	270.00	747.72	772.88	178.00	0	55.00	0	0	145.20	674.59	804.16
- red	256.50	823.50	1809.67	1270.95	178.15	34.00	30.00	151.10	225.54	431.27	744.48	967.46
Black Bear	301.00	216.00	87.00	320.00	253.00	170.00	180.00	108.00	106.00	8.00	0	0
Value at Montreal Auctions	$29573.65	$28549.75	$32402.51	$32410.42	$19335.13	$13919.60	$13561.25	$17169.63	$13192.82	$ 7199.61	$12886.33	$19890.00
Correction Factor	59	60	61	62	63	64	65	66	67	68	69	70
Estimated Cash Income From Sale of Furs	$17448.00	$17130.00	$19766.00	$20094.00	$12181.00	$ 8909.00	$8815.00	$11332.00	$ 8839.00	$ 4896.00	$ 8891.00	$13923.00

(CONTINUED)

Table A11.3-1 Estimated Cash Income From the Sale of Fur Pelts, 1924-25 to 1963-64[1] (Continued)

Species	1936-37	1937-38	1938-39	1939-40	1940-41	1941-42	1942-43	1943-44	1944-45	1945-46	1946-47	1947-48
Beaver	$ 350.00	$ 0	$ 86.25	$ 2420.00	$ 3220.00	$ 2268.00	$ 2125.00	$ 2807.00	$ 2610.95	$ 7332.00	$ 7809.15	$ 9028.80
Ermine, Weasel	95.60	407.20	399.00	177.60	264.00	526.50	1193.00	1180.30	958.40	1533.60	336.60	423.15
Fisher	5331.10	1500.00	1575.00	90.00	-[4]	-[4]	-[4]	-[4]	-[4]	-[4]	-[4]	-[4]
Lynx	9525.00	2340.00	1875.00	580.00	33.00	132.00	2200.00	4940.00	2720.20	2223.00	1432.50	577.50
Marten	3105.00	5040.00	5040.00	2050.00	1040.00	1260.00	1755.00	1764.00	987.00	1122.00	252.45	207.35
Mink	1175.50	727.65	633.88	1562.88	3150.00	5340.00	8895.00	7610.40	2389.25	2737.50	641.30	799.25
Muskrat	747.50	856.50	1185.50	2760.00	6609.75	6270.75	5225.00	4536.80	4598.65	3971.10	1707.10	7254.90
Otter	570.00	1100.00	768.75	860.00	740.00	864.00	820.00	1132.80	1186.80	1392.00	680.40	804.75
Skunk	1.05	2.00	2.00	8.00	0	0	0	0	0	0	0	0
Squirrel	0	-[2]	-[2]	-[2]	-[2]	359.60	279.75	-[2]	326.55	1854.26	278.10	784.80
Fox - silver	0	0	17.83	29.94	-[4]	-[4]	-[4]	-[4]	-[4]	-[4]	-[4]	-[4]
- cross	953.81	192.84	60.76	53.64	55.23	94.72	560.05	3993.00[3]	2621.90[3]	1242.00[3]	405.60[3]	201.60[3]
- red	652.74	326.37	101.83	86.57	98.00	132.00	1260.00	6930.00	4050.60	1896.75	811.20	299.60
Black Bear	72.00	0	0	0	0	0	0	0	0	0	0	0
Value at Montreal Auctions	$22579.30	$12492.56	$11745.80	$10678.63	$15209.98	$17247.57	$24312.80	$30357.50	$22450.30	$25304.21	$14345.40	$20381.70
Correction Factor	71	72	72	72	72	72	72	72	72	72	72	72
Estimated Cash Income From Sale of Furs	$16031.00	$ 8995.00	$ 8457.00	$ 7689.00	$10951.19	$12418.25	$17505.22	$21857.40	$16164.22	$18219.03	$10328.69	$14674.82

(CONTINUED)

Table A11.3-1 Estimated Cash Income From the Sale of Fur Pelts, 1924-25 to 1963-64[1] (Continued)

Species	1948-49	1949-50	1950-51	1951-52	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60
Beaver	$ 1071.00	$ -[5]	-[5]	-[5]	$28920.00	$33804.00	$48140.00	$50144.00	$49945.50	$31090.71[6]	$28003.75[6]	$30374.68[6]
Ermine, Weasel	1951.50	2572.35	1372.00	191.70	360.00	366.00	212.00	197.60	312.90	142.80	154.80	160.20
Fisher	-[4]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]
Lynx	1183.00	1572.00	924.00	483.00	224.00	196.00	75.00	107.50	231.00	273.00	666.00	4104.00
Marten	0	0	0	0	0	0	0	0	0	0	0	0
Mink	1680.00	3703.00	2370.00	1650.00	1580.00	1666.00	940.00	1230.00	1120.00	1820.00	2100.00	3639.50
Muskrat	9484.95	7505.40	5452.00	3222.00	3463.25	2545.50	2455.25	2156.00	2986.25	2544.00	3220.00	1994.40
Otter	838.50	984.40	675.00	552.00	775.00	945.00	1092.00	2100.00	1140.00	1827.00	1512.00	1755.00
Skunk	0	0	0	0	0	0	0	0	0	0	0	0
Squirrel	463.50	149.73	539.40	58.05	107.00	90.30	19.60	20.40	31.10	11.70	20.60	12.30
Fox - silver	-[4]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]
- cross	24.00[3]	27.50[3]	56.00[3]	3.00[3]	3.00[3]	1.00[3]	2.00[3]	0	0	0	0	0
- red	48.00	40.00	52.00	10.50	8.00	.50	2.00	2.00	0	7.50	0	0
Black Bear	0	0	0	0	0	0	0	0	0	0	0	0
Value at Montreal Auctions	$16748.45	$16554.38	$11458.40	$ 6170.25	$32416.79	$39614.30	$52937.85	$55957.50	$55766.75	$37716.71	$37716.55	$42040.08
Correction Factor	72	72	72	72	72[7]	72[7]	72[7]	72[7]	72[7]	72[8]	72[8]	72[8]
Estimated Cash Income from Sale of Furs	$12058.88	$11911.95	$ 8250.05	$ 4442.58	$26232.09	$31902.74	$42929.04	$45303.80	$45146.61	$35861.43	$34996.97	$38773.77

(CONTINUED)

Table A11.3-1 Estimated Cash Income From the Sale of Fur Pelts, 1924-25 to 1963-64[1] (Continued)

Species	1960-61	1961-62	1962-63	1963-64
Beaver	$30241.53[6]	$25080.00[6]	$37824.50[6]	$27745.80[6]
Ermine, Weasel	222.20	93.60	49.40	52.20
Fisher	-[2]	-[2]	-[2]	-[2]
Lynx	2380.00	1472.00	1998.00	1664.00
Marten	0	0	456.00	2272.00
Mink	4875.00	3615.00	1247.00	1875.50
Muskrat	1259.10	1003.20	1749.00	911.40
Otter	2184.00	2184.00	1092.00	1138.50
Skunk	0	0	0	0
Squirrel	26.64	4.10	13.35	13.20
Fox - silver	0	0	0	0
- cross	0	0	0	0
- red	3.00	0	0	10.00
Black Bear	0	0	0	0
Value at Montreal Auctions	$41191.47	$33351.90	$44429.35	$35682.60
Correction Factor	72[8]	72[8]	72[8]	72[8]
Estimated Cash Income From Sale of Furs	$38125.49	$31107.77	$42579.99	$33460.30

Footnotes:

1. Fur pelt sales from Appendix 10-2, and Quebec Fur Service, prices from Minville, et al., 1946:554-555 and Brochu, 1970:297.
2. No price quoted.
3. Assumes that cross fox prices are double red-fox prices.
4. No data on pelt sales.
5. No data on sales. Many beaver were live trapped in summer to reestablish populations on other beaver reserves. Hunters were paid $20.00 per live beaver.
6. Based on actual average price paid to Waswanipi hunters through Quebec, Fur Service.
7. 88 percent for beaver.
8. No adjustment made on beaver.

Table A11.3-2 Comparison of Prices of Fur Pelts in 1924-25

Species	Average Price Paid at Waswanipi 1925 (Outfit 255) Hudson's Bay Store[1]	Prices Credited to District by Hudson's Bay Company (Outfit 255)[2]	Average Price for Quebec Pelts 1924-25[3]
Beaver	$11.40	$ 12.09	$ 23.00
Black Bear	5.08	7.29	7.00[4]
Ermine	0.36	0.55	0.90
Fisher	33.67	46.11	50.00
Fox, Silver	-	120.81	125.00
Cross	21.75	30.67	40.00
Red	8.59	10.98	13.50
White	7.25	16.13	37.00
Blue	-	21.89	50.00
Lynx	14.07	14.31	22.00
Marten	16.63	19.21	17.00
Mink	5.31	6.08	13.00
Muskrat	0.63	0.81	1.15
Otter	21.37	22.63	30.00
Skunk	0.93	1.53	1.25
Wolf, Timber	8.70	11.50	12.00
Wolverine	-	8.93	11.00

Footnotes:

1. D.FTR/21, Annual Reports from District Officers, Outfit 255(1925). James Bay District.
2. A.74-35, Annual Report Outfit 255, Year Ended 31st May, 1925. James Bay District.
3. Minville, et al., 1946:554-555.
4. All bears but polar bears.

Table A11.3-3 Comparison of Prices of Fur Pelts in 1939-40

Species	Waswanipi Hudson's Bay Company			Average Price for Quebec Pelts 1939-40[2]
	Pelts Bought[1]	Total Paid[1]	Average Price Paid	
Beaver	88	$1055.00	$11.99	$20.00
Black Bear	0	-	-	-
Ermine	446	122.75	0.28	0.40
Fisher	1	31.50	31.50	90.00
Fox, Silver	2	20.00	10.00	14.97
Cross	3	25.50	8.50	17.88
Red	12	31.50	2.63	7.87
White	0	-	-	-
Blue	0	-	-	-
Lynx	27	776.00	28.74	20.00
Marten	41	648.00	15.80	50.00
Mink	96	669.50	6.97	14.08
Muskrat	639	561.35	0.88	0.75
Otter	15	167.00	11.13	20.00
Skunk	16	9.60	0.60	0.50
Wolf, Timber	0	-	-	-
Wolverine	0	-	-	-
Squirrel	663	33.15	0.05	-

Footnote:

1. Waswanipi Journals. B 227/9/68.
2. Minville, *et al.*, 1946:554-555.

Table A11.3-4 Comparison of Average Prices of Beaver Pelts at Auction and Average Prices Paid to Hunters, 1957-58 to 1963-64

Year	Average Price Northern Quebec Beaver Pelts at Auction	Average Price Paid to Waswanipi Hunters Per Beaver Pelt	Waswanipi Price as a Percentage of Auction Price
1957-58	$13.80	$10.99	80
1958-59	13.00	10.75	83
1959-60	16.75	13.07	78
1960-61	14.45	10.89	75
1961-62	13.00	10.45	80
1962-63	15.00	14.14	94
1963-64	15.75	13.10	83
Average	$14.54	$11.91	82

NOTES ON BIBLIOGRAPHIES

Two bibliographies were prepared, a general bibliography, and a bibliography of natural sciences references. The general bibliography lists the citations and related literature for almost all sections of the main text of this study and many of the appendices. The natural sciences bibliography was prepared as a special bibliography of references for the appendices reviewing natural scientific knowledge of the Waswanipi region, Appendices 9-4 to 9-8, and the sections of Chapter 10 in which biological data on the management of wildlife resource populations are reviewed.

Bibliographies are also included in some appendices which cite references of a highly specialized nature. This system of bibliographies has led to the need for some multiple listings, but hopefully it will result in relatively easy access to the references.

The bibliography of natural sciences references begins on page B-132.

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