

A GEOGRAPHICAL STUDY

of

WAINFLEET TOWNSHIP



K. J. CARDWELL

A Thesis

Submitted to

The Department of Geography

in Partial Fulfilment of the Requirements

for the Degree

Bachelor of Arts

McMaster University

March 1965

Table of Contents

<u>Chapter</u>	<u>Page</u>
Acknowledgments	ii
Table of Contents	iii
List of Maps	iv
<u>Acknowledgments</u>	v
List of Ill.	vi
Introduction	vii
<p>I would like to express my appreciation to all those who, in any way, aided me in the compilation of this study, especially the following: Dr. H. A. Wood, my faculty adviser; my Aunt Miss M. Stuckey, for typing the thesis; my parents and sister who patiently listened to my problems; and the many people of Wainfleet who willingly gave me their time and knowledge.</p> <p>To all these people this thesis is dedicated.</p>	
1. Physical Features	13
2. Climate	16
3. Physiography	22
Vegetation	28
II. CULTURAL GEOGRAPHY	
Historical Geography	31
1. Wainfleet Township under Indian Control (1775)	31
2. Early White Settlement (1773-1820)	32
3. Later White Settlement (1820-1900)	34
4. The Period Encompassing Two Wars (1891-1911)	39
Wainfleet (1851-1904)	44
1. Urban Service Areas and Settlement Geography	45
2. Agriculture	56
3. Recreation	71
4. Other Rural Non-agricultural Activity	79
III. <u>SUMMARY and CONCLUSION</u>	
	82
Bibliography	
	86

Table of Contents

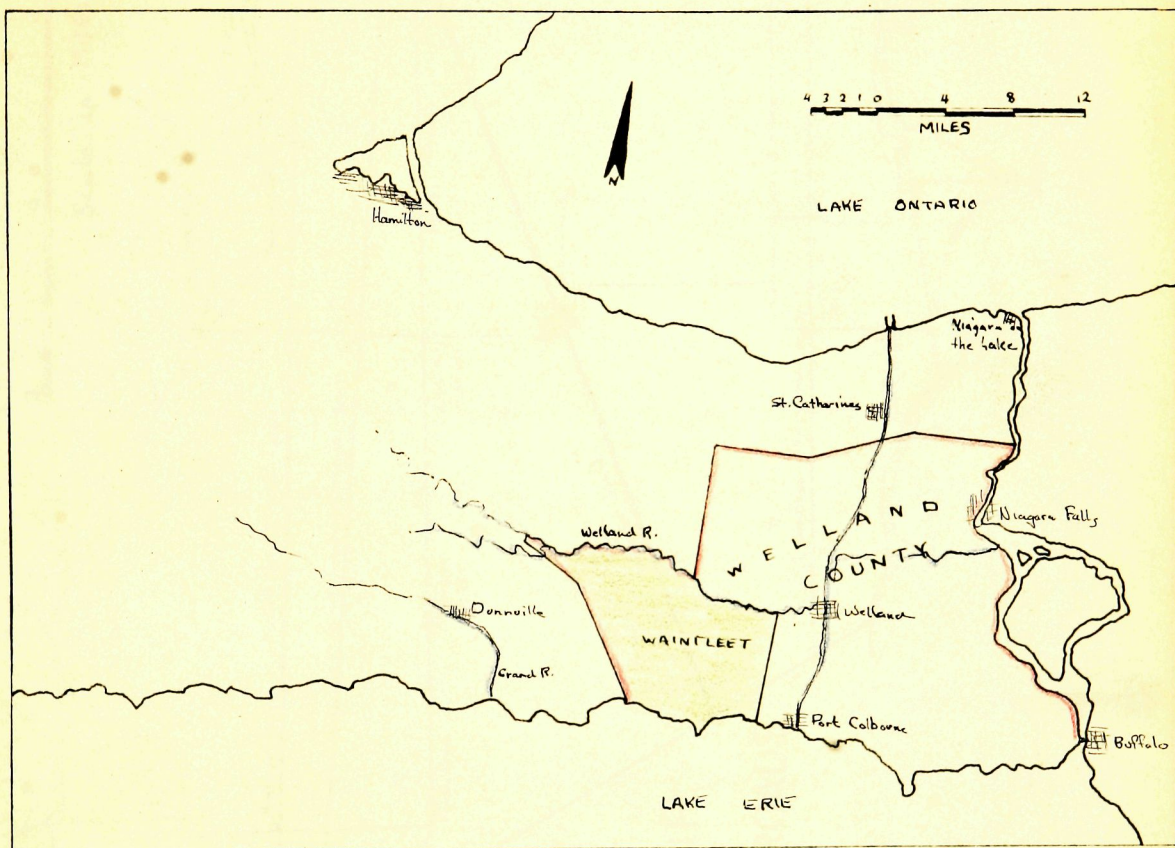
<u>Chapter</u>	<u>Page</u>
Acknowledgments.....	ii
Table of Contents.....	iii
List of Maps and Figures.....	iv
List of Illustrations.....	v
Introduction.....	vi
 I <u>PHYSICAL GEOGRAPHY</u>	
Climatic Features:	3
Physiography:	7
1. Pre-glacial Landform Remnants	7
2. Glacial History	13
3. Post-glacial Development	16
4. Physiographic Regions and Soil Types	22
Vegetation:	29
 II <u>CULTURAL GEOGRAPHY</u>	
Historical Geography:	31
1. Wainfleet Township under Indian Occupancy (-1776)	31
2. Early White Settlement (1776-1829)	32
3. Later White Settlement (1830-1900)	34
4. The Period Encompassing Two World Wars (1901-1951)	39
Wainfleet (1951-1964):	44
1. Urban Service Areas and Settlement Geography	46
2. Agriculture	55
3. Recreation	71
4. Other Rural Non-agricultural Activity	79
 III <u>SUMMARY and CONCLUSION</u>	82
 Bibliography	86

List of Photographs

<u>Photo.</u>		<u>Page</u>
1	Aerial view of Wainfleet from over Lake Erie	6
2	A gas well	12
3	Glacial striae	12
4	Burnaby anticline	19
5	Sugar Loaf sand dune	19
6	Berrien sandy loam	20
7	Tuscola silt loam	20
8	Muck soil	21
9	Caistor clay loam	21
10	Jeddo clay	25
11	Dissected clay plain	25
12	Brantford silt loam	26
13	Haldimand clay	26
14	Ontario loam	27
15	A drainage ditch	27
16	A typical rural road	52
17	Wainfleet Village homes	52
18	Shack housing	53
19	Level sand plain	53
20	Bog agriculture	70
21	Rock shore at Morgan's Point	74
22	Sand beach at Sugar Loaf	74
23	Algae at Long Beach	75
24	Boating on the Welland River	75
25	Law's sand-pit	81

List of Maps and Figures

	<u>Fig.</u>
Welland: Temperature and Precipitation	1
The Evolution of the Bois Blanc Escarpment and Bedrock Vale	2
Wainfleet's Population Trend	3
	<u>Map</u>
Location of Wainfleet Township	1
Settlements and Main Roads	2
Geology	3
Physiographic Land Types	4
Drainage and Topography	5
Soil Type Regions	6
Commercial Service Areas	7
Agricultural Regions	8
Land Use (1958)	9
Location of Sample Areas	10
Sample Area A	11
Sample Area B	12
Sample Area C	13
Sample Area D	14
Sample Area E	15
Sample Area F	16
Recreational Facilities	17



LOCATION OF
WAINFLEET TOWNSHIP
IN THE
NIAGARA PENINSULA

79°30'

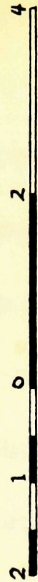
79°20'

43° 00'

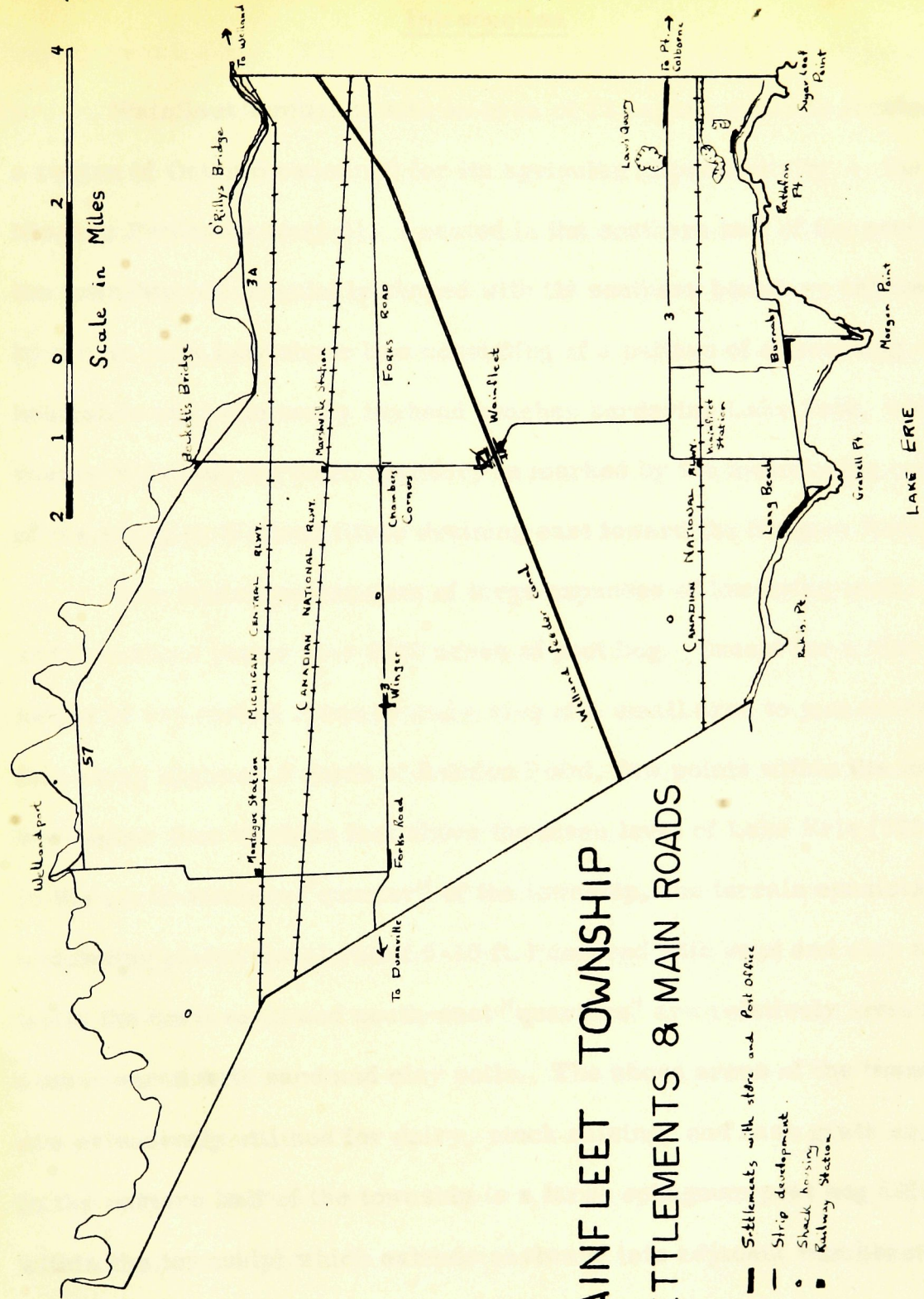
42° 30'

79°30'

79°20'



Scale in Miles



WAINFLEET TOWNSHIP SETTLEMENTS & MAIN ROADS

- Settlements with store and Post Office
- Strip development
- o Shack housing
- Railway Station

LAKE ERIE

Introduction

Wainfleet Township with an area of 73 square miles is located in a region of Ontario renowned for its agricultural productivity - the Niagara Peninsula (map 1). Located in the southern half of the peninsula, the township is irregularly shaped with its southern boundary delineated by a nine mile long shore line consisting of a pattern of alternating rocky headlands and wide sandy bayhead beaches bordering Lake Erie, while its twenty mile long northern boundary is marked by the meandering course of the sluggish Welland River draining east toward the Niagara River.

The landscape consists of large expanses of low-lying sand, clay, and limestone plains plus 3500 acres of peat bog. Except for a rise to a height of 635 feet at Burnaby and a rise of a small area to just above 600 feet along Highway 3 north of Rathfon Point, few points within the township are higher than thirteen feet above the mean level of Lake Erie (572 ft.). In the north-western "quarter" of the township, the terrain consists of undulating plains (local relief 5-10 ft.) covered with sand and clay soils, while the north-east and south-east "quarters" are relatively level plains also covered with sand and clay soils. The above areas of the township are extensively utilized for dairy, stock raising, and cash grain crops. In the eastern half of the township is a large sphagnum peat bog (3500 acres within the township) which extends eastward into adjacent Humberstone Township. Some peat moss extraction and market gardening is being carried out within the bog limits. South of this depressional area rises

the Bois Blanc escarpment¹, forming a low height of land - twenty feet higher than the bog. This land south of the escarpment is a limestone plain overlain by shallow till. Agriculture in this area is less intensive than that which is being conducted on the previously mentioned clay and sandy plains; some quarrying operations are evident in the limestone. Along the southern edge of the township is a narrow belt of land, varying from 100-600 feet in width, consisting of sandy beaches and rocky headlands densely settled by summer cottages.

The township is devoid of any town or city settlement; the largest permanent settlement is the unincorporated village of Wainfleet with an estimated population of 120 people. As the only other settlements of the township - Long Beach, Winger, Chambers Corners, Burnaby - are very much smaller, the 4,776 population is largely rural. Nevertheless, there are large urban areas just east of the township: the city of Welland (pop. 35,645) with its chemical and steel plants, and Port Colborne (pop. 15,090) with its nickel refinery, flour mill and steel production. Seven miles west of the township is the market town of Dunnville (pop. 4,500) on the Grand River.

Within the township, communication and transportation routes are extensively provided. A grid of gravel and dirt roads covers all the township except in the vicinity of the peat bog; all weather Highways no. 3 and no. 3A traverse the township east-west and north-south respectively; and three rail lines oriented east-west pass through Wainfleet.

¹ The Bois Blanc escarpment is known in older literature as the Onondaga escarpment

In this study the reasons underlying the distribution and spatial location of geographical phenomena - physical and cultural - within Wainfleet Township are explained. The first part of the study examines the physical factors which have interacted to constitute the 'natural' surface of the landscape. The second part proceeds to investigate the cultural geography of the township - the changes that have been wrought within the area of study since the advent of man. The remaining part of this study is devoted to a summary and conclusion of the geographical relationships which were discovered and discussed in the two earlier parts of the study; it might be considered a statement of Wainfleet's "regional personality", as of 1964.

The research and fieldwork for this study were mainly conducted during the period of July - September 1964. During this period the writer was employed in the Niagara Peninsula as assistant field-officer (Conservation Authorities) for the Ontario Department of Energy and Natural Resources, thus many opportunities were provided which enabled the writer to become familiar with the township and meet its people.

and winter temperature means are 66.8 F. and 26.1 F. respectively while the spring mean is 49.3 F. and the autumn mean is 51.4 F. (Table 11). The average annual rainfall is approximately 34 inches evenly distributed throughout the year. A minimum monthly precipitation occurs in August while the maximum precipitation monthly mean occurs in the following month. Although no figures are available on the amount of snow accumulation in Wainfleet, on the basis of the city of Welland's observations 37 inches may be expected to fall.²

² Niagara Peninsula Conservation Board Report, 1964.

PHYSICAL GEOGRAPHY

The objective of this first part is to outline and explain features of the physical landscape: the distribution and nature of its landforms (physiography), its climatic characteristics, its soil distribution, and its vegetative cover. All are major features with which man had to cope with when he came to settle Wainfleet.

Climatic Characteristics:

The fairly level terrain of the study area, plus the small area of the township (76 sq. miles) relative to the large overhead air masses should result in fairly uniform climatic characteristics throughout. Although no climatological station exists within Wainfleet, the location of a station in adjacent Welland - on the same lake plain and under the same air masses - has permitted the utilization of this station's data to present a general picture of Wainfleet's temperature and precipitation characteristics.

The township has a mean annual temperature of 47.6°F . Summer and winter temperature means are 68.8°F . and 26.1°F . respectively while the spring mean is 49.2°F . and the autumn mean is 51.4°F . (table 1). The average annual rainfall is approximately 34 inches evenly distributed throughout the year. A minimum monthly precipitation occurs in August while the maximum precipitation monthly mean occurs in the following month. Although no figures are available on the amount of snow accumulation in Wainfleet, on the basis of the city of Welland's observations 67 inches may be expected to fall².

²Niagara Peninsula Conservation Report: Water., Toronto, 1964 p. 10

The main factors contributing to the climatic characteristics of the study area are latitude and continental position. Wainfleet's position at approximately 42° N latitude is such that the insolation received should result in cold winters and hot summers. However, because of the proximity of the Great Lakes, especially Lake Erie, to the study area, these bodies of water have a moderating effect which result in the winters being milder and the summers being cooler than they would be if these lakes were not present. This moderating effect on Welland is evident when data is compared to data from London³, which is twice the distance from Lake Erie. For example, London's January temperature of 22.5° F. is 2.5° F. colder than Wainfleet's. London also receives less rain than the study area (30.54" : 34.02") because of further distance from the lake.

The average frost free period in Wainfleet is 157 days, but according to Chapman, the actual growing season is 46 days longer for he considers the growing season to be between those dates in spring and fall when the average temperature reaches 42° F. For the study area these days are April 14 and November 3 therefore the growing period is 203 days.

The township's latitudinal position also places it in the path of prevailing westerlies, and its position in the north-east of the continent finds it on the route of many of the cyclonic storms moving eastward across the continent. There is a considerable variation in weather over a five day period, resulting from the frequent passage of these cyclones.

³ - all London's data is from The Climate of Canada Meteorological Branch, Queen's Printer, Ottawa 1962 p. 45

AVERAGE MONTHLY PRECIPITATION & TEMPERATURE FOR WELLAND (1921-1950)

Month	Precipitation in inches	Temperature (deg. fahr.)
January	2.90	25.0
February	2.72	24.0
March	2.93	32.8
April	2.92	43.6
May	2.88	55.2
June	2.63	65.6
July	2.98	71.1
August	2.33	69.6
September	3.28	63.0
October	2.70	51.3
November	2.99	40.0
December	2.76	28.8
Yearly total	34.76	Mean average 47.6

From WATER: N.P.C.A. Report
table 4, Toronto, 1964

Mean of Dec. Jan. Feb.	26.1
Mean of Mar. Apr. May.	44.2
Mean of Jun. Jul. Aug.	68.8
Mean of Sept. Oct. Nov.	51.4

FIG. I

N.P.C.A.

photo. 1 : An aerial view of Wainfleet - taken from over Lake Erie at Rock Island Point. In the foreground a Conservation Area is using the sandy shore zone for camping and picnicking while in the background the level, poorly drained lacustrine plain is partially cleared for pasture. Grass stabilized sand dunes form a ridge along the shore, Onondaga limestone forms a resistant headland in the immediate foreground, and the sand beach to the left is used by bathers.

Physiography:

Wainfleet's present physiography is an heritage of past geographies. The presence of bedrock topographic features are clues of a distant past while younger landforms of unconsolidated materials tell tales of a landscape being moulded under the influence of moving and wasting ice sheets and then evolving to the present physiography under geomorphic processes still active. In order to gain an appreciation of the present distribution of the area's landforms the writer considers the former landscapes in so far as the landform remnants of each landscape are relevant to the development of the present physiography.

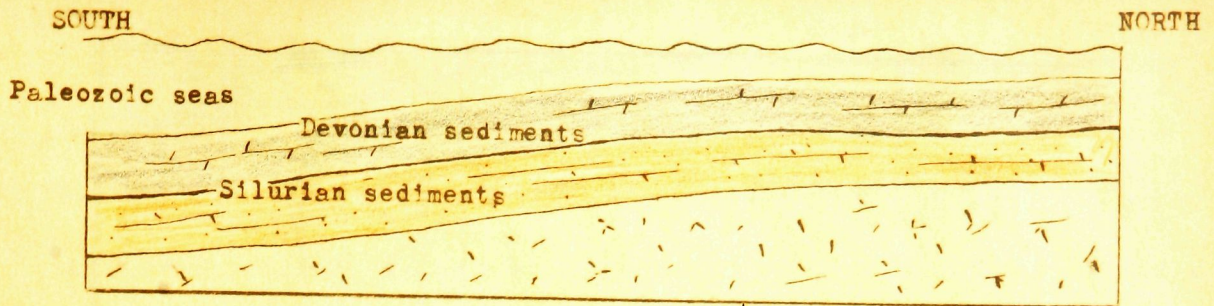
1. Pre-glacial Landform Remnants

The entire surface of the study area is underlain by Paleozoic bedrock deposited between 450 and 700 million years ago in seas which extended over the whole area of the lower Great Lakes. Structurally these sedimentary formations beneath Wainfleet form part of a large monocline (the dip slope of the Niagara Cuesta) gently dipping south at an average gradient of twenty-eight feet per mile.

After their deposition, these Paleozoic rocks were subjected to processes of denudation with the result the large monocline's upper elevations lowered. One consequence was the exposure of a south dipping bedding plane between Silurian and Devonian age rocks. Differential erosion along this exposed bedding plane (fig. 2) subsequently resulted in the formation of a north facing 20 ft. high escarpment.

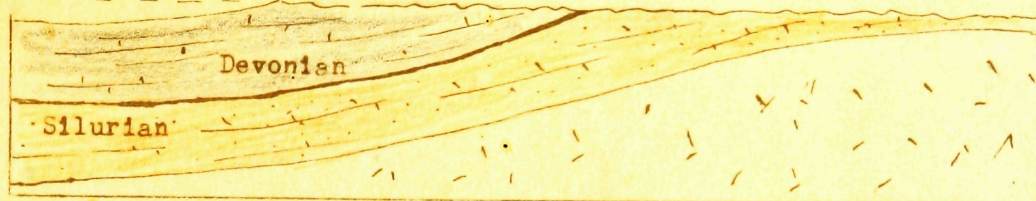
The present landscape has inherited this distinct topographic feature known as the Bois Blanc escarpment (map 3) which separates an upper plain

THE EVOLUTION OF THE BOIS BLANC ESCARPMENT & BEDROCK VALE

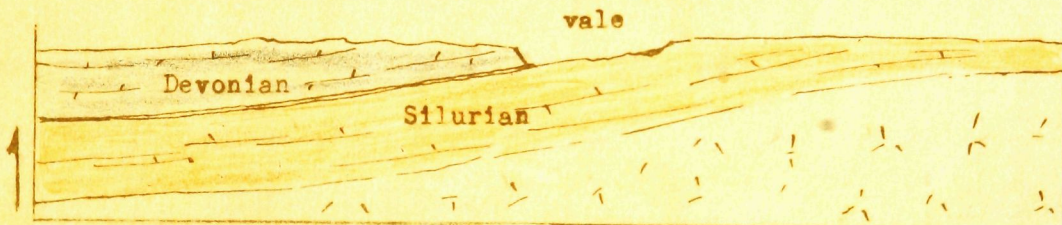


The Silurian and Devonian sediments were deposited in Paleozoic seas.

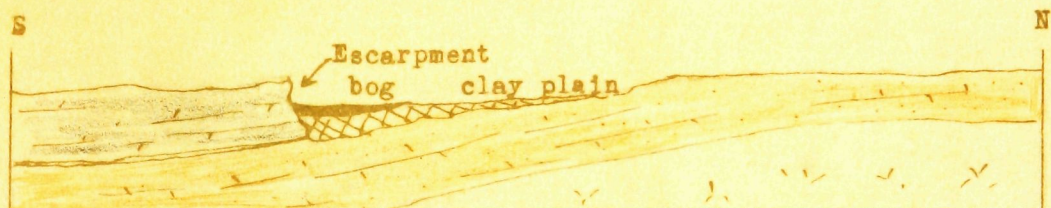
"Peneplain surface"



After these sediments had consolidated the landscape was peneplained.



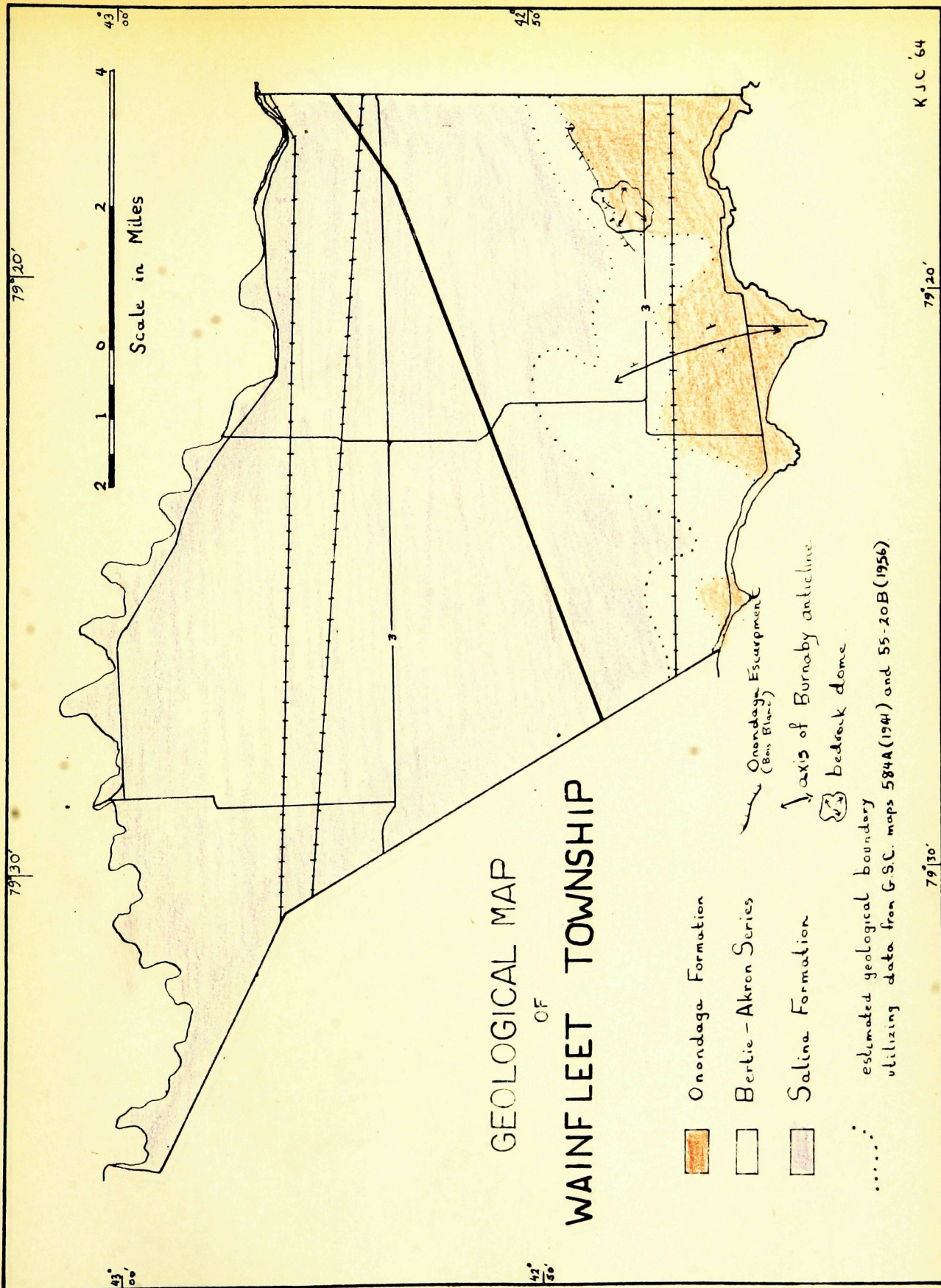
Then the area was uplifted, and differential erosion along the Devonian-Silurian bedding plane resulted in the removal of the overlying Devonian rock and the formation of a East-West oriented vale.

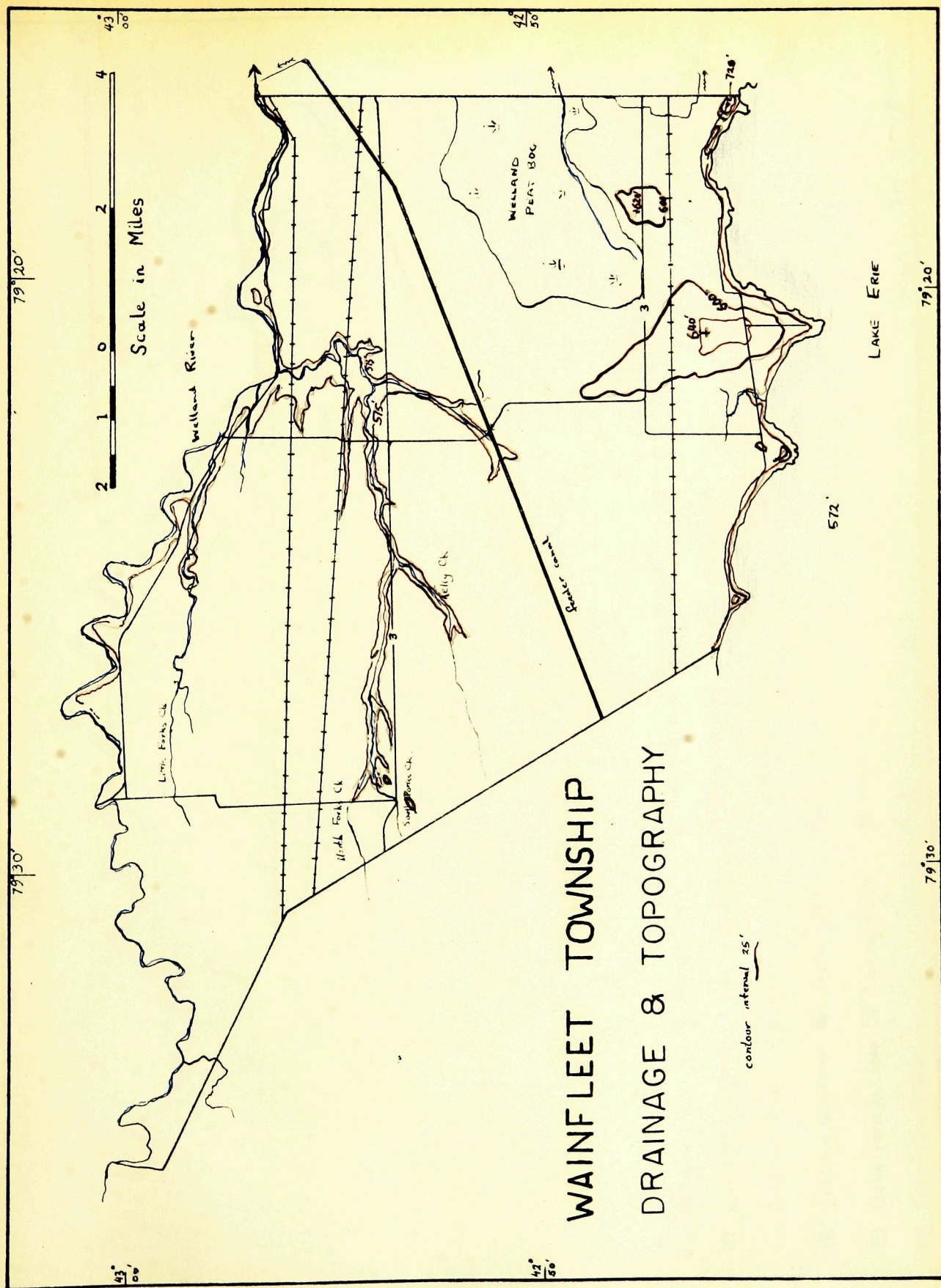


With the passage of time and continued erosion, the bottom of this vale has shifted southward down the dip-slope of the Silurian rock surface, with the southern slope of the vale forming the Bois Blanc Escarpment. Recent glacial sediments have obscured the valley floor.

(diagramatic cross-section)

FIG. 2





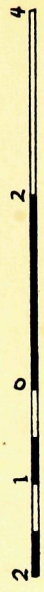
79°30'

79°20'

43° 00'

42° 30'

42° 50'



Scale in Miles

SOIL TYPES OF WAINFLEET TOWNSHIP

Legend

- | | | | | | |
|--|---------------------|--|----------------|--|-------------------|
| | BERRIEN SANDY LOAM | | ONTARIO LOAM | | WELLAND CLAY |
| | WAUSEON SANDY LOAM | | COLWOOD LOAM | | NIAGARA CLAY |
| | EASTPORT SAND | | HALDIMAND CLAY | | CAISTOR CLAY LOAM |
| | TUSCOLA SILT LOAM | | JEDDO CLAY | | BOTTOMLAND |
| | BRANTFORD SILT LOAM | | TOLEDO CLAY | | MUCK |
| | FARMINGTON LOAM | | PEAT | | |

SOIL SURVEY REPORT No. 5

79°20'

79°30'



photo. 2 : This gas well is typical of wells being used throughout the township to extract natural gas from the Salina formation for domestic use.



photo. 3 : Glacial striae on Devonian limestone indicate that the Ontario ice lobe advanced from 10° East of North.

of Devonian limestone (Onondaga formation) from a lower bedrock vale of softer Silurian natural gas bearing limestone (photo 2).

The extent of bedrock structural control on the present physical landscape varies within the study area. North of the escarpment later depositions of glacial unconsolidated material (up to a depth of 150 ft.) have filled in eroded irregularities of the Silurian Bertie - Akron Series and Salina formation to the extent that this bedrock surface now has no direct relevance to the present surface configuration. South of the escarpment, bedrock form does dominate physiography. Pre-glacial localized warping of the Onondaga limestone has produced a low anticline (local relief 35 ft.) and a broad dome with rock outcrops, while much of the intervening area is expressed as a level glacial scoured limestone plain (map 4).

2. Glacial History

Wainfleet; ancient scarp and vale bedrock was subjected to four major ice advances during the Pleistocene Epoch. The last one to occur was the Wisconsin glaciation 25,000 years ago, and it was the events of this glaciation which have been most pertinent to the present physiography of the area.

The Wisconsin ice sheet moved across the study area from approximately 10° East of North, scouring the ancient surface of the bedrock and leaving oriented striae indicating its direction of movement (photo 3). The ice, which was 6,000 feet thick in places, flowed across the bedrock vale, up and over the relatively small escarpment, and then continued southward across the Onondaga bedrock leaving five ice scoured shallow

swales separated by bedrock ridges - oriented in the direction of ice movements. Eventually the ice sheet halted and commenced to melt, while within the ice broken rock settled to the bottom of the sheet and was deposited as a till veneer - varying in depth up to 5 feet - on the ice scoured bedrock. This glacial detritus filled up the swales south of the escarpment, and extensively covered the bedrock vale⁴.

With the stagnation of the ice front, melting ice formed a series of successive proglacial lakes which were approximately located in the position of present Lake Erie; they were Lake Whittelsey (738'), Lake Wayne (655'), Lake Warren (675'), Lake Lundy (620'), and Early Lake Erie (585')⁵.

The first three of these lakes completely covered the study area for they were higher than the highest bedrock topography. During the duration of these early lacustrine lakes suspended silt and clay particles settled on the lake bottoms to form the thick clay veneer which extends throughout Wainfleet and is known as the Haldimand clay plain. With further retreat of the ice the outlet of Lake Warren was lowered and relocated with the result that the water level gradually dropped to the level of Lake Lundy (620'), and the Burnaby anticline (640') became an island. Then upon exposure to subaerial erosion the clay veneer overlying "Burnaby Island" was stripped

⁴It is known from gas and water well records that this till is still present in the vale, buried under thick clay deposits.

⁵The figures in brackets are only the approximate elevation of the respective lakes above mean level as the shore line of these lakes now vary in height due to latter warping of the landscape by isostasy.

away leaving exposed the heavier underlying till, (photo 4).

During this same period of time the lowering of Lake Warren's water level resulted in the formation of the Grand River spillway north-west of the study area. The melt water of this spillway was heavily laden with sand, and when this water flowed into the calm waters of Lake Lundy the sand settled to form a delta. The fringe of the sand delta spread eastward through what is now Moulton Township into the submerged western half of the study area, and only ceased to develop when the waters of Early Lake Erie disappeared from this section of the study area. A small area of lacustrine clay plain in the extreme north-west of the study area escaped the deltaic sand as the elevation of the plain was slightly higher than the delta.

Eventually the water level of Lake Lundy lowered to the level of Early Lake Erie (590') upon farther retreat of the ice northward. Burnaby Island grew in area and two new islands were created - upon an exposed rock (600') at what is now Long Beach, and upon the previously mentioned bedrock dome (620'). Offshore to these islands the lake formed wave platforms still evident to-day (map 4). At the same time the upper elevations of the sand delta emerged as land and a sand bar developed offshore at what is known as the hamlet of Forks Road on Highway 3.

Early Lake Erie then subsided to the lower water level of the present lake upon further retreat of the ice northwards. The low-lying clay plains in the study area emerged as land except for a depressional area at the base of the escarpment. This area of the Haldimand clay plain was relatively lower than points further north, due to the surface of the clay

plain conforming to the gradual southern dip of the underlying bedrock.

This depressional area, which extended east into Humberstone Township north of the escarpment and was confined from extending west by the sand deltaic plain, soon developed into a sphagnum peat moss bog with a maximum depth of 7 feet. The ultimate elevation of this rising organic surface has been limited to a water table elevation of about 580 feet⁶ for excess water in the bog spills east over the clay plain in the adjacent township to the Niagara River.

In brief the landscape at the end of this glacial period of erosion and subsequent deposition was relatively flat and low-lying, consisting of a peat moss bog and heavy clay and light sandy areas north of the escarpment, while to the south the landscape was characterized by a shallow till covered swale and ridge limestone plain.

For a greater detailed account of the glacial history of the Great Lakes the reader is referred to Hough's Geology of the Great Lakes⁷ - the most complete description and analysis of the Great Lakes chronology yet published.

3. Post-glacial Development

The present physiography of the study area is a result of post-glacial development. The present physiography of the study area is a result of post-glacial development. The present physiography of the study area is a result of post-glacial development.

⁶ Leverin, H.A., Peat Moss Deposits in Canada, Mines & Resources, #817 Queen's Printer, 1946, p. 68

⁷ Hough, J.L., Geology of the Great Lakes, Univ. of Illinois Press, Urbana, 1951

glacial isostasy and recent lacustrine and fluvial processes modifying the landscape which had emerged upon the lowering of the water level of proglacial Early Lake Erie.

The study area now has a scalloped shore of headlands and bays the development of which has been structurally controlled by the Onondaga bedrock. As will be recalled in the last chapter the movement of ice over the bedrock of the back shore had scoured north-east south-west oriented swales separated by five bedrock ridges. To-day where these ridges dip under the waters of Lake Erie they form wave resisting headlands while the swales -filled with unconsolidated materials- are now being eroded into by wave action from the west. The result is a number of bays (map 4).

West of the township the lower stretch of the Grand River, due to a lowering of the river mouth from Early Lake Erie to the present lake, is now eroding into the deltaic sand plain through which it flows. The eroded sand is being transported downstream out into Lake Erie whereupon it is then shifted east along the lake shore by wave action. During this process there is a tendency for the sand to accumulate in the study area's bayheads where the beach line is most exposed to the southwesterlies⁸. The sand content of these five bayhead beaches becomes increasingly coarser proceeding from west to east along the shore line for the fine deltaic sand becomes increasingly mixed with eroded material from the swales.

Another development along the shore line is a line of sand dunes back

⁸ Hill, P. L., The Northeastern Shore of Lake Erie: Physical Features and Recreation, M.A. Thesis, McMaster University, 1964, p. 100

of the sand beach areas. These dunes have developed in response to the onshore southwesterlies blowing dry beach sand. At Rock Island Point the sand dunes are from fifteen to twenty feet high; eastward along the shore they increase in height above lake level until at Sugar Loaf they have a local relief of 115 - 125 feet (photo 5). The greatest dune development is found at Sugar Loaf for this is where the most sand is available, and is where the shore is most exposed to the full force of the prevailing winds.

Fluvial processes have also been modifying the landscape, especially the vale of land north of the Bois Blanc escarpment. As the escarpment prevents drainage south from the vale into Lake Erie, the eastern part of the vale's run off water drains into Welland Bog which in turn spills it east into Humberstone Township and ultimately into the Niagara River. The western section of the low-lying vale is drained by tributaries of the sluggish meandering Welland River which flows east twenty-two miles to the Niagara River (map 5). In the extreme western half of the township the delimitation of the drainage divide by the Bois Blanc escarpment is replaced by the ridge of sand dunes, for the escarpment diminishes in height from east to west until it is non-existent west of Long Beach.

The fluvial history of the vale is complex. When the ice retreated north, the eastern portion of the Niagara Peninsula was left depressed for the ice had been thicker there than further west. When the study area gradually emerged from the waters of Early Lake Erie, a drainage system developed upon the clay and sand plains of the vale; the main stream (the Welland River) meandered eastward down the slight grade to the north-south axis of the depression - the Niagara River. As the ice retreated



photo. 4 : This rise of land was caused by the warping of the underlying bedrock. The shallow till overlying the Burnaby anticline was deposited by the Ontario ice lobe.



photo. 5 : This sand-pit excavation at Sugar Loaf Hill shows the extent of the local relief of the sand dunes found along the eastern section of Wainfleet's present lakeshore.



photo. 6 : The A and B horizons extend only down to the spade handle. The C horizon which extends down past this point consists of pure deltaic sand. The dark zone is wet from ground water.

Berrien sandy loam profile



photo. 7 : The thick A horizon-14" is fertile and easily worked but the mottled appearance of the B horizon -from 15" to 21" below the surface- is indicative of the imperfect drainage of this soil type.

Tuscola silt loam profile



photo. 8 : Muck soil profile.
Six inches of organic soil overlies marl beds which are saturated with water.



photo. 9 : Caistor clay loam profile.
The upper blocky structure of this soil type is not favourable for cultivation as the soil does not permit easy growth of plant roots. The base of the handle marks the top of the compact C horizon.

further north, the depressed area began to rebound slowly. The established drainage systems of the area maintained their original course by downcutting their beds into the rising land. In Wainfleet this rejuvenation of the Welland River led to its tributaries Little Fork Creek and Forks Creek downcutting through the northern section of the deltaic sand plain to the underlying clay. Eventually all the sand was stripped off, and the present dissected (undulating) surface on the exposed clay plain was developed (map 9). In the northeastern section of the vale the clay plain remained relatively "level" for the very shallow gradient of the peat bog water shed was not favourable for extreme erosion.

4. Physiographic Regions and Soil Types

Eleven physiographic land type regions are discernable in the study area: dissected (undulating) sand and clay plains, level clay and sand plains, peat bog and swampy areas, till and limestone plains, and a shoreline of sand beaches and dunes alternating with rock headlands (map 4).

Sixteen different soil types have also been identified. (map 6). As the soil classification is based on features such as colour, texture, structure and parent material of the soil - which are in turn a response to the conditioning environment, it is not surprising to find that there is a correlation between the location of certain assemblages of soil types and particular physiographic regions.

In the north-west of the study area is found the undulating sand plain region. This region is drained by the tributaries of Forks Creek; downcutting by these tributaries into the deltaic sand has been the main reason

for the development of the undulating surface. The soils of this region, Berrien sandy loam and Wauseon sandy loam, are sandy and light in texture; the major difference in these soils is due to drainage. The Berrien sandy loam has developed in those parts where the undulations are six feet above older underlying clay (photo 6) whereas Wauseon sandy loam, which is darker in colour, has developed in those areas of the region where clay is found at a depth of one to two feet. As a result of the clay underneath, drainage is imperfect in the Wauseon sandy loam areas, and this is clearly reflected in the mottled sand of the B horizon. The A horizons of both soils are deficient in such nutrients as lime, nitrogen, and phosphate, and are lacking in organic material as intensive farming in the last 50 years has tended to deplete the soil.

In the centre of the township is an extensive surface of level sand plain which has remained undissected because of its low-lying position relative to the Welland River. This area was very poorly drained before installation of drainage ditches, and the Colwood and Tuscola silt loam stonefree soils which have developed on this 10 inch thick sand veneer over clay reflect this poor drainage by the mottled colouring of their B horizons (photo 7). The Tuscola which has developed on thicker sand areas is yellowish in colour in the A horizon, while the Colwood, which has developed on thin sand areas, is greyish in the A horizon due to some silt mixed in with the sand. In one area a stream did begin to dissect the sand but was then blocked, possibly by a fallen tree. Into this blocked basin (maps 4. 6), organic

material began to accumulate - developing into a well decomposed muck soil (photo 8).

The large tracts of level clay plain (map 4) give an impression of flatness to the whole study area. These regions are very poorly drained because of the flatness, and surface runoff slowly drains the depression of the Welland Bog. The soils of this area: Toledo, Welland clay, Niagara clay, Jeddo clay and Caistor clay loam are all heavy clay and have a high moisture content throughout the year. Variation of these different soils is very subtle for in several cases the only difference is colour due to impurities in the clay. Jeddo clay for example has a dark grey clay loam A' horizon over a B horizon of stonefree grey clay subsoil. Caistor clay loam (photo 9) in contrast has developed on the same type of topography but is light brown in its A' horizon because of silt impurities. The Jeddo clay's dark colour is due to organic impurities. Niagara clay has tended to develop in the better drained clay areas such as found on the eastern flanks of the anticline at Burnaby. This light brown to reddish brown clay (photo 10) is somewhat gritty due to grit in the parent material. Welland clay soil has developed on the clay deposited on the bedrock swales in the south by Early Lake Erie; the A' horizon of the soil is gritty due to grit in the parent material. The Welland clay is darker than the Niagara because of a higher organic content. All these soils are deficient in lime and phosphate for imperfect drainage has prevented podzol soil development.

The dissected clay plain in the north is much better drained than the



photo. 10 : Niagara Clay profile. Although this soil has similiar structure and texture as the preceding Caistor clay loam the mottled B horizon is deeper and the drainage is better as this soil is located on a sloping topography.



photo. 11 : This view south from Highway 57 reveals the extent of dissection of the clay plain by Little Forks Creek.



photo. 12 : Brantford silt loam profile.

This profile shows 9" of light friable loam in the A horizon while the mottled B horizon is about 4" thick. The dark wet sand parent material starts 14" from the surface.



photo. 13 : A Haldimand clay profile showing a dark 6" clay horizon over a lighter grey brown B horizon 18" thick. The C horizon below this has a massive blocky structure.



photo. 14 : An Ontario loam profile showing the stony loam of the A horizon extending down to bedrock at the base of the ruler.



photo. 15 : A view of one of the drainage ditches installed to lower Welland Bog's watertable so that extension of agriculture might be feasible. The narrow gauge railway in the foreground is used to convey peat moss from the bog to a local processing plant.

level clay plain, and therefore has a much higher potential for agricultural development as the soils are not so acidic. Formerly this clay was covered by the fringe of deltaic sand but downcutting by the Welland River and its tributaries (photo 11) has since exposed and modified the clay surface. The soils of this region are Brantford silt loam, Haldimand clay and Caistor clay loam. Brantford silt loam, which has developed in areas of well drained slopes, is characterized by a grey to light brown A' horizon underlain by a horizon of yellow and grey stratified silt and clay (photo 12). The Caistor clay loam has developed in areas not as well drained as the Brantford silt loam; there is less silt in the parent clay material. Its greyish colour is very similar to Brantford silt loam. The Haldimand clay is very similar to the Caistor soil in colour and drainage (photo 13); its A' horizon is greyish to light brown, but its gritty clay parent material is redder than the C horizon of Caistor clay. These soils are moderately acid and are deficient in organic matter, lime and phosphate.

The depressional region of peat bog is another distinct land type unit. Unlike the soils elsewhere in the study area the bog soil is organic, consisting of an upper live layer of peat moss and a lower 3 to 7 foot layer of fossilized plant remains known as peat. As this bog drains much of the sand and clay plains it is fairly moist throughout the year.

The limestone plain in the south is a result of erosion stripping off the clay and till veneer deposited during the ice age. A very thin soil, Farmingington loam, has developed on this flat lying surface. As it is less than 12 inches in depth it has no potential for agricultural development.

Elsewhere, a tract of till plain has been uncovered by erosion of

pro-glacial clays on the flank of the high bedrock topographic feature at Burnaby (photo 4). On this well drained till material, Ontario loam soil has developed. This soil has a light brown A' horizon of 6 inches over a lower horizon of reddish brown stony material. In several places where the soil is shallow, soil development of the A' horizon has extended right to the bedrock (photo 14).

The most recent land type to develop in Wainfleet is the lake shore zone of post-glacial beach sands. This zone is characterized by a sand beach platform north of which is a line of sand dunes parallel to the shore. In the western end of the region the dunes are only about 20 feet high and are stabilized with grass. Eastward the dunes are higher, reaching a local relief of 125 feet at Sugar Loaf (photo 5). The soil, Eastport sand, is well drained but is deficient in humus.

Vegetation:

Much of the existing vegetative growth in Wainfleet is secondary growth with very little virgin bush remaining except in parts of the Welland Bog and in other poorly drained areas. D. Halliday has classified this area as being one of broad-leaved associations with the major species being elm (*Ulmus americana*), beech (*Fagus grandifolia*), red maple (*Castanea dentata*), walnut (*Juglans nigia*), birch (*Betula papyrfera*), cedar (*Thuja occidentalis*), some white pine (*Pinus Strobus*), and red juniper (*Juniperus virginiana*).⁹ The present second growth, found mainly on scrub and idle

⁹ Halliday, W. E. D., A Forest Classification For Canada, Dept. of Mines & Resources, Ottawa, 1937, p. 28-9

land, consists of hawthorn, ash, and poplar.

The elm tree has been subjected to the Dutch Elm disease in the last decade; many standing dead trees are in evidence. Nevertheless the elm species is fast growing, and as the disease only attacks mature trees, much new growth is to be observed in the township. Birch and white pine are common in the better drained sand plain areas, white oak is found growing on the poorly drained clay plain. Beech, red maple and walnut are scattered throughout the township but there is a greater concentration of these species in the better drained areas. Red cedar is found growing on the limestone plain and the well drained shallow soil of "Burnaby Island". Willow is becoming common along the disused feeder canal as the wet conditions are providing a favourable ecological environment. Willow is also present on the bottom lands while sedges, grass, and sphagnum moss dominate in the bog area. On the well drained Lake Erie sand dunes white pine is the predominant tree species.

From the above description, it is clearly evident that Wainfleet's forest cover is primarily deciduous and that drainage conditions in the township constitute a strong factor in determining species location.

CULTURAL GEOGRAPHY

The preceding section of this study has dealt with dominant features of Wainfleet's physical geography, features which have since proved relevant to human development of the area. This section has a two-fold objective - to describe the observable effects of man upon the landscape, and also to reveal the extent that man's activities in the township have been directed and limited by the physical environment.

Historical Geography:

One method of understanding the present cultural landscape is to approach the subject through a consideration of past cultural geographies and of the processes by which these geographies have changed. By using this dynamic approach, an appreciation is gained of processes which have produced and are active in the contemporary geography of Wainfleet.

1. Wainfleet Township under Indian Occupancy (- 1776)

The tribes occupying the peninsula of Southern Ontario prior to 1650 were the Neutral and Petum-Huron Indians.¹⁰ These woodland Indians, peaceful in nature, lived off the wildlife resources of the peninsula and some small scale subsidiary agriculture.

The advent of the Europeans and their rivalries into the region in the first half of the Seventeenth Century resulted in a depletion of the

¹⁰ Hill, P. L., Moulton & Sherbrooke Townships, McMaster University, 1959, p. 33.

Indian population. The Iroquois (Six Nations), which were located south of Lakes Ontario and Erie, allied with the English; the Hurons allied with the French forces. During the resulting wars the victorious Iroquois disposed of much of the Huron population, and the Neutral Nation, located in the intervening Grand River valley, was destroyed for giving assistance to the Hurons. Thus, after 1650 for a hundred years, this section of land along the northern shore of Lake Erie became a "wilderness waste". The only humans to be seen were a few Mississauga Indians who passed through the study area hunting game.¹¹

After the American Revolutionary War (1776), a tribe of Mohawk Indians, members of the Six Nations, who had allied with the British, were forced by the Americans to leave their lands in what is now New York State. Led by their Chief, Joseph Brant, the Indians fled to the security of Canada where the Governor of Canada, Halidmand, granted them land in the Grand River valley. The eastern boundary of this reservation, known as the Indian Line, now forms the western boundary of Wainfleet. It is most likely that these Indians extended their hunting forages into the study area.

2. Early White Settlement (1776 - 1829)

The earliest white settlers were United Empire Loyalists who

¹¹ - a tribe of the Chippawa Nation which controlled all the north shore of Lakes Huron and Superior.

fled to the township and vicinity at the close of the American Revolutionary War. At this time the greater part of Wainfleet was heavily forested and unfit for cultivation owing to poor drainage back of the shore. To move from place to place was difficult: the only "routes" in the township were hardly recognizable Indian trails which tended to keep to the sand shore strip in an effort to avoid the low-lying swampy regions inland; the only alternatives were to canoe along the Welland River or Lake Erie shore.

David Morgan from Pennsylvania, the first recorded settler, located his cabin on the well drained till soil found at Burnaby - one of the few dry areas in the township conveniently close to lake shore transportation.¹² His first crops were potatoes and corn - grown for subsistence purposes.¹³ At the close of the Revolutionary War Wainfleet's settlement was enlarged by an influx of new families - among them the Farris and Zavitzes - who settled along the lake shore close to water transportation.

The pioneer life of those days was severe; the nearest flour mill until 1786 was at King's Mill at Niagara-on-the-Lake. In order to reach it the settlers had to canoe east along the lake to the Niagara River and

¹² Duff, L. B., Burnaby, Welland Tribune-Telegraph Press, Welland, 1916.

¹³ The History of the County of Welland, Welland Tribune, Welland, 1887, P. 375

¹⁴ Gentilecore, L., Beginnings of Settlement in the Niagara Peninsula (1782-1792), Canadian Geographer, 1963, p. 80.

then portage north along the American shore to below its rapids where they resumed canoeing to the river mouth. The return trip was quite arduous. After 1786 the distance was shortened as a grist mill was built at Table Rock in the vicinity of the Niagara cataract. In 1792 the first grist mill was constructed in the township by the Zavitz brothers at Sugar Loaf; the mill was wind-powered owing to a lack of water power in the township. The building of this mill provided much needed milling facilities, not just for the settlement of about 100 people at Sugar Loaf, but for the entire Lake Erie shore.¹⁴

Growth of settlement during the 1776-1829 period was mainly restricted to the sheltered bayhead beach areas where boats could be brought close to shore - away from underwater extensions of the rock promontories. Cultivation on the well drained undulating sand plain (map 4) was almost nil for between this region and the sand shore region lay the low-lying impassable swampy clay plain and peat bog. Settlement on the drier limestone area was very sparse for the shallow infertile soils were not conducive to cultivation.

3. Later White Settlement (1830 - 1900)

The construction of the Welland feeder canal from the Grand River across the clay plain to Welland (map 1), undertaken to provide

¹⁴ Gentilcore, L., Beginnings of Settlement in the Niagara Peninsula (1782-1792), Canadian Geographer, 1963, p. 80.

a sufficient head of water for operation of the Welland Canal, brought about a change in the settlement geography of the township. The completion of the canal prompted the municipal government to install a grid of drainage ditches throughout the clay and sand plain regions, with the ditches draining into the feeder canal. The excavated material from the ditches was utilized to form a road foundation thus allowing the building of a grid of roads through the low-lying clay and sand regions. The installation of the roads and ditches encouraged agricultural settlement inland, and the completed feeder canal (1832) was large enough to accommodate horse drawn barges and schooners loaded with cargoes of lumber and wheat, thus providing shipping facilities for people who settled near the canal's banks.

During this period a wagon route was built through the township from west to east connecting Dunnville on the Grand River and Port Colborne just east of the township (map 1).¹⁵ An extension of this route went north to the Welland River and then followed the river downstream to Welland. As this was a dirt road traffic was restricted to dry periods when the road was passable.

By 1850 the township's population had increased to 1,500 from approximately 460 in 1817 - reflecting a rapid increase of people coming into the study area from Europe. This trend continued and by 1885 the

¹⁵ Highway 3 now follows this route.

population, chiefly of Irish extraction, had grown to 3,000.

Intensive clearing of the sand and clay plains took place with some of the lumber being cut by four saw mills¹⁶ for local use, while some of the logs were floated down the Welland River to a saw mill at Welland. By 1885 there were 4,000 acres of sand and clay plain sown in winter wheat; the yield that year was more than 100,000 bushels. Much of this grain was sold for cash; the grain was shipped and carted to markets in the growing cities of Eastern Canada such as Welland, Hamilton and Toronto.

Agriculture development expanded in the township. The Welland Bog region of the township, which hitherto had been avoided owing to lack of funds for development, was purchased by the Municipal County Council with the expressed objective of starting to reclaim the land (map 4). Drainage ditches were installed (photo 15), and by 1882 8,000 reclaimed acres and the bog had been disposed of to farmers while a remaining 5,000 acres were sold to Wilson and Reavely for later development.

In the south-eastern part of the township quarrying activities commenced on the limestone plain with the advent of railways to the township in the 1850's; 200,000 bushels of white lime was produced yearly and exported to Buffalo.

¹⁶ - the location of these mills are not known - they were probably powered by steam "donkey engines" and were mobile.

¹⁷ Stevens, C. B., *Canadian National Railways Vol. I, Clarke, Lewis & Co. Toronto, 1904.*

In the early 1850's the great Western Railway's subsidiary, the Air Line, was built between Detroit and Buffalo via Wainfleet Township. Although the rail line was primarily built to provide a "short cut" for American goods passing between the two mentioned cities, the railway did build Marshville Station (map 2) to handle local freight and passenger service. Not long after, another railway, the Buffalo and Lake Huron, was built in 1858 crossing through the southern half of the township.¹⁷ This competitor railway opened Wainfleet Station one and a half miles north-west of Burnaby to provide rail facilities for local agricultural produce and passengers.

Along with the construction of the feeder canal, roads, and railways, widespread settlement of the township occurred and hamlets developed at what are now Winger and Wainfleet Villages.

Winger developed on Highway 3 as a collecting point for produce from the surrounding dairy and mixed farms which were becoming established throughout the undulating clay and sand plains in this section of Wainfleet. A creamery was built to make butter which was then carted to markets in Welland and Dunnville. A grist mill was also built at Winger to grind local corn into feed. As there is no trace of a former water supply at Winger, this mill probably was powered by a wood burning steam engine.

In the 1820's a hotel and tavern were built at the intersection of what is now Highway 3 and the feeder canal which was under construction. For

¹⁷ Stevens, C.R., Canadian National Railways Vol. 1, Clarke, Irwin & Co. Toronto, 1960.

many years the facilities of the hotel and tavern were available to road and canal travellers. Upon the completion of the canal in 1828 a grist mill was built at this community - known as Marshville;¹⁸ the mill was powered by water diverted from the canal into a raceway leading to a tributary of Forks Creek. The mill's services plus the availability of canal transportation resulted in Marshville in the 1830's developing into an agricultural collecting centre for produce which was then shipped out of the township to markets via the feeder canal. The shipping services were curtailed when the canal was closed upon completion of an extension of the Welland Canal to Port Colborne in 1890.

In contrast to the growth of Marshville, Burnaby in the south half of Wainfleet maintained the same size that it had in the early days of settlement as it was off the main transportation routes. Its general store and post office served the local farmers.

The period of 1832-1890 saw change in transportation along the lake front. Local lake shipping was discontinued as farmers in the southern half of the township began to rely on faster transportation media made possible by the completion of the railways and a lake shore road to Port Colborne. Incentive was given to this changeover by the fact that the larger ships of the period would have had a difficult time in the shallow waters off shore.

The roads and drains made overall settlement of the township

¹⁸ The name Marshville was changed to Wainfleet when the inhabitants discovered that flour sales dropped because prospective buyers refrained from buying from an obviously marshy area.

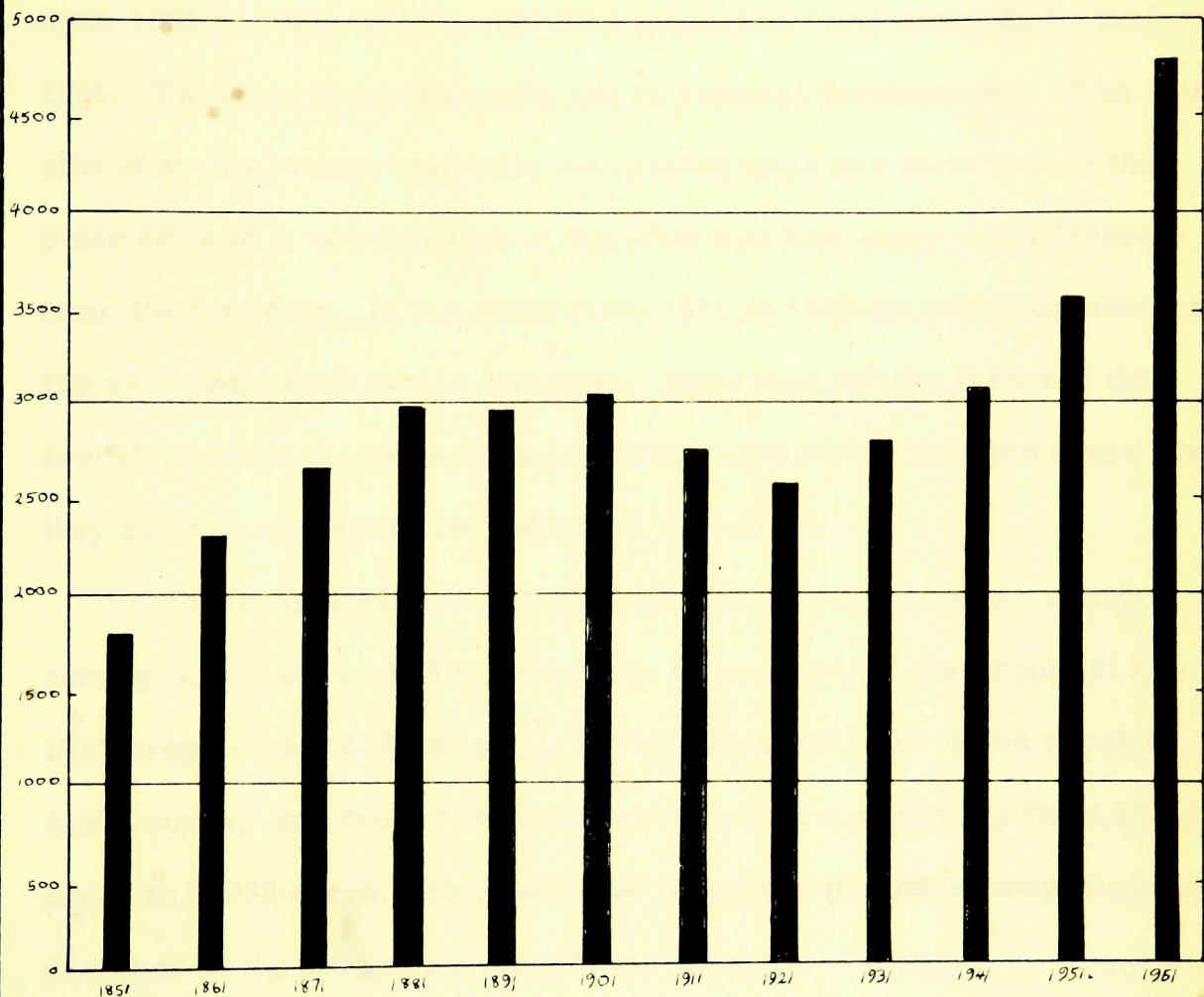
feasible but the physical environment did present problems to the new settlers. Often in winter snow drifts would isolate the farms for several weeks, and in wet weather traversing of the slippery clay roads was hazardous and sometimes impossible thus hindering the movement of perishable agricultural produce to market.

The main theme that dominates the geography of this period is change - extensive modification of the physical landscape by man. Men installed drainage ditches to lower the water table thus making land clearing and agriculture possible; men built railways and roads thus introducing efficient means of travel throughout Wainfleet - excepting the Welland Bog-, and men built their farms in land throughout the township thus changing the pattern of settlement geography from a line of farms along the lake shore. With means of getting their goods to market via road and rail, farmers replaced subsistence farming with commercial farming.

4. The Period Encompassing Two World Wars (1901-1951)

By 1901 man had left very few sections of the natural landscape untouched; his roads and railways crossed the township, he had cleared and drained extensive tracts of land, and he had established small communities such as Winger, Wainfleet Village and Burnaby. Commercial farming had become the livelihood of the township with oats and wheat the main cereal crops on the undulating well drained regions while dairy farming prevailed on the lower lying wetter lands. This was Wainfleet

WAINFLEET TOWNSHIP



POPULATION TREND

FIG. 3

just before the turn of the century, a township with a stable established agricultural economy.

After 1901, Wainfleet began a phase of upheaval and change. Census data (fig. 3) reveals that the study area underwent a decrease in population from 1901 to 1921, and that the 1901 population level was not regained until 1941. This decrease was partly due to external developments. The extension of the railways resulted in the opening up of new farm land in the prairies, and it was this lure of the West that took many young farmers from the township. In the years from 1910 to 1920 the additional feature of the war contributed to this decrease. Many men left the farms of the township to join the armed forces while others moved to urban areas where they could contribute to the industrial war effort.

No information is available from the census on township crop acreages for 1891 and 1901, but it can be ascertained that from 1911 to 1921 crop acreages did drop.¹⁹ Wheat decreased from 4,684 acres to 4,372 acres, oats from 5,280 acres to 5,068 acres, and hay from 10,519 acres to 9,333 acres. This decrease in cultivated land accompanied the decrease in the township's farm labour supply.

The rise of population from 1921 to 1931 reflects a new trend for some people to move back to the farms after the war, but a continued decrease in grain acreage for the same period (wheat acreage decreased from 4,372 to 3288) may be explained since full-time farming was not the

sole means of livelihood for some of the township's people. The attraction of good wages in industry in the nearby urban areas of Welland and Port Colborne, plus the advent of widespread use of cars, and improved surfaces on rural roads, encouraged many former full-time farmers to hold full-time jobs in town while living on the farm and working smaller acreages. This trend continued to the end of the period for grain acreages decreased from 23,328 acres in 1931 to 20,150 in 1951.

Changes in livestock management were also instigated by part-time farmers. For example some dairy farmers in the level clay region who changed to part-time farming, switched to raising beef cattle, for beef cattle require less attention than dairy cattle.

In the late 1920's and 1930's a new trend of settlement began to modify the landscape as suburban dwellers began to settle along Highway 3 west from Port Colborne to where the highway veers north. Lower township taxes, the country landscape and the convenience of all weather roads to work in Port Colborne and Welland were prime inducements for settlement. Former city dwellers also located between Wainfleet Village and Chambers Corners, and a few settled along the highway between this last mentioned crossroads and Winger. Daily commuting by car to Welland and Port Colborne was common.

Along the lake shore the sand beaches began to be utilized for summer recreational activity as people sought ways of using increased leisure time. The opening of the Peace Bridge across the Niagara River in 1928 brought about an influx of American cottagers who settled along the sandy bayheads.

By 1940 the complete shore was settled, with half the owners being Americans from Buffalo and vicinity. These people usually stayed at the cottages throughout the summer months while the working member of the family travelled back and forth daily by car to Buffalo via Highway 3. Canadians also built cottages but tended to rent them out for most of the summer. Building of snack-bars, dance halls and amusement booths at Morgan's Point and Grabbell Point accompanied the cottage building for the development of television had not yet made inroads into evening entertainment.

Another in flux of permanent settlers occurred during the Second World War. These newcomers, who worked in the Welland City industrial complex, settled on vacant lots in the strip development along Highway 3. They too claimed that the appeal of lower taxes was a prime inducement for movement of household to Wainfleet from urban locations.

The period 1901-51 was a period of change for Wainfleet. External developments such as industrial growth and the two wars resulted in a population decline and then an increase, the innovation of part-time farming brought about a change in crop and livestock management, and the settlement of urban industrial workers along the highway was in response to tax advantages. Cottage development of the sandy lake shore stretches also started, for this was a period when automobile owning city dwellers sought outlets for leisure.

Wainfleet (1951 - 1964)

The previous chapters on physical and historical geographies have outlined the evolution of the township's geography up to 1951. These geographies have shown how in past periods man entered the study area and began to modify the poorly drained low-lying landscape by forest clearing and by the construction of drainage ditches and rail and road facilities. These geographies have traced the evolution of Wainfleet's land use and economies. From these past geographies one is able to discern that after the turn of the century new features began to dominate and restrict the established agricultural land utilization. The opening up of new farm lands in western Canada led to a reduction in grain prices, and the development of a continuing labour demand in two nearby urban areas after the outbreak of World War I led to an overall reduction in the study area's supply of farm labour. All these features led to a decrease in agricultural activity. Meanwhile since the 1920's recreational development along the lake shore has been intensive. This then was the heritage that Wainfleet had after World War II.

In this next section an examination of the cultural landscape is undertaken from the period 1951-64 with the objective of knowing the present "geographical personality" of Wainfleet. Urban influences and settlement patterns are first examined followed by studies of the agricultural, recreational, and other rural non-agricultural land use. After having looked at these geographical phenomena individually, the separate con-

79°30'

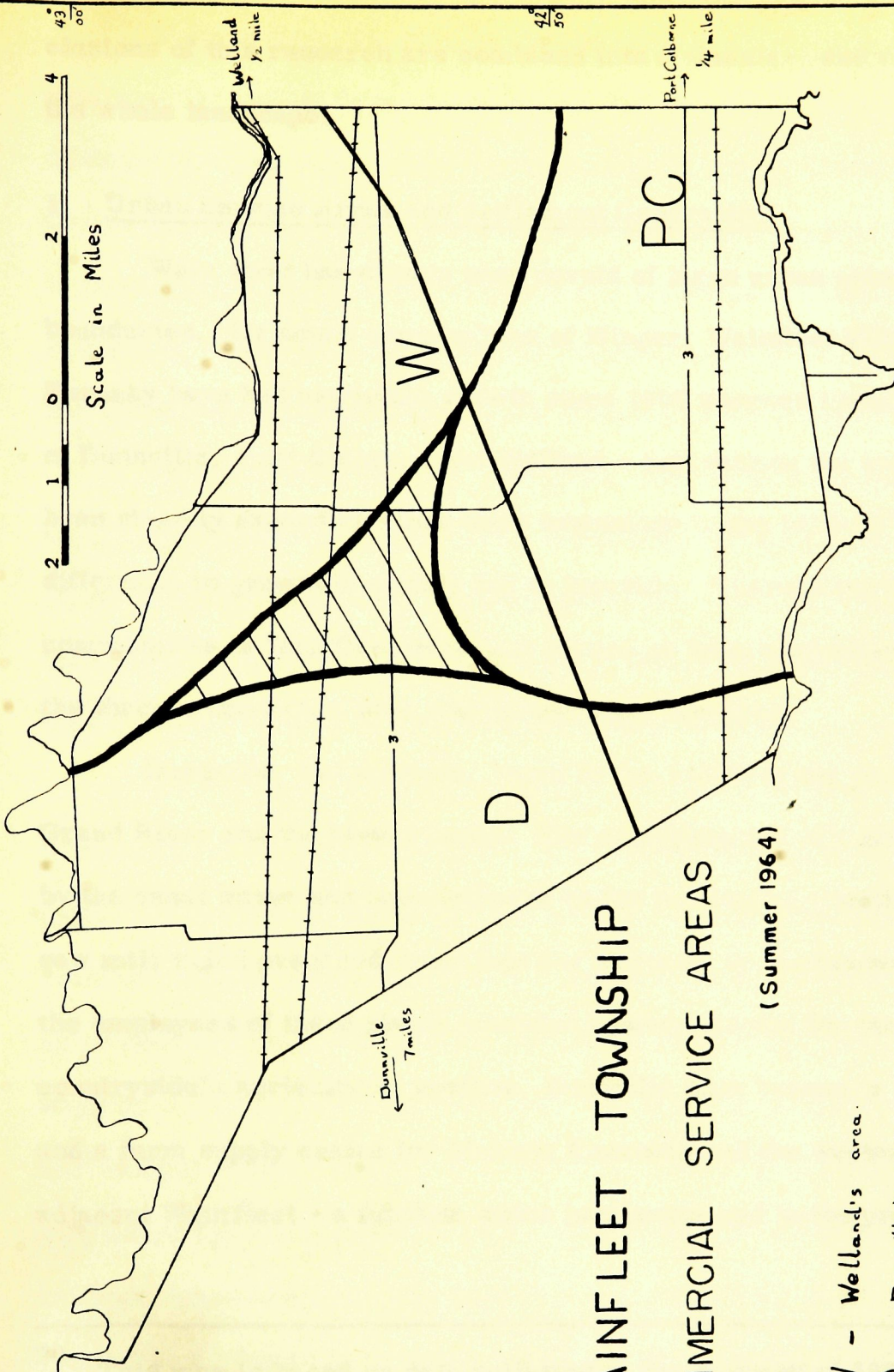
79°20'

43° 00'

42° 50'



Scale in Miles



WAINFLEET TOWNSHIP

COMMERCIAL SERVICE AREAS

(Summer 1964)

W - Welland's area.

D - Dunnville's area.

PC - Port Colborne's area



Less than $\frac{2}{5}$ pop. attending specific urban centre.

79°30'

79°20'

K.J.C. 564

map 7

clusions of this research are combined into a summary and conclusion for the whole landscape.

1. Urban Service Areas and Settlement Geography

Wain fleet has always been devoid of large urban areas within its boundaries. Its small communities of Winger, Wainfleet Village and Burnaby have had negligible growth since 1900 whereas the urban centres of Dunnville, Port Colborne and Welland - just outside the township - have been steadily expanding since their beginnings in the 1830-50's. This difference in growth is mainly due to location. Whereas the three mentioned communities in Wainfleet have only served as local agricultural centres, the three urban areas have maintained other functions.

Dunnville, for example, began in the 1830's at the junction of the Grand River and the feeder canal. The establishment of a grist mill powered by the canal water was soon followed by the building of a textile plant, and a saw mill which prepared river logs for shipment on the feeder canal. As the employees of these plants provided a ready market for the adjacent countryside's agricultural produce, Dunnville soon became a market town and a farm supply centre for Moulton Township and the western part of adjacent Wainfleet - a function which has continued to the present day (map 7).²⁰

²⁰ This map is based on data collected in the summer of 1964 from the interviewing of 135 home owners scattered throughout the study area regarding their, and their neighbours', shopping habits. Due to the proximity of the three urban centres, service areas overlap. Therefore the determination of a dominant urban centre at different locations in the township is based on three of five adjacent homes favouring a specific centre.

change Welland (pop. 35, 645) just to the north-east of the study area has continued its growth from its early days as a market town primarily because of its central position in the Niagara Peninsula and its location on the Welland Canal. Its stainless steel mills utilize hydro-electric power from nearby Niagara Falls and its chemical plants use the Welland Canal for shipment of materials. Many of Wainfleet's part-time farmers work in Welland and therefore their shopping and banking is conveniently carried out in the city.

Ontario Port Colborne (pop. 15, 000) has a dominating effect on "Friday night" supermarket shopping in the south-east section of the township. Its nickel refinery, steel mill, cement plant and flour mills, which were built because of the convenience of the Welland Canal for shipping purposes, provide a number of jobs for the township's men who commute via Highway 3.

zones To-day, transportation of local agricultural produce to market is by road as the three railways have closed their stations in Wainfleet and cater only to through passenger and freight service. Highway 3, which is used by transport trucks travelling between Buffalo and Detroit, is also used by township people commuting to jobs in Dunnville and Port Colborne. Highways 3A and 57, and Forks Road east of Chambers Corners, also receive a fair amount of farm and commuter traffic oriented to Welland. As the township keeps the grid system of rural roads regularly ploughed in winter, and as these roads are regularly gravelled and graded (photo 16), communication by road to all farms is possible except in exceptionally prolonged wet periods. the general store is patronized by cottagers from the nearby resort

communities The structure and function of Wainfleet's small settlements have

changed very little since the preceding period of 1901-51. Wainfleet Village, for example, is still unincorporated and the same size (pop. 120). Located centrally within the township at the junction of Highway 3 and the feeder it is the "seat" of municipal government. Its Post Office, two flour mills, and a hardware and two general stores plus a public school, a firehall, and two churches provide service to the immediate locale. Its Township Office, in addition to the township clerk, also houses the municipal police force. The Ontario Department of Highways has a depot there which services the province's highways in Wainfleet. All of these stores and community services are located along the highway while the homes are behind this commercial strip. Thirty-two homes of various age and condition are evenly distributed within the residential section with no differentiation of class zones (photo 17). In the present period the village's two feed mills, now electrically operated as the canal water no longer flows, cater only to farmers in the immediate area, competing with grist mills at Winger, Port Colborne and Dunnville. In addition to its administrative and milling functions the village is a static residential community with many of the village men working in Welland, Port Colborne and at Law's stone quarry (map 2).

Burnaby, the oldest settlement in the township, has changed very little since the turn of the century. Provided with one general store, Post Office, and a Methodist Church, this community of 25 old frame and brick homes is essentially a retirement centre for old farmers. During the summer the general store is patronized by cottagers from the nearby resort communities of Morgan's Point and Harbour View.

The only other "closely knit" all year settlement is the hamlet of Winger on Highway 3 (map 2). Historically an old settlement, its feed mill, and general store had a flourishing business prior to the advent of motor cars but this business has declined as to-day's mobile farmers prefer to patronize the shops of nearby Dunnville. Twenty-three old and modern homes, a firehall, three churches and a creamery constitute the rest of Winger. The creamery, which uses milk from dairy farms on the nearby undulating clay plain and employs two men, produces butter to be sold within the Niagara Peninsula. Many of Winger's inhabitants commute to work in Dunnville while others commute across the township to Welland.

The only other community of comparable size is the Long Beach cottage settlement at Gravel Point. A concentration of retail stores and other commercial development is located near the main lake road intersection. Four grocery stores, two restaurants and a small number of amusements are strategically located close to the greatest aggregation of summer population at the eastern end of the wide sand beach (map). The area also has a small frame Roman Catholic Church which is used only in the summer by cottagers.

Unlike Burnaby, Wainfleet, or Winger, this community (Long Beach) of approximately eighty cottages is inhabited mainly in the warm months for it is essentially a summer resort; the only all year residences belong to local farmers who have their homes facing the lake shore road. P. L. Hill²¹,

²¹ Hill, P. L. , The Northeastern Shore of Lake Erie: Physical Features and Recreation M.A. Thesis, McMaster University, 1964.

who has just completed an intensive study of recreational development along this stretch of Lake Erie shore, noted that there is a direct contrast between the development, use, and users of the sand beach and those of the rock shore at Grabell Point. The cottagers on the sand beach are usually rented, close together, and used by young families who go to enjoy recreation while the cottages on the rock shore are spaced further apart and occupied by elderly owners who tend to use the lake for scenic rather than recreational purposes. At present all the cottages are on the lake side of the road and occupy the whole lake front; no building of cottages has yet occurred on the inland side of the road, perhaps due to the problem of lack of access to the beach.

In addition to the above communities there are several minor concentrations of population in Wainfleet. For example, there is Chambers Corners at the major crossroad intersection of Highways 3 and 3A and Forks Road. Six service stations and two restaurant-motel complexes provide service to transient motorists while a farm implement dealer offers his services to local farmers. The five homes at Chambers Corners are inhabited by operators of the mentioned commercial enterprises.

The residential strip development which began in the previous period between Chambers Corners and Winger and between Chambers Corners and Wainfleet Village has slowly continued in the last decade. The condition of these homes vary from poor to good; the distribution of good and poor homes appears to be random reflecting the not too rigid township building regulations. Although many of these people settled in the township to avoid high city taxation, a few owners on Forks Road are trying to sell their houses as they

are finding that since the war the township has raised its taxes to the point that it is now more advantageous to dwell in Welland and other adjacent urban areas.

Although this study has accounted for the main concentrations of population, brief mention is warranted here of several shack "settlements" of two to three houses (photo 18, map 2). These settlements are in areas where there is scrub land or farm land that is reverting back to bush. The owners usually live on welfare relief and income from casual employment.

From this brief study of the location and types of settlements of Wainfleet it is apparent that Wainfleet Village, Winger and Burnaby are becoming more important as residential communities as the early function of being agricultural service and collecting centres diminish with the decline of agricultural activity and the establishment of competing service outlets in Dunnville, Welland and Port Colborne.

Although there is very little present residential expansion in Wainfleet Village, Winger and Burnaby, it is conceivable that within the next decade the expansion of Port Colborne and Welland, if continued, may well result in a new surge of residential building in established Wainfleet Village, Winger and Burnaby, as well as in the present uncontrolled strip development along Highway 3.



photo. 16 : This gravel road is part of the grid system of rural roads which has facilitated access to most parts of the township.



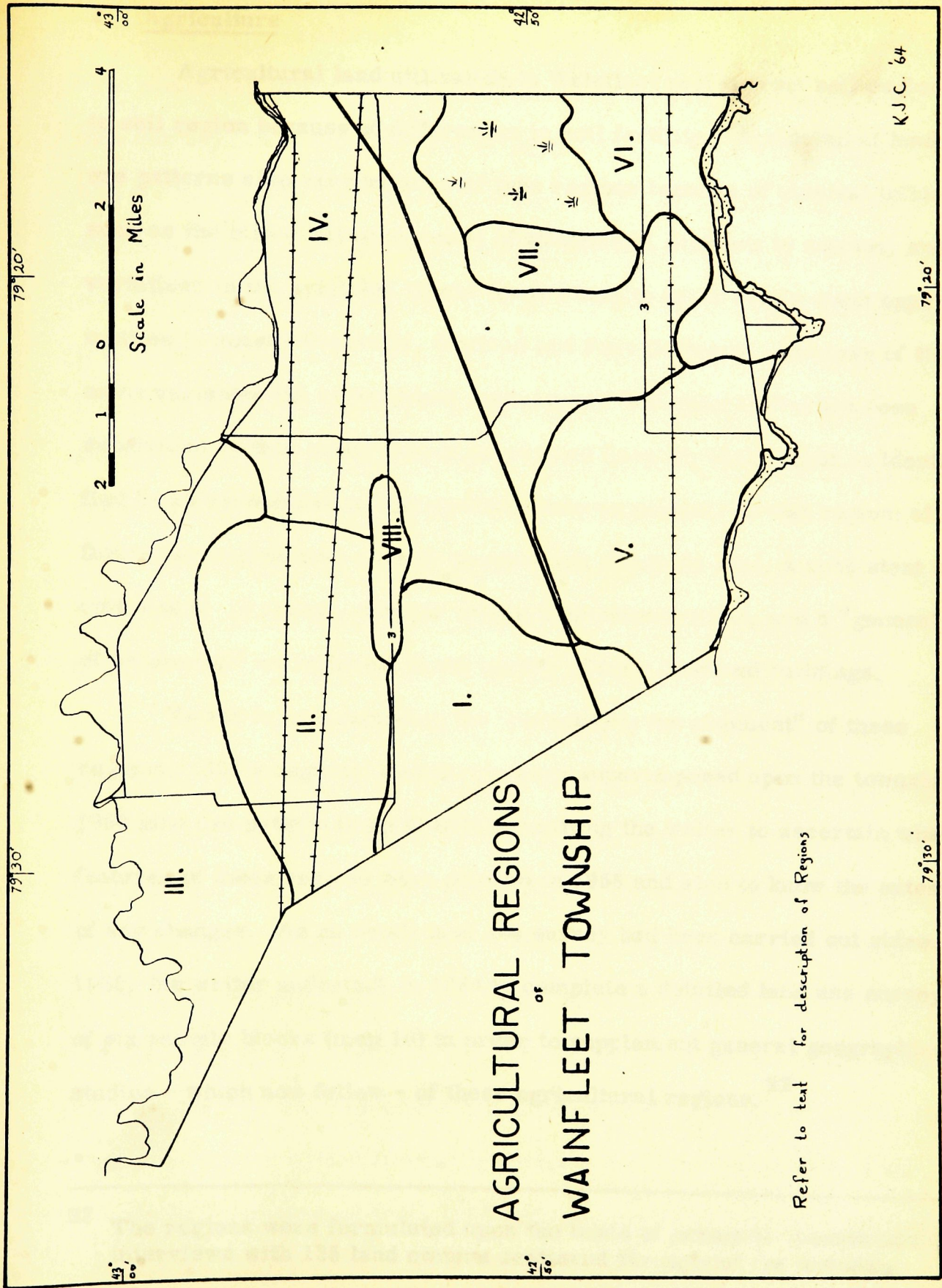
photo. 17 : A typical Wainfleet Village home. In general the homes are well kept, for the owners receive "fair" incomes as full-time industrial workers.



photo. 18 : One of the shack homes found scattered in the poorer sections of agricultural landscape.



photo. 19a : This hay field on level sand plain is characteristic of the land use found on Region IV's light sand soils.



AGRICULTURAL REGIONS
of
WAINFLEET TOWNSHIP

Refer to text for description of Regions

K.J.C. '64

2. Agriculture

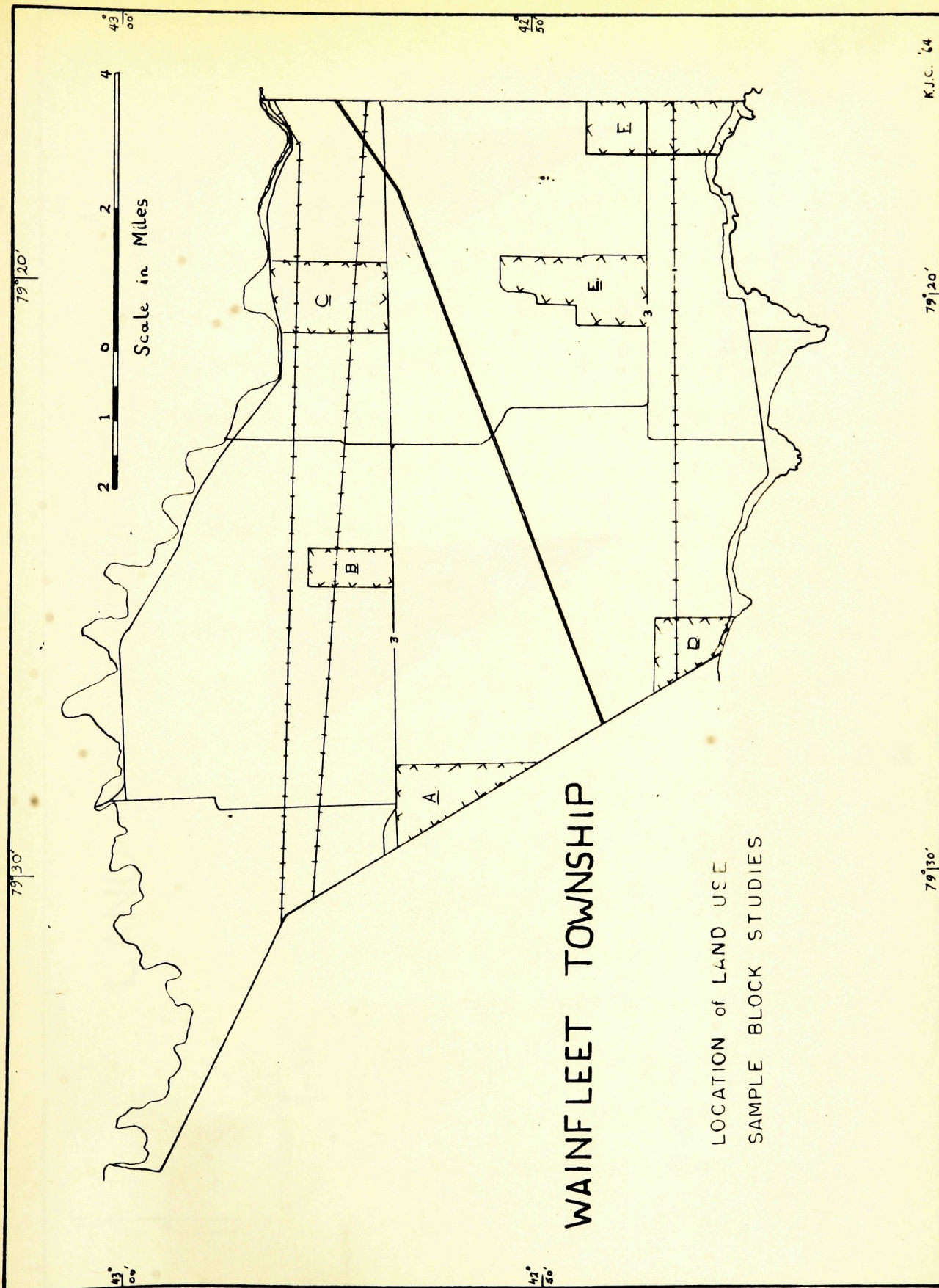
Agricultural land utilization in Wainfleet varies from soil region to soil region because of differences in soil fertility. Agricultural land use patterns also vary within soil type regions because of cultural influences such as the historical background of settlement, distance to market, and variations in the available labour force owing to other employment opportunities in nearby Dunnville, Welland and Port Colborne. Because of these many variables the agricultural landscape of Wainfleet (1964) has been subdivided by this writer into eight regions (map 8); each region is identified by an association of interrelated features peculiar to that region: all farms per region have similar percentages of arable land, a consistent farm unit size (\pm 15 acres), similar crop and livestock ratios, and a "general level of prosperity" as reflected in the quality of farm land and buildings.

To aid in understanding the "personality development" of these regions, 1964's regional boundaries were superimposed upon the township's 1958 land use pattern (map 9) thus permitting the writer to ascertain what features of these regions were present in 1958 and also to know the extent of any changes. As no detail land use survey had been carried out since 1958, the writer undertook in 1964 to complete a detailed land use survey of six sample blocks (map 10) in order to supplement general geographical studies - which now follow - of these agricultural regions. ²²

²² The regions were formulated upon the basis of personal observations and interviews with 135 land owners scattered throughout the township.

Region I is characterized by small farms of 50-60 acres located upon undulating sandy loam soils and mainly growing vegetables, corn, oats and hay. The 1964 land use of Sample Area A (map 11) is representative of this region. Sixty percent of the arable land is being used for grain with half of the grain acreage devoted to growing feed corn for commercial marketing. The remaining grain acreage is mainly oats and hay. Market growing of cabbage and carrots occupies one seventh of the remaining arable land while another one seventh of the remaining arable land is now scrub. No livestock is in evidence and the overall appearance of the farmland and buildings range from fair to poor.

Historically this agricultural region was the first inland region to be cleared and settled by farmers since its undulating sandy loam soils were the first well drained soils to be encountered by settlers moving north from the lake shore. These early subsistent farmers divided the land into 50 acre farm units the boundaries of which have been maintained to the present day. Both the light Wauseon and Berrien sandy loams proved favourable for growing oats, corn, and vegetables. Eventually, as other lower lying regions developed in the township and specialized in dairy and livestock raising, this region began to grow fodder crops to sell to these regions. With the completion of a main wagon road (Highway 3) to Dunnville, a ready market developed there for the region's vegetables and has continued to the present day. It was ascertained by the writer through interviews with local farmers that the increase in grain acreage from 1958 to 1964 (map 11) is a result of a recent



N

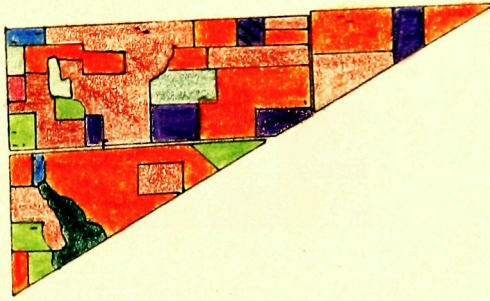
LAND-USE of SAMPLE AREA

A



SOIL TYPE

- WAUSEON SANDY LOAM
- BERRIEN SANDY LOAM

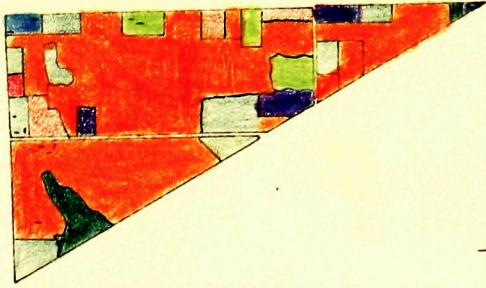


1958

- Commercial Area
- Hay
- Grain
- Horticulture
- Vineyard

after

Geographical Branch



1964

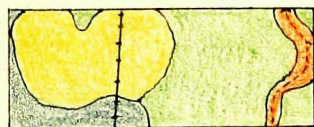
- Tree fruits
- Improved Pasture
- Dense Woodlot
- Scrub

SCALE 1:50,000

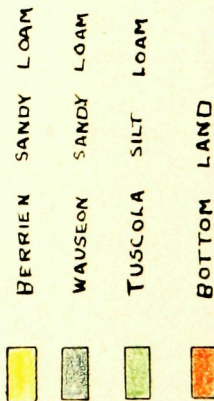
LAND USE of SAMPLE AREA B

N

SCALE 1:50,000

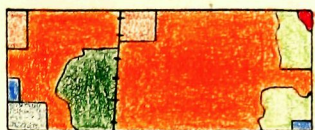


SOIL TYPE



1958

after
Geographical
Branch

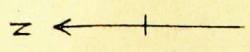


1964

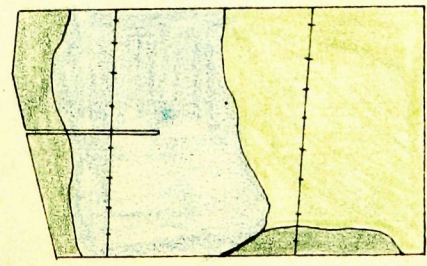
K.C.






LAND-USE of SAMPLE AREA C

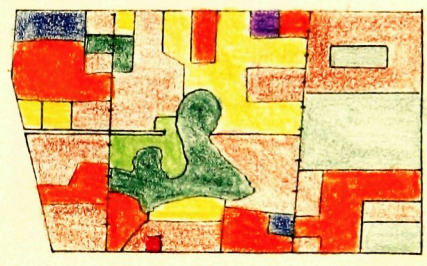


SCALE 1:50,000








SOIL TYPE

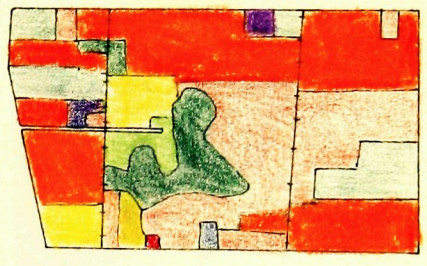
- | | |
|---|---------------------|
|  | CAISTOR CLAY LOAM |
|  | BRANTFORD SILT LOAM |
|  | TUSCOLA SILT LOAM |



Geographical Branch





1958

- | | |
|---|--------------|
|  | Hay |
|  | Grain |
|  | Horticulture |
|  | Vineyard |
|  | Poultry Farm |

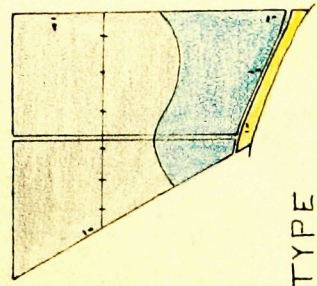
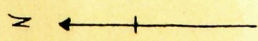


KJC

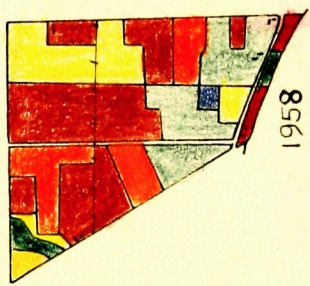
1964

- | | |
|---|------------------|
|  | Open Grassland |
|  | Improved Pasture |
|  | Open Woodland |
|  | Dense Woodland |

LAND-USE of SAMPLE AREA D

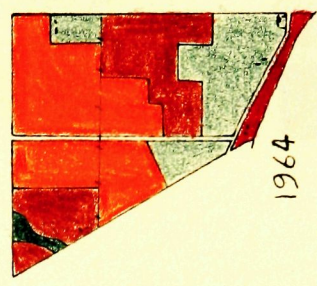


SOIL TYPE



1958

Geographical Bound



1964

K.S.C.

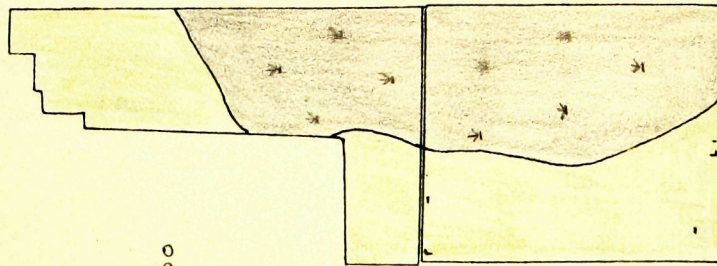
- | | |
|-------------------|------------------|
| Colwood Loam | Improved Pasture |
| Caistor Clay Loam | Open Grassland |
| Eastport Sand | Scrub Woodland |
| Residential | |
| Hay | |
| Grain | |
| Tree Fruit | |

SCALE 1:50,000

LAND-USE of SAMPLE AREA E

N

SCALE 1:50,000



SOIL TYPE

TUSCULA SILT LOAM

PEAT

Peat Removal

Hay

Grain

Horticulture

1958

Tree fruits

Open Grassland

Scrub Grassland

Scrub Woodland

Geog. Br.

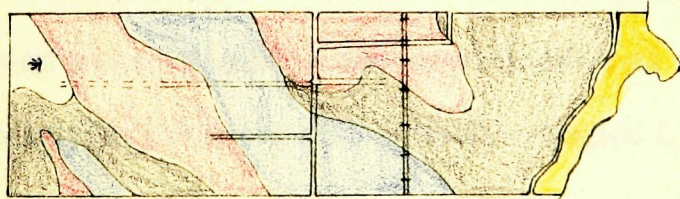
1964

Swamp

LAND-USE of SAMPLE AREA F

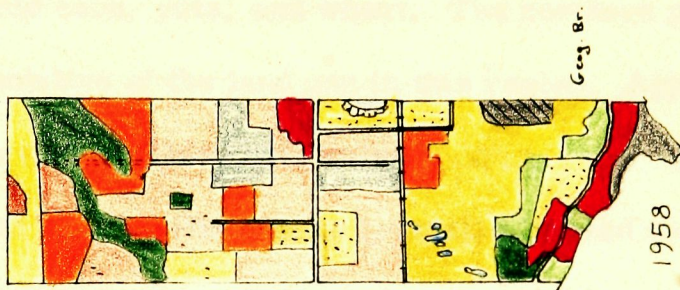
N

SCALE 1:50,000



SOIL TYPE

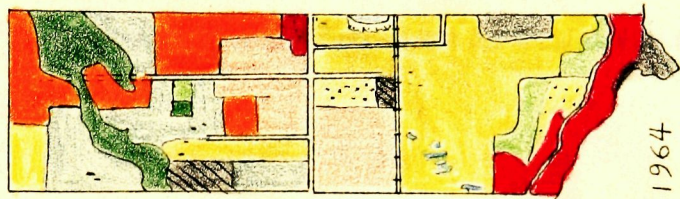
- FARMINGTON LOAM
- WELAND CLAY
- JEDDO CLAY
- EASTPORT SAND
- PEAT



Geog Br.

1958

- Residential
- Hay
- Grain
- Improved Pasture
- Open Grassland



K.J.C.

1964

- Scrub Grassland
- Unproductive Land
- Industrial Land
- Dense Woodland
- Scrub Woodland

trend to replace hay fields with corn as corn now obtains a higher market price per acre. The poor to fair condition of the farms is a result of the small farm sizes and part-time farming. It is increasingly difficult to maintain a "good" farm income from 50 acre farms, for with technological advancements larger farms elsewhere have been able to produce more resulting in lower market prices. Because of low farm incomes, 80 percent of the region's farmers work full-time in Dunnville and Welland and farm only part-time.

Region II is characterized by farms of 100-125 acres in size specializing in field corn, oats, and wheat. The northern part of Area B (map 12) is representative of the land use in this region. Approximately one eighth of the land is still uncleared for cultivation .

This region, like region I, is also located upon undulating sandy loam soils which are fairly well drained, in contrast to soils in other parts of Wainfleet. As this region is further back from the lake shore, it was settled later than region I. At the time of settlement in this region, larger tracts of land were allotted by the government thus explaining why this region now has larger farm size units than region I. This feature of larger farms is a major reason why this area is more prosperous than region I to-day for farmers here are able to maintain an adequate income on the fertile Berrien and Wauseon sandy loam and Tuscola silt loam soils. In 1964 each farm in the study area had about 60 acres in corn and oats; there is a visible trend since 1959 for these grain crops to replace hay (map 12) ,

as corn is now favoured more than hay by livestock farmers for fodder. Fifteen to twenty acres per farm are used to grow winter wheat as this region is one of the few in the township to have adequate soil drainage for wheat cultivation. Because of larger farm units of this region only 60 percent of the farmers hold full-time jobs in Dunnville and Welland in contrast to 80 percent of the farmers of adjacent region I - which has essentially the same physical geography.

Region III is an area of 100-110 acre dairy farms which appear to be prosperous. It was ascertained from farmers in the region that in 1964 about 40-50 acres have been set aside for growing field corn but that in previous years more acreage was set aside for growing fodder crops. This explains the higher percentage of hay and grain acreage evident in this part of Wainfleet in 1958. The trend in the last several years is to increase the size of the dairy herds from forty to about sixty-five cows, and to purchase feed from mills in Wellandport and Winger rather than grow it. Several reasons are apparent: the dissected Haldimand and Caistor clay soils which are moderately drained are better suited for pasture than grain crops, and the feed mills are readily provided with corn from grain regions in the township. The farmers also need to expand their herds as their milk quotas have been enlarged by the installation of bulk coolers and the practice of dairies now hauling milk in bulk direct from farms to dairies in Welland, Dunnville and Hamilton via tank truck.

As a result of this increased specialization, and because dairying

is a full-time occupation, the major income of the region's farmers is derived from farming in contrast to the farmers in the regions to the south who obtain their major income from urban employment.

Region IV is an extensive region of mixed farming located upon level sand and clay soils. Most of the farms are 100-110 acres in unit size although there are several 500-1000 acre dairy farms west of Chambers Corners - formed by full-time farmers purchasing adjacent farms from elderly and part-time farmers. The general appearance of the farm lands and buildings in this region vary from poor to fairly good with the farms improving in condition as one proceeds south-west away from heavy less easily worked clay soils into the lighter sand soils (photo 19); the agricultural representative for Welland County attributes this change to a slightly higher yield of grain crops on the sand soils, resulting in an increase in general prosperity.²³

The land use of Sample Area C (map 13) is representative of this region. Fifty percent of the land is used for grain - the two major grain crops being corn and oats with each occupying about twenty percent of the total grain acreage. Buckwheat, rye and some wheat complete the remaining grain acreage. The rest of the land is devoted to growing hay, with some pasture present. An interview with the owner of the farm property along the eastern side of Area C revealed that the grain field which was classified

²³ The light texture of the sandy soils are ecologically more favourable for for root growth than the heavier clay soils.

as open grassland in 1958 was really set aside as fallow. Except for crop rotation there has been little change in the sample area over the last five years. The reduction of horticulture in the north-east corner of the sample area is a result of the part-time farmer of this property not having enough time to devote to vegetable growing.

Even though the average farm size is 100 acres and the clay and sand soils are fertile, it was noticed in interviewing that an estimated eighty percent of the men in this region are only part-time farmers, as they prefer the steady hours and wages which accompany employment in the nearby Welland-Port Colborne industrial complex and local quarries. It was also observed by the writer that because of part-time farming many of the fields now have a weedy and neglected appearance even though farmed. If this lack of agricultural initiative continues in the region, it is conceivable that some of this farmland will revert to scrub.

Region V is an area of 130-150 acre mixed farms with emphasis on dairying and stock raising. From 50 to 60 percent of the land is pasture, open grassland, and scrub, with the remaining acreage divided 50:40 between grain crops and hay. This is the major beef cattle region in Wainfleet with 20 percent of the farms specializing in raising cattle on the lush green grass which grows very well on the low-lying imperfectly drained Caistor clay and Colwood loam. Although Southern Ontario generally experiences summer drought, local farmers claim that the problem of drought is less severe in this region because of poor drainage of spring run-off.

Sample Area D is representative of this region (map 14). It was ascertained from the area's farmers that the increase in grain acreage and slight decrease in hay (1958-64) reflects the increasing trend throughout Wainfleet to use more and more corn for fodder in lieu of hay.

From 1938 to 1964 there has been a slight increase in arable acreage (map 14), but it was suggested by a couple of the farmers that this trend is unlikely to continue as they claim they are just breaking even with costs after selling their produce to Welland, Port Colborne and Canada Cement Company. There is a close correlation between the boundaries of this region (map 8) and the physiographic ridge and swale limestone plain (map 4); the farmers of the region maintain that because of the shallow soils which are easily exhausted, their hay and grain yields per acre are considerably lower than elsewhere in Wainfleet. It is evident from the agricultural land use pattern of Area F (map 16), which is representative of this region, that there is little significant difference of the land use upon the clay soils and the Farmington loam soils. The scrub land in the south of the sample area is a remnant of quarrying operations.

Farmers in this region indicate that land use has changed very little over the last six years. Since the war more than 90 percent of the farmers have been working full-time in Port Colborne and the quarries. Although most of the farmland looks neglected many of the homes are in fair condition, indicating that these people are able to maintain a good standard of living on non-farm wages.

Region VII is a 200 acre area of market gardening located within Welland Bog. At present this farmland is cultivated by five farmers (three of them tenant farmers); carrots, celery, cabbages, onions and potatoes are the major crops (photo 20).

From 1958 to 1964 there has been a slight increase in arable acreage (Area E - map 15), but it was suggested by a couple of the farmers that this trend is unlikely to continue as they claim they are just breaking even with costs after selling their produce in Welland, Port Colborne and Highway 3. The small flimsy shacks of the tenant farmers reflect this low prosperity.²⁴ (photo 21).

This writer believes the level of prosperity can be raised. It was noted that there were no storage facilities for produce thus necessitating immediate marketing of the freshly harvested vegetables, often at low prices because of a surplus of market produce. If storage facilities were available the region's farmers could withhold their produce from market until opportune times when vegetables are "out of season". It was also apparent from personal observations that agricultural procedures could be improved. For example when one farmer was questioned as to how he was attempting to control the potato bugs on his crop, his negative reply revealed that he knew nothing about chemical control techniques. It is probable that yields on existing acreage could be increased if scientific methods of

²⁴ The owners live on other farm property in region IV.



photo. 19b : This extensive level terrain with dairying being practised upon it illustrates a common land use found on poorly drained clay soils.



photo. 20 : A view of family labour weeding potatoes grown on the rich organic soil. In the background is uncleared bog.

farming were to be applied.

Region VIII, the only other agricultural region in Wainfleet, is uniquely characterized by farmers specializing in raising tomatoes and other vegetables in greenhouses: the plants are sold as nursery stock to other farmers in the township, especially to those of region I. As the land used for this purpose on these 25-30 acre farms amounts to only 3-5 acres per farm, the remaining acreage is usually sown to produce grain and hay crops. Several of the farmers have also begun to engage in poultry raising within the last couple of years in response to an increase in market demand. The condition and class of the buildings vary from good to excellent, this being indicative that these specialized full-time farmers are obtaining a satisfactory income.

The development of this region started with the settlement of Dutch immigrants into this area fifty years ago. Attracted to this area because of its fertile light well drained sandy soils, these new Canadians saw the feasibility of practising farming under glass - a type of farming in which they had been engaged previously in the Netherlands. This type of agriculture has proved quite successful despite high costs incurred in the upkeep of the greenhouses in Wainfleet's cold winter climate.

3. Recreation

Wainfleet's proximity to large urban areas - Welland, Port Colborne, Niagara Falls and Buffalo - plus its sandy beaches has made the lake shore

a popular summer refuge for urban dwellers seeking relief from city heat and tension. As will be recalled from the historical geography of Wainfleet, recreational development of the lake shore began with the advent of the motor car and paved roads. This development accelerated with the opening of the Peace Bridge across the upper Niagara River in 1928 for business and professional men from Buffalo and vicinity began to purchase many sandy beach properties, build cottages, and undertake regular commuting. They preferred the Canadian shore rather than their own American shore, for the lake shore around Buffalo is unattractive, possessing high bluffs of thinly bedded shales and little or no beach. Canadians also built cottages, travelling from the local townships and the urban areas of Welland and Port Colborne.

The first cottages were built on the fine sandy bay sections of the township at Long Beach, Rathfon Point, Reeb's Bay, and on the coarser sand at Sugar Loaf (photo 22). After 1950, with the sand areas of the shore line fully occupied, the remaining rock fronted and other non-sandy sections of the lake shore such as at Morgan's Point and Gravel Bay were gradually occupied so that by 1964 the township's complete shore line has been built upon by cottages except where four parks have been reserved for campers and day trippers (map 17).

To-day, half of the sand beach cottage properties are Canadian owned with the rest American. The Americans usually just use their cottages themselves but the Canadian owners in these sand areas have been renting their cottages on a full-time commercial basis. This situation is

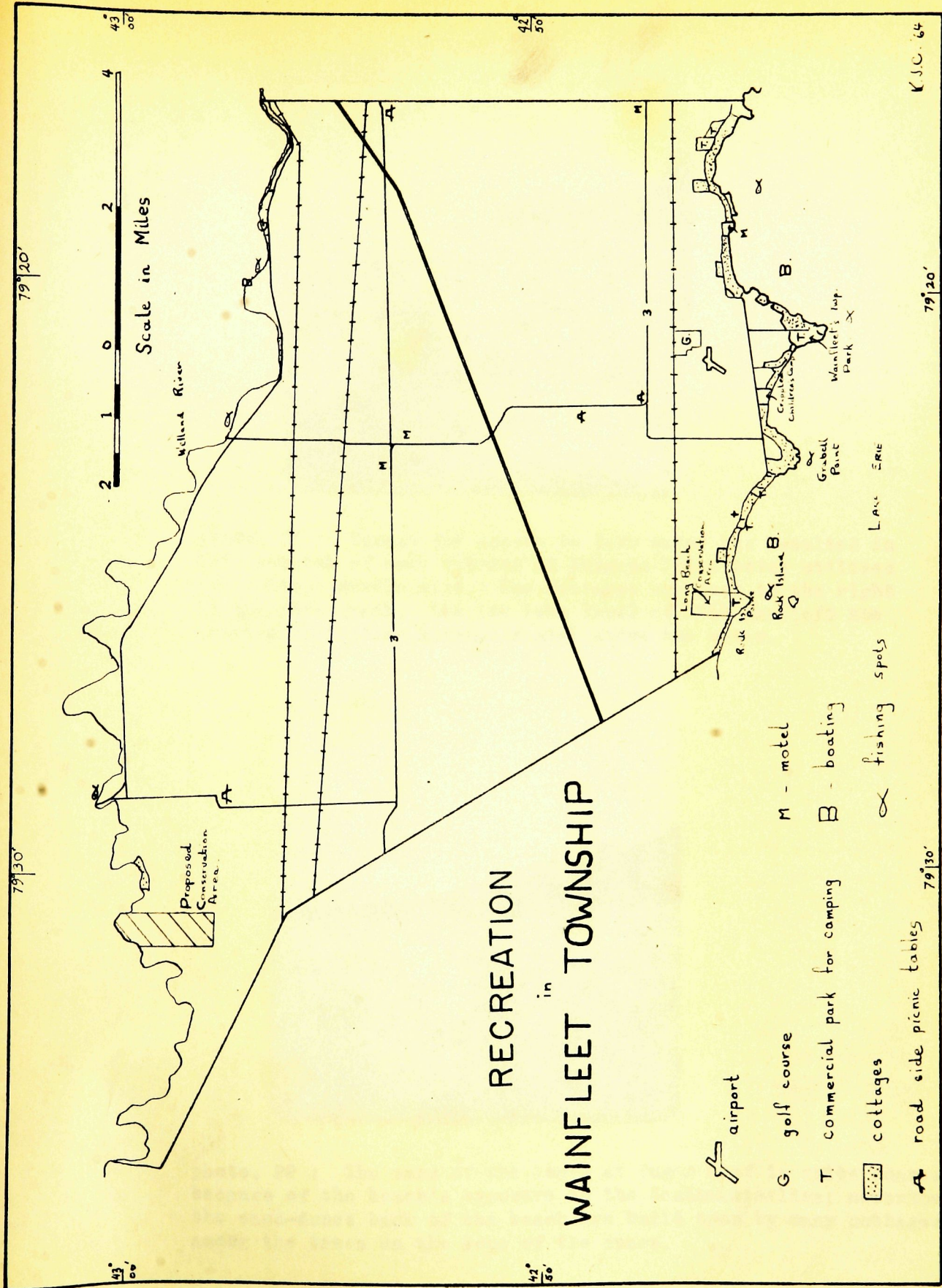




photo. 21 : Demand for access to lake water has resulted in this stretch of rock outcrop at Morgans Point being utilized for cottage development. The cottages are just to the right of the photograph. The low lake level of 1964 has left the mooring facilities unusually high above the water.



photo. 22 : The sand of the beach at Sugar Loaf is quite coarse because of the beach's exposure to the Southwesterlies; nevertheless, the sand-dunes back of the beach are built upon by many cottages--among the trees on the tops of the dunes.



photo. 23 : The tractor is clearing decaying algae from the sand beach at the Conservation Area in order to allow bathers to gain access to the water.



photo. 24 : Out-board motor boating and fishing are becoming popular recreation activities on the sluggish Welland River.

in contrast to the rocky stretches of shore where three-quarters of the properties are Canadian owned, and utilized personally by their owners. This phenomenon may be partly due to the fact that cottages on the two types of physiography are owned by people of different age groups for different purposes. For any further discussion on density and other characteristics of lake shore cottage development, the reader is referred back to the description of the settlement at Grabbell Point.

Two of the four parks are privately owned and cater only to swimmers and picnickers. They charge \$1.00 admission fee during the week and \$2.00 on the weekends. The Niagara Peninsula Conservation Authority, publicly owned, has been operating an 138 acre park at scenic Rock Island Point since 1958. Large picnic areas are provided and family camping, boating, fishing and swimming facilities are offered (photo 1). The park accommodates about 5,000 campers and an estimated 20,000 day-trippers per season. This park is the result of a public planning program which is trying to keep sections of the waterfront accessible to the public. The other public park is at Morgan's Point and is operated by Wainfleet Township. As it possesses a poor beach area, swimming is not popular. The park is used mostly by local township people for picnics.

A new problem has developed along the lake shore in the last five years. Abnormal low lake levels have lowered the wave base level which in turn has dislodged offshore banks of underwater algae. The algae then floats to the surface whereupon storms and southwesterlies wash it onto the shore where it accumulates and decays with a disagreeable smell.

Because of this there has been a decrease in bathers. The Niagara Penin-

sula Conservation Authority has been attempting to keep its section of the shore clean by removing the algae with a tractor and rake (photo23), and using it as fill in low-lying points of the park. Judging by the luxurious growth of weeds on this fill it would appear that this algae is a potential fertilizer resource.

For further information on the recreational development of the township the reader is referred to P. L. Hill's Thesis The Northeastern Shore of Lake Erie: Physical Features and Recreation.²⁵ This is the most complete study on lake shore recreation in this area yet written.

A second area of recreational activity in Wainfleet is the Welland River. At present the river is used for fishing for pike, catfish and carp, and some boating (photo 24). A fish count and survey was conducted by the Department of Lands and Forests this summer (1964) with the objective of assessing the biological feasibility of restocking the river. Results of the survey were unobtainable at the time of writing.

Cottage development along the river has been slight as the river is in "easy" travelling distance for local fishermen. However, there is one exception - there is one small settlement of nine cottages upstream from Wellandport. The owners of these 10 year old cottages are from Hamilton and Toronto. They maintained, in interviews with the writer, that they have been attracted to this location by the peace and solitude of the adjoining

²⁵ Hill, P. L., The Northeastern Shore of Lake Erie: Physical Features and Recreation M.A. Thesis, McMaster University, 1964.

farmland and meandering creek. As there has been no extension of this community in the last five years, one might conclude that this, the only recreational settlement on the Welland River, is static in growth.

Nevertheless, the Welland River recreational area is becoming more intensely used as increasing numbers of local inhabitants are becoming aware of its potentiality as a "handy" site to spend leisure time. The development of boat trailers in recent years has led to people taking up water-skiing and outboard boating on the river, as mooring of unattended boats on the river is no longer necessary. At present, preliminary procedures are in progress for development of a Conservation Authority Area off the Welland River just west of Wellandport (map 17). Such an area would help to alleviate the capacity crowds at the conservation park on the lake shore.

Besides these two major areas of recreation, that is the lake shore and the river, the township's landscape and proximity to urban areas has led to the development of other minor places of recreation (map 17). A golf course on unfertile land along the river supplies enjoyment to Welland's golf enthusiasts, and another golf course on the agriculturally poor land on the north-east flank of "Burnaby Island" caters to lake shore vacationers and local enthusiasts. A small airstrip, located on a stretch of agriculturally poor thin veneer of lacustrine clay, has been utilized as a base for sport flying and the new sport of "sky diving".

The Highways Department has a policy of providing roadside picnic tables during the summer months (map 17). These tables, plus motels and restaurants located at Chambers Corners and on the eastern section of

Highway 3, cater to the heavy flow of motorists travelling between Detroit and Buffalo.

In brief, it is evident from this survey that the major area of recreational development is upon the sand and rock lake shore. It is also evident that this land utilization is intensive and extensive enough, relative to the major agricultural geography of the township, to warrant consideration in the final definition of Wainfleet's regional personality.

4. Other Rural Non-agricultural Activity

Much of Wainfleet's acreage is utilized only for agriculture and some recreation, as industrial concerns in the Niagara Peninsula have tended to locate elsewhere closer to water power supplies and established transportation centres. However, there are a few industrial concerns peculiar to Wainfleet because of the township's natural resources.

The Onondaga limestone plain of Wainfleet has favoured the development of several quarries. To the west of Wainfleet there is no quarrying as the bedrock is obscured by thick unconsolidated material. To the east there was a stone quarry in Humberstone - at Sherkston Beaches on an extension of the Onondaga limestone plain - but blasting operations caused spring water to fill the quarry and operations ceased. As there are now no other crushed stone operators in Wainfleet or adjacent areas Law Crushed Stone Ltd. has a fairly large demand for stone for road work and building construction purposes.

In the last decade this firm has also been engaged in producing

asphalt from imported tar and local sand from a pit at Sugar Loaf Hill (photo 25). At present Law Crushed Stone Ltd. hires about 150 full-time men who live throughout Wainfleet and in nearby Port Colborne.

The Canada Cement Company in Port Colborne also has limestone quarries located just inside the township (map 2), as the calcium rich rock of the Onondaga formation unlike the magnesium rich Silurian rocks of northern peninsula quarries is well suited for making Portland cement. As the Onondaga rocks underlie the southern part of the township (map 3), it would seem that unless rapid and appreciable changes in the chemical composition of the rocks occur from place to place, raw material suitable for Portland cement is present in substantial quantities.

The other major "industry" in the township is peat moss extraction on 3500 acres of the Welland Bog by Atkins & Durbrow (Erie) Ltd. A specialized operation because of the rarity of suitable peat moss deposits in the Niagara Peninsula, this firm bales peat moss which is air dried, and then sends it to retail gardening outlets throughout Eastern Canada and the United States. No production data was available from the company. At present, this firm is restricted to dry summer weather as the wet peat moss is air dried. Although this firm owns most of Welland Bog, a small firm belonging to a Stoney Creek nursery has recently started a pilot peat extracting and processing operation on 15 acres of bog along the eastern township line. By utilizing a new vacuum dehydrating process which works independently of atmospheric humidity conditions, this firm hopes to establish an all-year operation employing eight men.



photo. 25 : Sand is being removed from this sandpit at Sugar Loaf Hill for industrial purposes. Lake Erie is visible to the left in the background.

SUMMARY and CONCLUSION

In the first part of the preceding chapter the evolution of the study area from the advent of man to the present day has been traced. It is evident that the post-glacial landscape with its low-lying densely forested and swampy interior restricted the first settlers - farmers by trade - to the lake shore area which was relatively dry and higher as a result of the study area's geomorphological history outlined in Chapter I. It has also been shown that within 50 years after the first influx of white settlers the application of human knowledge began to modify cultural limitations imposed by the physical landscape, for the installation of a drainage ditch network and a grid system of roads throughout the sand and clay plains made feasible the extension of settlement and agriculture into the interior low-lying terrain.

While this development was taking place the growth of three urban areas - Welland, Port Colborne and Dunnville - adjacent to the township, and the improvement of transportation facilities by the utilization of the Welland feeder canal for shipping and by the construction of three railways east-west across the township had several important effects on the study area's infantile cultural landscape. These growing towns soon created an appreciable demand for agricultural produce with the result that farmers in the settled sections of Wainfleet - along the lake shore, upon the undulating sand and clay plains, and in cleared sections of land in the level sand and clay plains - changed from subsistence to commercial farming.

The development of these urban areas plus their convenient accessi-

bility has also had an effect on town ship settlement geography; their commercial service areas were extended throughout the study area and as a result there has been no large agricultural service and market centres developing within Wainfleet.

Since World War I rapid industrial growth in these three cities, with resultant high wages, plus the development of other successfully competitive agricultural regions such as Canada's western wheat lands have led to an estimated 90 percent of Wainfleet's farmers taking up full-time employment in Welland, Port Colborne and Dunnville, and in Wainfleet's limestone quarries. As a consequence of this shift of labour, there has been a continuous decline in the amount of farm land worked since 1915. Agriculture, it might be suggested, is now being restricted relatively more by cultural than by physical limitations of the landscape.

In the second part of the preceding chapter, dominant features of Wainfleet's present cultural landscape have been studied. The landscape with its moderate climate and man-modified physiography has favoured extensive agriculture while its inherent lack of mineral and ore deposits and absence of a supply of water power has led to no extensive industrial development. The only significant non-agricultural work being carried out within Wainfleet to-day are two natural resource exploitative operations; peat-moss is being stripped from the Welland Bog to be sold as a lawn conditioner, and rock is being removed from quarries in the Onondaga formation to be made into crushed stone and Portland cement for construction purposes.

Bibliography

Although agriculture dominates the vast expanses of the interior, it was also mentioned in the last chapter that the physical landscape with its lake frontage, sandy beaches, and proximity to Buffalo, Welland and other cities has favoured development in this age of cars of seasonal recreation along the lake shore. In 1964, with all the waterfront developed with cottages and parks, this shore area has been fully utilized for present recreational pursuits. The Welland River is also being used, to a much smaller extent, as a recreational area for boating and fishing by people from Welland and the township. Plans for a Conservation Area extending south from the river in the western half of the township are indicative that responsible authorities are becoming aware of the river's recreational potentialities.

This then is the landscape of Wainfleet 1964: a landscape devoid of large urban settlements, dominated by a declining agricultural economy, and with its northern and southern boundaries delineated by recreation.

McKenney, H. A., Post Glacial Deposits in Canada, Mines & Resources, Memoir 11, Queen's Printer, Ottawa, 1946

McKenney, H. A., Atlantic Coast, Hydrographic Contour, Paper 58.25, Ottawa, 1956

McKenney, H. A., Canadian National Survey, Vol. 1, Clarke, Irwin & Co., Toronto, 1956

Watt, A. M., Overwater in Canada, A. M. & Co., Bulletin 1, Toronto, 1961

The History of the County of Welland, Welland Tribune Press, Welland, 1887

Water - Niagara Peninsula Conservation Paper, Toronto, 1964

Report No. 34 of the Ontario Soil Survey, Ontario Agricultural College, Guelph

Land Use Maps - West 30 L/14 & East 30 L/12, Geog. Div., Dept. of Mines and Tech. Surveys, 1961

Bibliography

Caley, J.F., Paleozoic Geology of the Toronto-Hamilton Area, G.S.C.,
Memoir 224, Ottawa, 1940

Chapman, L.J., Putnam, D.F., The Physiography of Southern Ontario,
University of Toronto Press, Toronto, 1951

- The Climates of Southern Ontario,
Scientific Agriculture 18.8, April 1938

Census of Canada since 1851

Duff, L.B., Burnaby, Welland Tribune-Telegraph Press, Welland, 1916

Gentilcore, R.L., The Beginnings of Settlement in the Niagara Peninsula
(1782-1792), Canadian Geographer, V11(2), 1963

Halliday, W.E.D., A Forest Classification for Canada, Queen's Printer,
Ottawa, 1937

Hill, P.L., A Geographical Study of Moulton and Sherbrooke Townships,
(B.A. Thesis) McMaster University, 1959

- The Northeastern Shore of Lake Erie: Physical Features and
Recreation, (M.A. Thesis) McMaster University, 1964

Hough, J.L., Geology of the Great Lakes, University of Illinois Press,
Urbana, 1958

Leverin, H.A., Peat Moss Deposits in Canada, Mines & Resources,
Memoir 817, Queen's Printer, Ottawa, 1946

Sanford, B., Welland County Bedrock Contour, Paper 58.20, Ottawa, 1956

Stevens, G.R., Canadian National Railways, Vol. 1., Clarke, Irwin & Co.,
Toronto, 1960

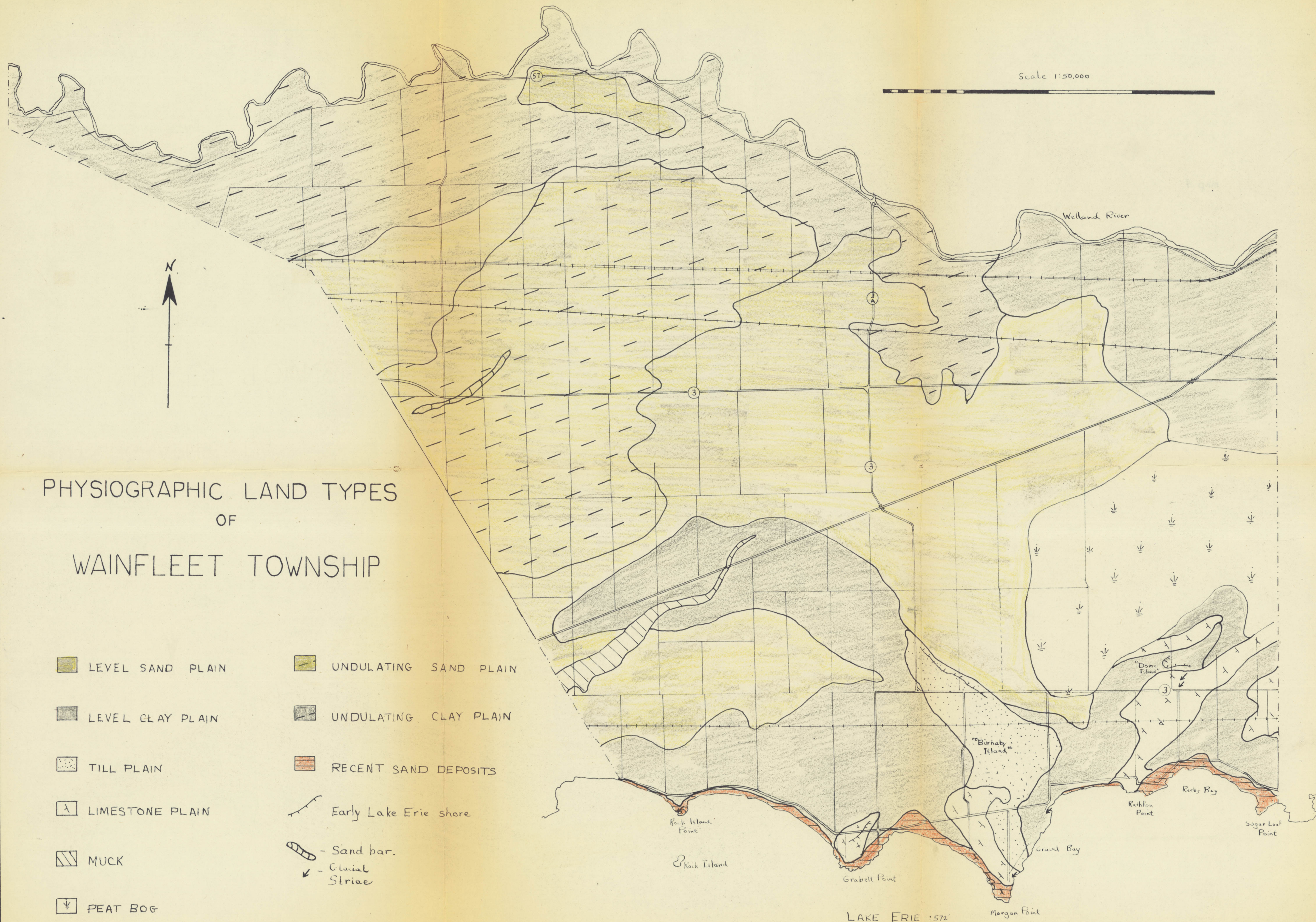
Watt, A.K., Groundwater in Ontario, O.W.R.C., Bulletin 1, Toronto, 1961

The History of the County of Welland, Welland Tribune Press, Welland, 1887













Water - Niagara Peninsula Conservation Report, Toronto, 1964

Report No. 34 of the Ontario Soil Survey, Ontario Agricultural College, Guelph

Land Use Maps - West 30 L/14 & East 30 L/13, Geog.Br., Dept. of Mines
and Tech. Surveys, 1961

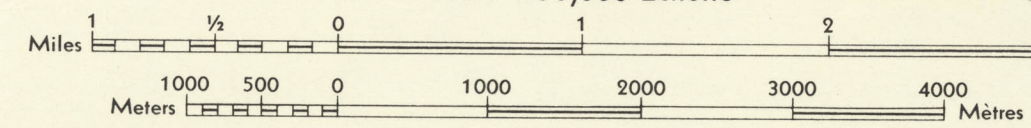


PHYSIOGRAPHIC LAND TYPES
OF
WAINFLEET TOWNSHIP

- | | |
|--|---|
|  LEVEL SAND PLAIN |  UNDULATING SAND PLAIN |
|  LEVEL CLAY PLAIN |  UNDULATING CLAY PLAIN |
|  TILL PLAIN |  RECENT SAND DEPOSITS |
|  LIMESTONE PLAIN |  Early Lake Erie shore |
|  MUCK |  - Sand bar. |
|  PEAT BOG |  - Glacial Striae |

GEOGRAPHICAL BRANCH
DEPARTMENT OF MINES AND TECHNICAL SURVEYSDIRECTION DE LA GÉOGRAPHIE
MINISTÈRE DES MINES ET DES RELEVÉS TECHNIQUESW E L L A
ONTARIO

Scale 1:50,000 Échelle

Contour interval 25 feet
Elevations in feet above Sea Level

Universal Transverse Mercator Projection

Équidistance des courbes, 25 pieds
Altitude en pieds au-dessus du niveau de la mer

Projection universelle transverse de Mercator

LEGEND

LÉGENDE

Industrial Areas and Industrial Lands Zones industrielles et terres industrielles	
Commercial Areas Zones commerciales	
Residential Areas Zones d'habitations	
Recreational Areas Parcs et terrains de jeux	
Associated Urban (non-agricultural) Areas Zones urbaines associées (non agricoles)	
Hay Foin	
Grain Céréales	
Tobacco Tabac	
Horticulture Exploitations horticoles	
Vineyards Vignobles	
Tree fruits and small fruits Fruits d'arbre et petits fruits	
Improved Pasture Pâturage amélioré	
Open Grassland Prairie découverte	
Scrub Grassland Prairie à brousse	
Dense Woodland Terrains boisés, serrés	
Open Woodland Terrains boisés, clairs	
Scrub Woodland Terrains broussailloux	
Cut-over or Burnt-over Areas Terrains déboisés ou brûlés	
Unproductive Land Terrains improductifs	
Swamps and Marshes Mécages, tourbières, savanes	

Printed by the Surveys and Mapping Branch.

Base drawn and reproduced by the Army Survey Establishment R.C.E., 1953.
Compilé par la Direction des levés et de la cartographie.and Technical Surveys in cooperation with the Community Planning Branch,
Ontario Department of Municipal Affairs.

Forest information supplied by Ontario Department of Lands and Forests.

Imprimée par la Direction des levés et de la cartographie.

Carte de base dessinée et imprimée par le Service topographique de l'Armée.

G.R.C., 1953. Établie par la Direction de la géographie, Canada Ministère des

Mines et de Relevés techniques en collaboration avec le Community Planning

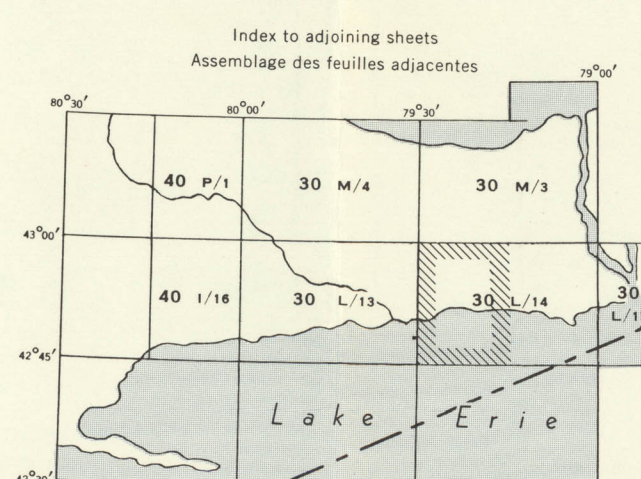
Branch du Ministère des Affaires Municipales de l'Ontario.

Information forestière gracieusement fournie par le Ministère ontarien des

Terres et Forêts.

COPIES OF THIS MAP MAY BE OBTAINED FROM THE DIRECTOR, GEOGRAPHICAL BRANCH, OTTAWA.

DES COPIES DE CETTE CARTE PEUVENT ÊTRE OBTENUES DU DIRECTEUR, DIRECTION DE LA GÉOGRAPHIE, OTTAWA.

PUBLISHED
1961
PUBLIÉ ENWELLAND
30 L/14
WEST OUEST