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STUDIES IN THE GEOGRAPHY OF POPULATION CHANGE, CANANDAIGUA LAKE REGION, NEW YORK

BY

ROBERT B. SIMPSON

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STUDIES IN THE GEOGRAPHY OF POPULATION CHANGE, CANANDAIGUA LAKE REGION, NEW YORK[1]

ROBERT B. SIMPSON
Department of Geology, University of Rochester

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I. INTRODUCTION

Every cultural pattern is related to a populational pattern. The distribution of crops on an Iowa farm, of transportation routes in Siberia, or of religions in Africa, can be explained adequately only with direct reference to the distribution of inhabitants. The field of sociology is frequently divided into two parts, one rural, the other urban, largely because of the differences in social phenomena between areas of sparse and of dense population. In the economist's triumvirate of land, labor, and capital, each element is based upon population density. Historians regard population density as important in matters of national policy and international friction, and in the migration of ideas and of people. Tax rates, civil improvements, and economic planning involve the use of populational data.

Ontario County, New York, is interested in surfacing more roads. Which shall be surfaced? Not necessarily those which are most densely populated today, nor even those in which the present trend is towards increasing population, for such trends may be short-lived. The roads which will best repay the cost of improvement are those which will be used by an increasing population during the next few decades. Detailed studies are essential for such predictions. Similar analyses of relationships would facilitate the location of electric power lines, railroads, and in fact all forms of capital investment.

A good beginning has been made in studies of population. The interest of geographers has been growing since about 1930,[2] and since 1933 a quarterly bibliography of all types of demographic research has been published.[3] It may well be that, as the number of students working in the field increases, those phases dealing with the effects of human distribution upon human problems should be left to the sociologist, the aspects centering upon the relationship between population density and environment should be interpreted by the geographer, and the broader statistical problems should be left to the demographer. It is inevitable, but certainly not unfortunate, that the borders occasionally would be crossed by the more adventuresome students in each field.

Fully a third of the geographic studies have dealt with entire countries. In almost every one, regardless of area covered, the smallest populational unit has been the township (or commune, or "administrative unit") and the source of data the government census (for examples, see Kendall, 1939; Glendinning, 1934).

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[2]Analysis of American, British, and French periodicals of the last two decades reveals that populational studies occupy only a small place in geographic research (one article in 26 in America; one in 35 in Europe) but that during the last decade American journals have carried about twice as many such articles as they did during the preceding ten-year period.

[3] The Populational Index, published by the Princeton University School of Public Affairs with the cooperation of the Population Association of America.

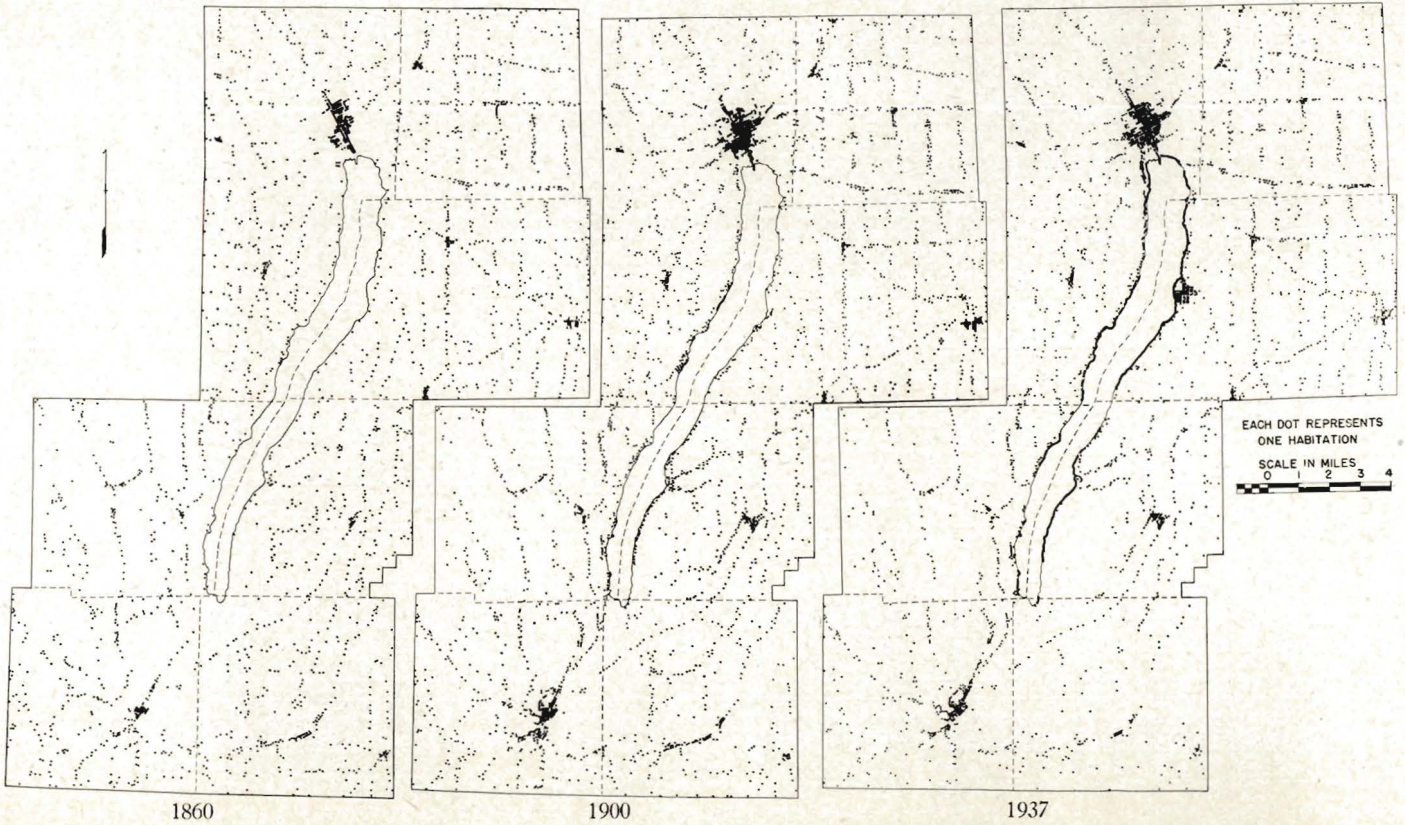


FIG. 13. Distribution of habitations, Canandaigua region.

It is obvious, however, that many variations in population distribution cannot be measured by such large units. Therefore, in this study the fundamental unit is the individual habitation instead of the township. Only by the synthesis of such small elements can previously-existing generalizations be evaluated, and new ones discovered; only in this way can accurate populational boundaries be drawn, and large-scale studies broken down for practical use of regional planning organizations.

The two objectives of this investigation are, first, an evaluation of the possibility of studying changes in population by mapping individual habitations, and second, an inquiry into the geographic relationships of the changing distribution of people in a specific area in the Finger Lakes district of New York. The studies were originally submitted, in earlier and larger form, to the School of Geography, Clark University, in partial fulfillment of the Ph. D. requirements. The criticisms and suggestions of Dr. Clarence F. Jones and Dr. W. Elmer Ekblaw of Clark, and of Dr. Harold L. Alling and Dr. Sterling A. Callisen of the University of Rochester are gratefully acknowledged. Other quantitative studies of New York State population shifts are Brigham (1916) and New York State Planning Board (1935).

The area selected comprises seven townships, as shown in figure 1. It totals 338 square miles, being 26 miles long and 13 miles wide. In the center of the region, and axial to it, lies Canandaigua Lake, the attenuated form of which aptly qualifies it as a "finger" lake. The areal boundaries, although political, correspond quite closely to the drainage divides of the lake itself. Like the other Finger Lake basins, Canandaigua is something of a geographic unit because of the tendency for commerce to follow drainage lines, and for major towns to develop in the bottoms of major valleys. The area is, then a hydrographic, a political, and something of a geographic unit.

Other factors favored the selection of this locality. Tumble-down old barns, cellar holes with scattered foundation stones and rotting timbers, indicate that this is a region of rural maladjustment, and leads one to the suspicion that, since population changes seldom keep pace with the stresses which cause them, the area will continue to lose population. On the other hand, hundreds of attractive new summer cottages indicate at least a seasonal return flow of population. A further striking contrast is noted between the relatively level, accessible, populous Lake Ontario Lowland and the rugged, relatively isolated, sparsely inhabited Allegheny Plateau.

The hundred-and-fifty-year period since the area was settled has been the subject of several scholarly and semi-scholarly volumes. Topographic, geologic, pedologic, highway, and railroad maps are available, and it was found possible to construct accurate habitation maps for 1937, 1900,

and approximately 1860 (see maps following page 50), in addition to a generalized map for 1820, thus giving distributional data at approximately 40-year intervals back to the time when the Indians occupied the area. Archeological treatises have supplied some data regarding aboriginal population shifts.

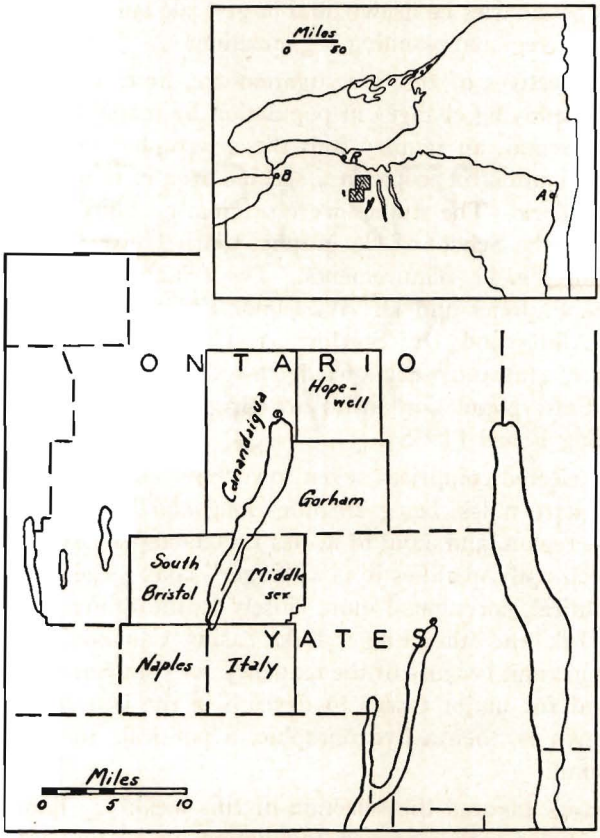


FIG. 1. Orientation diagrams. The position of the Canandaigua region in New York State and of its component townships with respect to the western Finger Lakes, is shown.

The dwelling maps with their 40-year intervals supply abundant areal detail, while the census data for the seven townships, gross in areal information, provide considerable chronological detail.

Disadvantages in the selection of the Canandaigua basin include the fact that choice of region with such variety of physical conditions and populational responses eliminates simplicity and uniformity. Also, the fact that the soils of one-fifth of the region were mapped several years later than those of the remainder has necessitated a translation of the later, more detailed, classification into terms of the earlier, more generalized map.

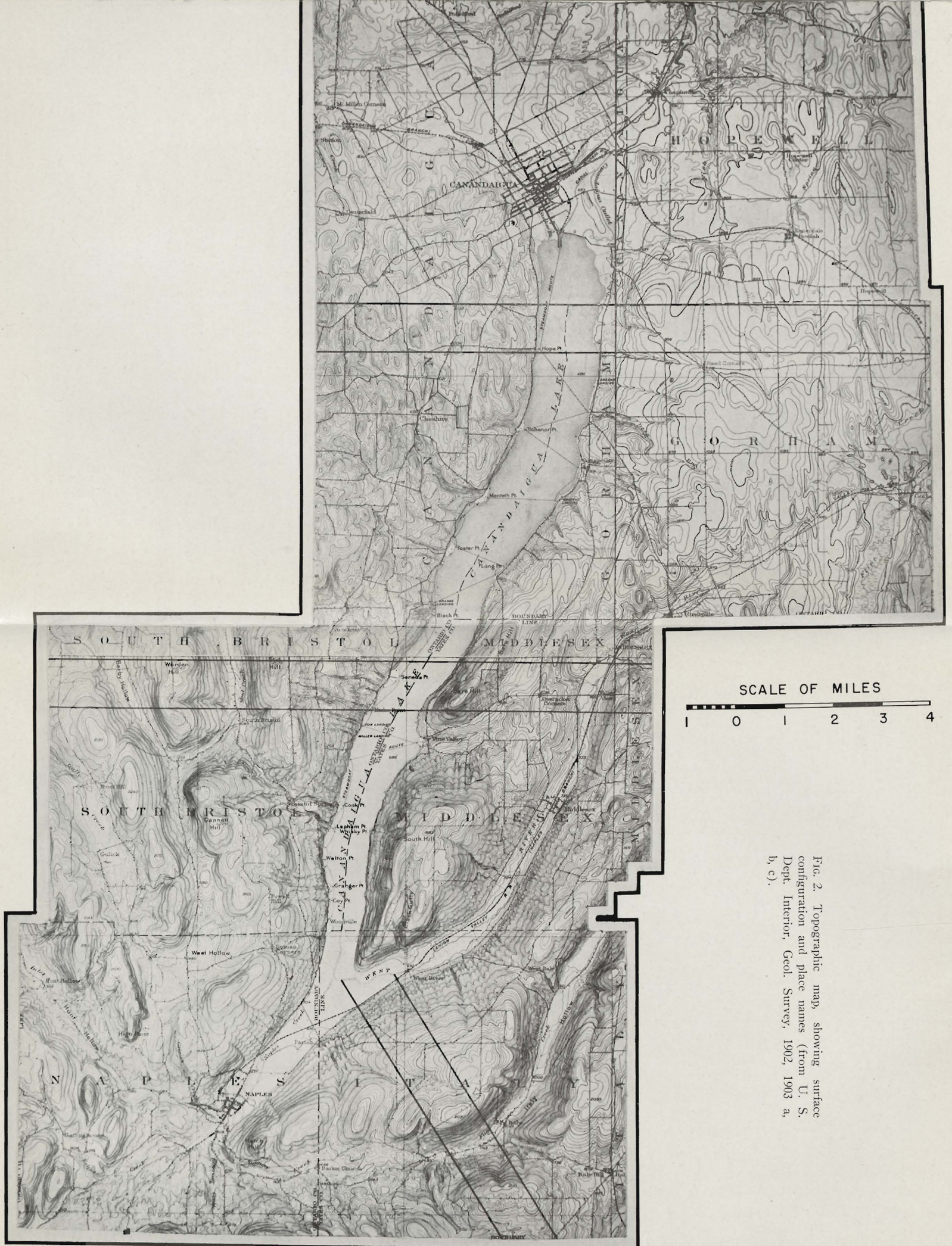


Fig. 2. Topographic map, showing surface configuration and place names (from U. S. Dept. Interior, Geol. Survey, 1902, 1903 a, b, c).

The study does not attempt to investigate all factors which may have influenced regional differentiation of population shift, for some of the elements could be approached better through land utilization studies, and others through cultural analysis of the various immigrant groups (for an example of such study in Tennessee see Kollmorgen, 1940). But the study does purport to analyze the most important physical and locational factors.

II. THE REGION: ITS PHYSICAL SETTING

The Canandaigua area is a rather compact unit in north-central New York. About twice as long as it is broad, it lies athwart the boundary between the Ontario Plain and the Allegheny Plateau. Canandaigua Lake lies along most of the longitudinal axis of the area, and towards it most of the land slopes (fig. 2). These flanking slopes rise for six or eight miles away from the lake both to the east and to the west, and culminate, on either side, in a broad divide which overlooks the basin of the next finger lake. Along each of these two areas of water parting are the town lines which bound the area on the east and west.

A 45-minute drive southeast from Rochester over a three-lane concrete highway which winds across the rolling, park-like Ontario Plain (plate 1A; all plates reproduced in this paper are gathered opposite page 54) and for some distance parallels the Barge Canal, brings one into the pleasant little town of Canandaigua (for this and all other place-names see fig. 2). The broad main street is flanked by spacious houses, impressive behind their classical columns. Highway markers inform the visitor who cares to read them that this is historic country, the route of General Sullivan's expedition which, at the close of the Revolution, drove the Seneca Indians from the territory and opened it to white settlement. One senses in the aristocratic air of the houses that the city is proud of its history—proud of the day when Canandaigua was the largest city west of Albany, while Buffalo and Rochester were still small frontier villages.

The mile-long main street runs through the business district and continues into the residential section beyond. There the street bends and beyond it lies Canandaigua Lake, flanked in the foreground by undulating slopes, each of which is a patchwork of fields rising gradually towards the skyline. Off in the distance, towards the head of the lake, the flanking slopes rise more steeply, and the horizon, high above the lake, can just be distinguished through the bluish haze (for a view of the southern half of the lake, see plate 3D). The land inclines not only from the lake shores to the inter-lake divides, but also from the foot of the lake towards the head, which lies invisible in the distance. The solid agricultural pattern of the nearer slopes gives way to much unbroken green in the distance.

A drive through this region which stretches away to the south begins with a run through a gauntlet of hot-dog stands and amusement booths—

crude reminders that geographic ecesis may not always be gracious. Once clear of the city, however, the concrete highway, which leads to Syracuse and Albany, is left behind and East Lake Road is followed—a macadam strip flanked by farm buildings rather typical of the Ontario Plain, buildings neither neat nor dilapidated, but testifying by the preponderance of classical architecture (plates 1C, 4C) over the jigsaw Gothic (plate 4D) to a period of heaviest settlement during the early years of the last century.

Swinging a mile or so away from the lake and continuing southward the road begins to climb, and soon enters a region where broad expanses of almost flat uplands give way rather suddenly to great open valleys, their floors in some cases lying almost a thousand feet below the upland (plates 1B, 3A). On the high flats abandoned buildings (plate 1D) are numerous, in apparent contrast to the flourishing activity of the valleys below. But a swing down into one of these valleys shows even more evidences of decadence in the bottoms than were visible on the hilltops.

Near the southern end of the area, some 20 miles from the starting point and down in a precipitous-walled valley flanked by acres of steeply-pitching vineyards, lies the village of Naples with its wineries. From it the road turns northwards and returns to Canandaigua along the west side

PLATE 1. Contrasted landscapes and dwellings. A.—Ground moraine of the Ontario Plain, smoothed by prolonged glacial lake activity and planted to beans and buckwheat. B.—An Allegheny Plateau landscape in the Bristol Hills. Here are found the regional maximum of configuration and relief. Few fields remain on the upland flats. C.—This "Greek revival" farmhouse on the Ontario Plain reflects in its architecture the population history of the region. The main section dates from the 1840's, near the end of the first period of expansion, while the rear wing, added just prior to 1870, suggests the second and latest period of population increase. D.—Relic of over-enthusiastic expansion. Although surrounded on three sides by broad, level acres, the people who occupied this farmhouse finally quit trying to wrest a living from a thin, acid soil, and to market their crops over a road which dropped a thousand feet in two miles.

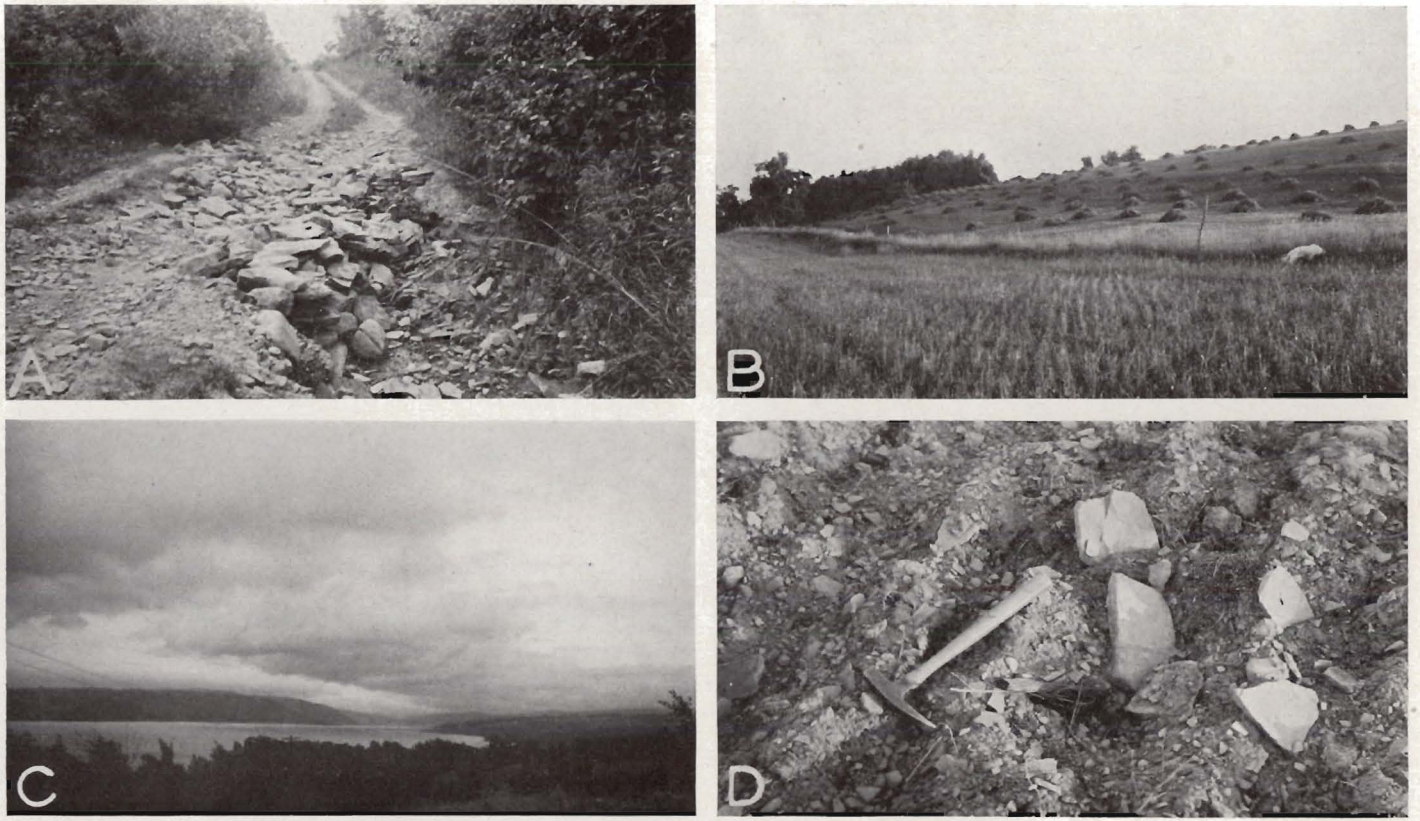
PLATE 2. Some reasons for populational contrasts. A.—Decadent road, Italy Township. This was formerly one of the important upland roads shown in figure 9, but as family after family emigrated it became a private driveway and finally a field road. B.—Drumloidal landscape, Canandaigua Township. Here the Pleistocene ice-sheet left scattered, elongated hills which break the monotony of the lowland landscape but also hasten the abandonment of farms. C.—Early morning cloud banner along Canandaigua Lake. Fortunate evidence of important micro-climatic variations, this cumulus cloud banner is the result of comparatively warm temperatures over the lake on a cool autumn morning. D.—Detail of coarse loam soil, South Bristol Township. This view of Ontario gravelly loam in a cultivated field near the hamlet of Bristol Springs shows a soil that is above average in coarseness, drainability, and alkalinity as a result of its formation from a parent material of moderately thick glacial gravels.


A


B


C


D


A
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C
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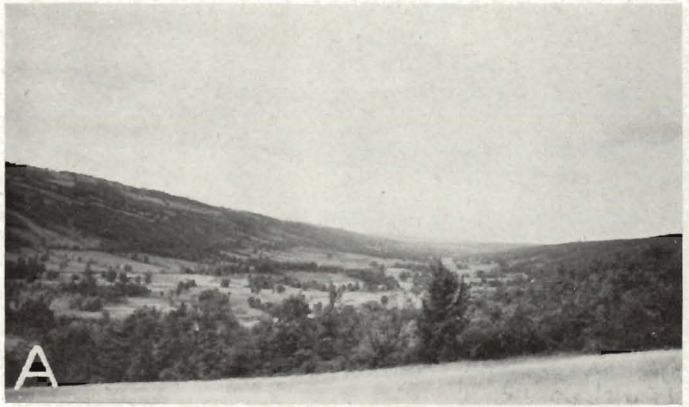
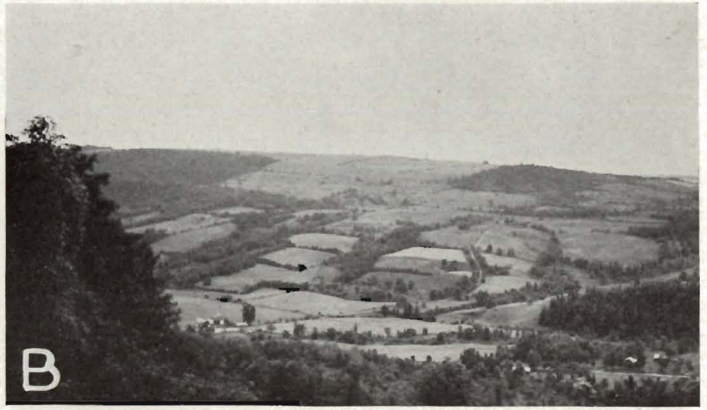

A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A


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C


D

of the lake, passing through a series of landscapes more or less the reverse of those encountered on the southward trip.

Obviously this is not a region which can be treated by a few generalizations, and its problems of geographic adjustment are in a general way the epitome of the problems of upper New York State. Why has Canandaigua village changed from the jumping-off place for pioneer settlement into a thriving western metropolis and then into a pleasant but almost static little agricultural and resort town? Why have families left the region, after a generation or more of the hardest kind of labor? Were they the victims of changing conditions beyond their control, or had their fathers attempted to farm the unfarmable? Whence come the summer resorters, with their carpenters and their paint cans, and how many more of them can the land support? These questions—and many more—must be answered before the Canandaigua region can understand its past, and even begin to plan for its future.

Geology

The region lies in two physiographic provinces, the Eastern Lake section of the Central Lowlands, and the Glaciated Allegheny Plateau section of the Appalachian Plateaus (Fenneman, 1938). The boundary between the two approximates in a general way the boundary between the northern and southern halves of the area as can be inferred from figure 2. Thus Canandaigua, Hopewell, and Gorham Townships are situated

Plate 3. Plateau landscapes. A.—Looking up Middlesex Valley, Middlesex Township. Here is plateau farming country at its best, for the valley bottom is broad, open, and rather well-drained. B.—Looking across Italy Valley, Italy Township. View southeastwards from Italy Hill, showing a relief of almost a thousand feet. C.—Swell-and-swale configuration on the Naples recessional moraine. One mile south of Naples village, looking southwestward. D.—View of southern end of Canandaigua Lake. Such panoramas as this, photographed from the kitchen window of a summer cottage, help to explain the still-increasing summer-time popularity of the Canandaigua basin.

Plate 4. Summer cottages and a pioneer home. A.—First summer cottage on Canandaigua Lake. Built about 1876 by the Chesebroughs of "Vaseline" fame, this well-built cottage was often visited by Secretary-of-State William Seward. It was reached by steamboat. B.—Modern summer cottage on artificially-made site. A picturesque setting, a good deltaic beach, and complete isolation in spite of proximity to a paved highway, combined to make this location so attractive that the shale banks were blasted away to provide a level site for the cottage. C.—A pioneer home, Italy Township. The dwelling is testimony, not only to the careful work of the pioneer stonemasons, but also to their ability to use local materials. The walls are built of West River sandstone chinked with glacial clay. D.—Evidence of early cottage construction, South Bristol Township. The running scrollwork beneath the eaves dates the construction of the cottage as of the decade prior to 1880.

on the plain whereas South Bristol, Naples, Middlesex, and Italy Townships lie on the plateau.[4]

Bedrock geology of the area is simple (Clarke and Luther, 1904; stratigraphic terminology modernized in Goldring, 1931; and Cradwick, 1935). Both provinces are underlain by sedimentary rocks, the strike of which is in general east-west and the dip southward at the rate of approximately 40 feet to the mile. Thus in travelling from north to south through the area the outcrops of successively younger and higher formations are encountered. Since this series of formations increases in sandiness upwards, the plateau owes its origin to the presence of resistant sandstones and flagstones, whereas the plain, situated upon less resistant formations which are mostly shales, has been eroded to a much lower level.

Canandaigua Lake, lying at an elevation of 686 feet above sea level, can be considered for most purposes the lowest part of the region (Fig. 2). The northern plain, flattish to drumloidal in character, lies in general from 100 to 500 feet above it, and the level hilltops of the plateau to the south, lying at an elevation of more than 2200 feet above sea level, in many cases rise almost 1000 feet above their neighboring valley bottoms.

These accordant flat-topped summits are assumed to be remnants of the Schooley peneplain, dissected to late youth or sub-maturity while the Ontario Plain was being eroded to late maturity or old age on the weaker shales to the north. The geomorphic story of this prolonged period of erosion has been discussed by Herman L. Fairchild in a number of papers (see especially Fairchild, 1925), although field evidences suggest a few changes in his maps. Interesting variations in plateau configuration, important enough to strongly influence population distribution, exist. For example, unreduced upland surfaces in South Bristol and Naples Townships are limited to patches averaging only one square mile in area, whereas those of Middlesex and Italy each include several square miles. Furthermore, various patterns of valley systems are found, such as the crudely radial one of Naples Township and the "linked chain" arrangement of South Bristol.

Pleistocene glaciation provided the latest important changes in physiography, for the entire region was covered by continental ice. During its northward retreat the ice-front paused long enough just south of the southern end of Canandaigua Lake to deposit an admirable recessional moraine (plate 3C), part of the important Valley Heads Moraine of New York State. This heterogeneous deposit can be recognized easily on the topographic map (fig. 2) by the crenulated character of the contours, and on the soil map (fig. 5) by the presence of Canadea soils. It not only

[4] Specifically, Fenneman designates the outcrop of the Tully limestone as boundary across west-central New York. In the Canandaigua region the Hatch formation, some 43 feet higher stratigraphically and six or eight miles south geographically would make a more accurate boundary horizon.

caused Canandaigua Lake to reverse its direction and drain northwards, but also influenced markedly the ensuing population history of the plateau.

Temporary glacial lakes, hemmed in between the ice-front on the north and the high land to the south, accompanied each stage of the northward retreat of the ice (Fairchild, 1909) (fig. 3). At first they were limited to

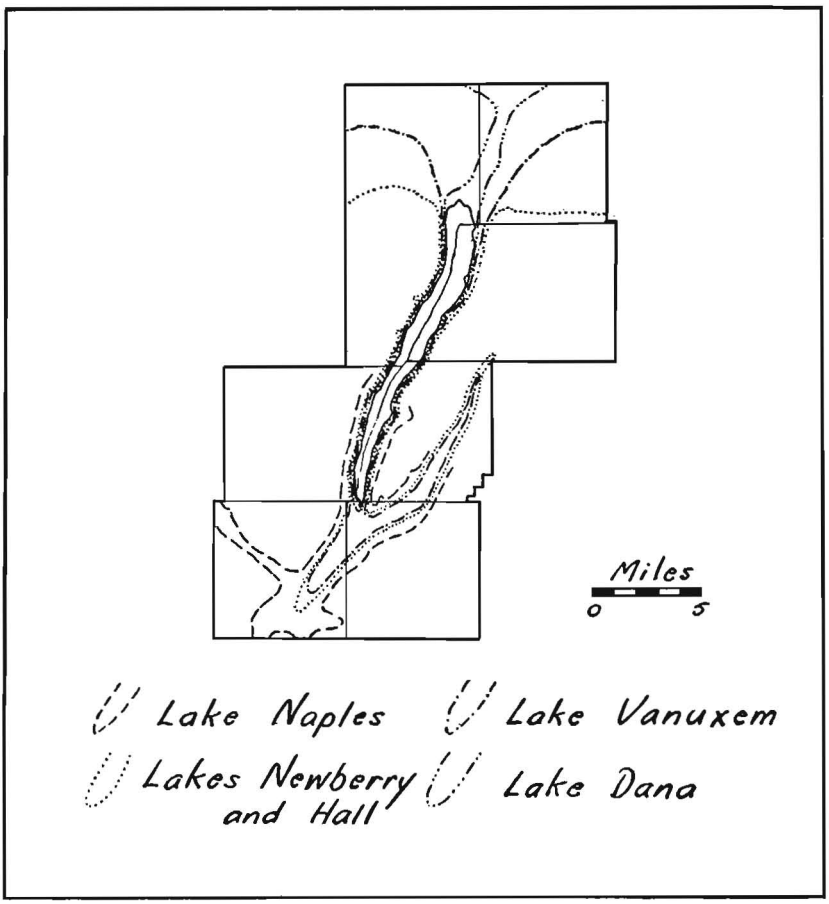

FIG. 3. Location and extent of former glacial lakes (after Fairchild, 1909).

the high-level valleys of the southern townships,[5] but later, as the ice-front retreated to the northern edge of the area, they occupied Canandiagua and Middlesex Valleys, and still later spread over a large part of the nothern plain. Thus glacial lake influence was brief in the southern valleys, more prolonged in Middlesex Valley, Canandaigua Valley and

[5] More or less casual observations suggest that high-level lakes occupied a greater number of the valleys than Fairchild realized.

much of the northern plain, and most prolonged in a triangular area north of Canandaigua city (compare plates 1B, 3A, 1A). Long-continued glacial lake deposition has resulted in decreased surface configuration and increased clay content of the soil.

Another type of glacial phenomenon which has influenced population change is that of the elongated, rounded, drumloidal[6] hills (plate 2B), numerous in the southern half of Canandaigua Township, but absent from the comparable area on the opposite side of the lake.

Ground moraine in the region varies from a few inches to many feet in thickness, being very thin on most of the southern hills. Plowshares on many of the plateau farms strike bedrock on each circuit of the field. In contrast, the plateau valleys in some cases have received several feet of glacial material, and such is also the case throughout the northern plain, although here much of the drift is buried beneath glacial lake sediments.

Many of the sedimentary formations of the region had local economic importance during the early periods, having been used for building stone, quicklime, and the like (Clarke and Luther, 1904), but as better materials have come within competing distance the use of local products has declined, until today only sand and gravel are exploited, and even these are consumed within a few miles of their place of origin.

Climate[7]

Variability, both with time and with place, is the keynote of the Canandaigua climate. Precipitation falls in a definite seasonal rhythm, temperatures exhibit marked continentality, and the characteristics of both temperature and precipitation differ greatly from place to place within the area. Although the climatic records show the Köppen classification (Köppen and Geiger, 1932) to be Cfb, there are both Cfa and Dfb stations within the Finger Lakes district, and a close network within the Canandaigua area would undoubtedly reveal examples of at least the Dfb type.

Although no Weather Bureau stations exist within the area, one is situated only a mile north of the northern border, at Shortsville, and another is located only two miles south of the southern border, at Atlanta (fig. 4),[8] in the bottom of a broad preglacial river valley more than 500 feet deep. The elevation at Shortsville is 660 feet and that at Atlanta 1300 feet.

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[6] Fairchild (1929) maps most of these as true drumlins.

[7] Data from Mordoff (1934), supplemented by Martin (1931).

[8] At Atlanta records of precipitation cover 18 years, those of other elements 7 or 8 years. Conclusions drawn from data of this station have been checked against those of other stations on similar sites. Records for Shortsville cover a period of 31 years.

Temperature. Normal lapse rates could well account for the differences in temperature between plain and plateau. Shortsville is 1½° warmer than Atlanta (46.6°F. instead of 45.2°F.). Similarly, Shortsville has recorded an all-time maximum of 102° and a minimum of –17°, while Atlanta records a maximum of 96° and a minimum of –35°.

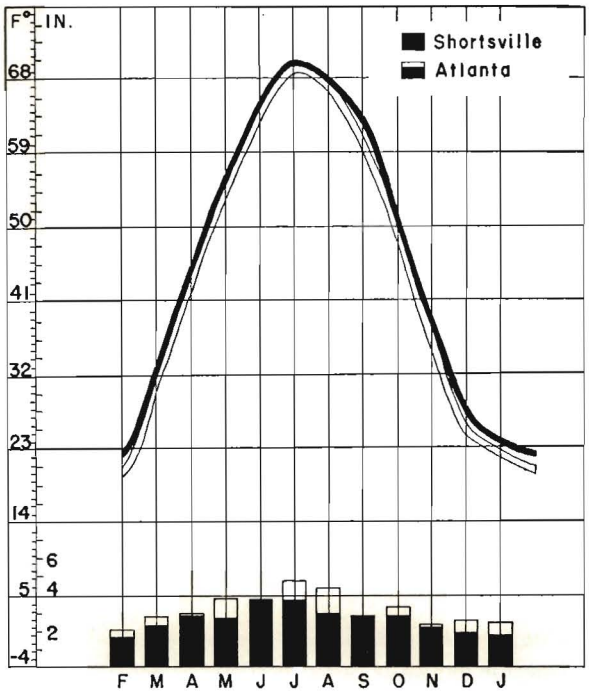

FIG. 4. Temperature and rainfall regimes, Shortsville and Atlanta (data from Mordoff, 1934).

Precipitation. The Finger Lakes district is one of the drier parts of New York State. Striking differences are found between plain and plateau, however, for 30 inches fall annually at Shortsville, on the plain, whereas 37 inches fall at Atlanta, on the plateau. The regime is one of little-modified continentality at both places, the precipitation of the wettest month being twice that of the driest month. But at Shortsville the maximum is in June, the minimum in January; at Atlanta the maximum is in July, the minimum in February.

Average variability is not unusually large at either place; not as large, in fact, as that of Rochester, which has a somewhat heavier annual rainfall and is situated on Lake Ontario. A system for computing extreme

variability has been devised,[9] and at Shortsville the annual figure is ±20 percent, that of the growing season being ±50 percent. At Atlanta the annual variation is ±30 per cent, but during the growing season is similar to that of Shortsville. A 50 percent extreme variability during the growing season means that at Shortsville the farmer expects 15½ inches of rain during his productive season, but has received as little as 10 inches and as much as 22 inches during the 31 years covered by the observations. As to sunshine, the region does not experience much of the cloudiness of the Lake Ontario fringe, although the percentage of possible sunshine (49 percent annually, 61 percent during the growing season) is considerably lower than that of the United States as a whole. Atlanta is slightly more sunny than Shortsville.

Growing Season. A striking difference in length of growing season exists between Shortsville and Atlanta, the result of differences in elevation and configuration, rather than of distance from Lake Ontario or Lake Canandaigua (see isoplethic map of average length of growing season, Mordoff, 1934, p. 36). Five and one-half months (161 days) are frost-free at Shortsville, and only four and one-half months (130 days) at Atlanta. The probabilities are that frost will not occur after May 8 around Shortsville, while it can be expected until nine days later at Atlanta. In the fall, danger is great after September 24 in the south, not until three weeks later in the north. Here is a very practical effect of air drainage, for Atlanta is located in a broad open valley flanked by high hills, whereas Shortsville, thirty miles farther north, is on an open plain where concentration of local cold air is all but impossible.

Turning to statistical probabilities, a crop which needs five months to mature would be nipped only two times out of ten in the north and more than eight times out of ten in the south. A four-month crop would be killed one year in four if planted near Atlanta, but probably never would be affected at Shortsville. If the short growing season of the south is considered in conjunction with the fact that many of the soils there are poorly drained, it becomes apparent that the southern farmer, in comparison with one in the north, will not be able to get onto his land until two weeks later in the spring, and must complete most of his harvest three weeks earlier in the fall.

These data show the magnitude of climatic differences between two points thirty miles apart, and can be accepted as indicative of the general differences between plain and plateau.

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[9] Extreme variability:

½[(precipitation of wettest year—mean annual precipitation)+(mean annual precipitation—precipitation of driest year)] / mean annual precipitation.

Growing season variability: same formula, but covering only May 1—September 30.

Micro-Climatic Observations. To fully analyze climate as a factor in population change, micro-climatic data should be gathered to indicate the differences in growing season between farms only a mile or two apart horizontally, but several hundred feet apart vertically; and between farms subject to the tempering influence of Canandaigua Lake as opposed to those less favorably situated. Such a complete study has not been made, but micro-climatic observations were taken on five different mornings, the last of which brought the first general frost of the autumn of 1937 to the region. On one of these mornings the visual evidence of micro-climatic variations shown in plate 2C, was observed.

The area selected for study was Stid Hill, on the west side of the lake in South Bristol Township (fig. 2). Observations began at the shore of Canandaigua Lake and extended 2½ miles inland, up the two-mile lakeward slope of Stid Hill ridge to its crest, which is 1384 feet above the lake, then down the steeply-pitching interior slope to its base in Mud Creek Valley, only 314 feet above the lake but 2½ miles distant from it. Land utilization mapping revealed that vineyards and orchards were present only on the lakeward slope, and these only to a height of about 700 feet above the lake. The five sets of data afford highly suggestive evidence of the micro-climate of the plateau.

First, there were definite temperature differences within the region on these fall mornings, as a result of 1384 feet of surface relief, but they were less than might have been expected. There never was more than 12°F. difference on any one morning, and the average was 7°.

Second, Mud Creek Valley was, on each morning, slightly colder than the lake shore, and was usually colder than any part of the slope leading down to the lake. Hence the lake did moderate the temperature of the slope leading down to it.

Third, the warm lake did not keep inversions from developing on the lake slope, although it probably modified them considerably. Data suitable to this purpose were gathered on three mornings. Inversions were present on two of them, in both cases extending to a height of about 600 feet above the lake. The upper limit of fruit cultivation ends approximately where temperature, on fall mornings, ceases to increase with elevation.

Natural Vegetation [10]

Reminiscent of the arrangement of troops in the Battle of Gettysburg, where the Confederate army advanced from the north and the Union forces lay to the south, is the vegetative pattern of upper New York State. Favored by the beneficent climatic effects of Lake Ontario, the Southern Hardwoods have spread northwards from the Appalachians of

[10] Data taken from Recknagel (1923), but especially from Bray (1930), as reproduced in New York State Planning Board (1935).

Tennessee and Kentucky, and occupy the lowland plain, whereas coniferous representatives of the Northern Mixed Forest lie on the plateau to the south. Although plant ecologists draw an arbitrary boundary between Southern Hardwoods and Northern Mixed Forest along the northern end of the Canandaigua region, study of settlement records (McIntosh, 1876; Cleveland, 1873; Doty, 1925, vol. 1; Turner, 1852) show that the entire region was part of a zone of vegetative transition.[11]

At present, judging from census records for Ontario and Yates Counties, only 15 percent of the region is in forest. Even during the time of occupance by the Iroquois the original vegetative pattern had been altered, for the Indians cleared away forest, not only for the growing of crops, but also to induce a heavy cover of tall grass which would attract deer.

Soils [12]

Although soil maps exist for the entire Canandaigua region, one part consisting of five townships was surveyed in 1910, the other part not until 1916.[13] In the interim considerable refinement and reorganization of pedologic classification had taken place. As a result, it was necessary in this study to translate the data for the later, more detailed survey into terms of the earlier, more generalized one.[14]

Although the details of soil variation throughout the region are complex, the general scheme is relatively simple. Only six series have areal importance (more than one square mile of total area) and the major pedologic differences are closely related to variations in physiography (compare fig. 5 with fig. 2). A brief summary of each of the six series follows.

In northern New York prolonged deposition in glacial lakes has usually resulted in the formation of a group of clayey soils known as the Dunkirk (see fig. 5 for the distribution of this and other soil series). In the Canandaigua region the Dunkirk occupies a crudely triangular area, with its apex at Canandaigua city, where all of the later glacial lakes deposited

[11] The Chestnut-Chestnut Oak-Yellow Poplar association seems to have dominated the physiographically transitional area occupied by Gorham Township and the southern half of Canandaigua, and to have extended along the shores of Canandaigua Lake at least two-thirds of the distance to the southern end. In addition, the south-facing slopes of such large plateau valleys as that of West River were covered with ash and hickory. Similarly there were a few patches of fir, spruce, and tamarack, representatives of the Northern Mixed Forest, in the poorly-drained swales of the Ontario Lowland.

[12] The two primary references are Carr and others (1912), and Maxon (1918).

[13] 1910: the Ontario County townships of Canandaigua, Gorham, Hopewell, South Bristol and Naples.
1916: the Yates County townships of Middlesex and Italy.

[14] Some indication of the difficulties involved in translation can be gained from the fact that along the boundary between the two surveys, twice as many types were found on one side as on the other; and that a single soil type on one side of the line, the Volusia loam, is represented by parts of six soil types on the opposite side of the line.

debris. It is a heavy but somewhat calcareous soil with moderately efficient to moderately poor drainage, and is represented by two important types, namely silty clay loam and clay. The A horizon is seven or eight inches thick, somewhat greater than the average for the region.

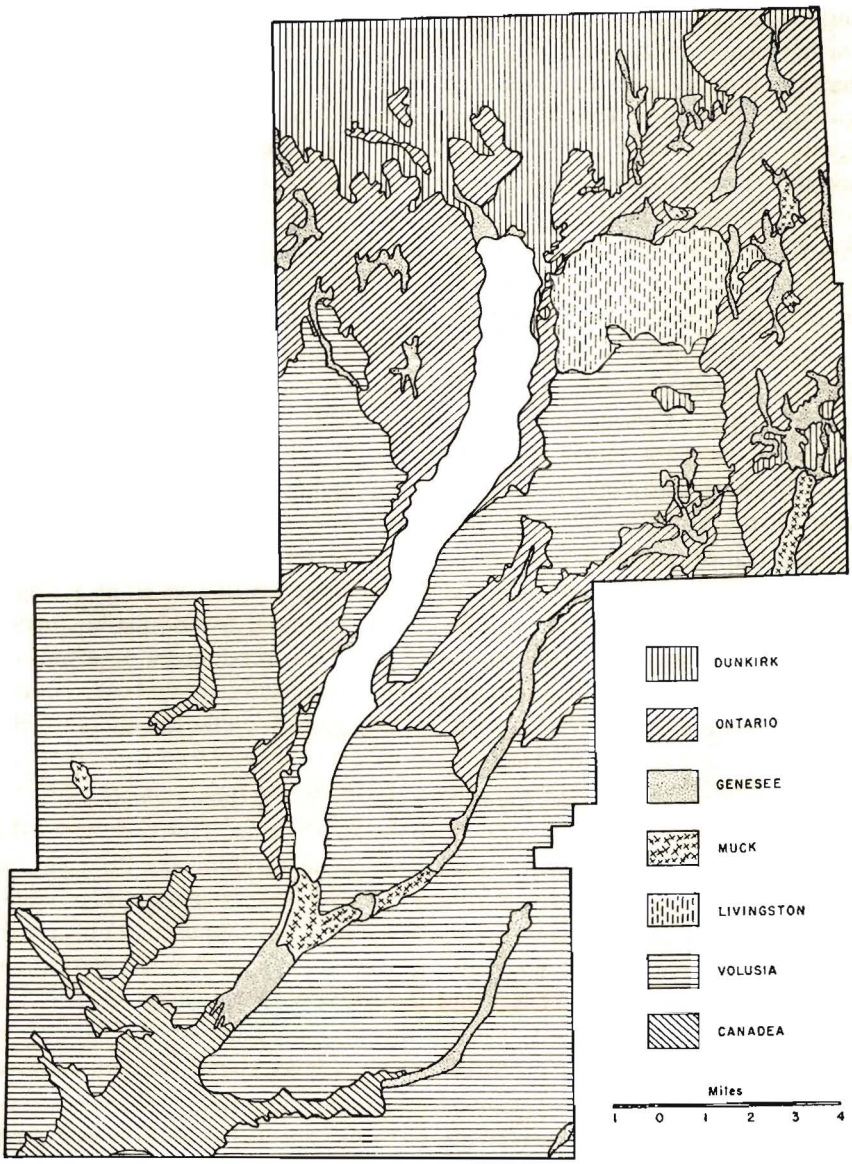

FIG. 5. Major soil series of the Canandaigua region (generalized somewhat from Maxon, 1918, and Carr and others, 1912).

The Ontario series of soils occupies the middle and higher parts of the plain and extends onto the forepart of the plateau for a distance of several miles, especially along the open, lakeward slopes. It is probably the best soil in the region as regards a combination of alkalinity, thickness, and drainage. It has developed from moderately thick ground-moraine, and owes its somewhat calcareous nature to the presence of limestone, derived largely from the Onondaga formation which outcrops along the northern edge of the area. Its texture is lighter and its drainage is better than those of the soils of most of the rest of the region. The commonest widespread textural type is simple loam, although fine sandy loam has significant areal extent, and other types are present (plate 2D). The A horizon of the Ontario varies from eight to twelve inches in thickness.

The typical group of soils of the plateau is Volusia. Derived by way of thin till from the underlying shales and sandstones, it is acid at all horizons. Drainage is far from perfect. On the flat uplands the presence of an indurated layer just below the B horizon frequently causes water to remain at the surface for days, and on the steep slopes the thinness of the soil is a handicap. Brown mottlings are common in the subsoil regardless of slope. Thickness of A horizon varies from an average of ten inches in the loam (moderate slopes) to only four or six inches in the shale loam (steep slopes). Textures commonly range from shale loam to silt loam, although more extreme types are present.

As a transitional soil between the Ontario series of the plain and the Volusia series of the plateau is the Livingston, which occurs in a single area on the eastern side of the lake. Here, on level to undulating topography, glacial and glacio-lacustrine processes have produced a light topsoil, but the underlying shales have created an imperfectly drained subsoil. Only one texture, a silty clay loam, is recognized. The thickness of the A horizon averages ten inches.

The most nearly normal soils of the plateau are those which have developed on the recessional moraine of the southwest. They belong to the Canadea series, and contrast strongly with the neighboring Volusia, for they have a slightly calcareous subsoil and good drainage characteristics. Both of these qualities result from the great depth of porous and permeable parent material, and from the steeply rolling surface configuration. Two textures, a gravelly loam and a silt loam, are recognized, the difference in amount of fine material being the result of differences in deposition on the floor of a short-lived, high-level glacial lake or lakes.

The Genesee soils are typical of the floodplains along the bottoms of the broadest valleys of the plateau, but they are also found in scattered, low-lying patches in every part of the area. In spite of a tendency towards seasonal flooding, drainage of representatives of this soil series is

fairly good. The A and B horizons are invariably acid, but subsoil is frequently alkaline. Four textures, all loamy, are found.

The only other soil having an area of more than one square mile is Muck, which, being composed largely of plant remains, is actually a pseudo-soil. It occupies the lowest part of the broad valley-bottoms within two or three miles of the southern end of the lake, in addition to small, scattered depressions in both plain and plateau.

Representatives of the Honeoye and Clyde series are found in the region, but their total areal extent is insignificant.

In summary, in spite of great variations from place to place, it can be said that the dominant textural types are the loams and silt loams; that, although many areas are adequately drained, most of the region has soil-water problems; and that, in spite of large areas having a tendency towards moderate alkalinity, an acid chemical reaction is the rule. Marbut (1935) classifies the entire region as "Grey-Brown Podzolic."

This brief treatment of soils will be supplemented, where necessary, in the discussion of population changes in later chapters.

III. THE ABORIGINAL POPULATION, AND CENSUS STUDY OF WHITE OCCUPANCE

Aboriginal Population

On the stage setting outlined in the preceding chapters, the drama of settlement and depopulation has been played. The period of occupancy by white men constitutes only the latest act in the epic, and a few program notes regarding the earlier phases of the drama will not be amiss.

The first human occupance for which any distributional data are available is that of the Algonkian Indians,[15] the immediate predecessors of the Iroquois. These people seem to have lived rather gregariously, usually in unfortified villages on lowland sites near streams. The Algonkians finally gave way to the Iroquois, of which the Seneca tribe occupied western New York. With the arrival of the Seneca, the population centers shifted from valley-bottom to hill-top, thus taking advantage, for purposes of defense, of steep slopes with running water at their bases. Italy Hill, South Hill and several of the "Bristol Hills" [16] show evidence of such occupation.

Just as the coming of the Iroquois changed the population pattern of the region, so Iroquois history itself reveals a major gradational change in distribution. The later Seneca villages occupied poorer and poorer

[15] Prior to the Algonkians were the Mound Builders, and before them an earlier culture, possibly Eskimoid, dominated the region, according to Parker (Doty, 1925, chaps. 3–5), and conversation with Charles Wray, Rochester Museum of Arts and Sciences.

[16] The term "Bristol Hills" will be used frequently in this paper to refer to the interior hills of South Bristol township.

military sites and better and better agricultural lands, probably because the population, and hence the food needs, increased. Almost all the later Seneca villages lay along the southern edge of the Ontario Plain, on the great east-west trail which connected the domain of the Six Nations. The villages in some cases included several hundred or even a thousand people, who lived gregariously in "long houses." Some of the individual dwellings sheltered as many as 50 people, and thus furnish a striking parallel to crowded modern living. From three or four to more than a hundred houses characterized each village.

Perhaps half the food which sustained the people in these agglomerations came from their own communal gardens and orchards,[17] and most of the remainder came from the native animal life.[18] Although there were no domesticated meat animals, deer were attracted to relatively accessible areas by clearing the forest and allowing grass to grow in its place. Hunting camps of more or less permanency were scattered throughout the forest, attesting the need for the hunters to range far afield to supply the village meat requirements.

The towns were kept from developing any real permanency, however, by several factors. Much of the game in the vicinity was soon killed off, and the rest retreated to a considerable distance. The soil lost whatever fertility it originally possessed, because of constant cultivation, and in spite of some crop rotation (corn and beans, in alternate years). The surrounding forest became cleared of the litter that was so necessary for firewood and construction material, the need for the latter being especially important because insects inevitably attacked the bark houses. Also it may be that disease was a factor, for certainly sanitary precautions were few. Hence every few years, perhaps ten on the average (Milliken, 1876, based upon Irving W. Coates), the villages were moved, providing very frequent minor changes in population distribution within the longer periods of evolutionary change.

The most recent short-term moves of the centers of Seneca population have been described by archaeologists, especially Parker (1922, vol. 2, pp. 650–664 and 716–717). From their data a map of village migration in the Canandaigua region has been compiled. Although not reproduced in this paper, the map shows that the village, which towards the close of the Indian period occupied the site of the present city of Canandaigua, had moved at least twice during the preceding century. It should be remembered that these changes represent minor ones towards

[17] Apple seeds were probably introduced by Jesuit missionaries, according to Doty (1925).

[18] Deer, the dominant game animals, were especially abundant. Elk and moose were not unknown, and buffalo were occasionally seen. The most numerous predatory animals were wolves, bear, and cougar. There were dozens of species of small fur-bearers and of game birds. Speckled trout swam in most of the streams, and salmon frequently came up Canandaigua Outlet as far the northern end of the region (Turner, 1852; Doty, 1925, vol. 1; Cleveland, 1873).

the end of the Seneca occupance, following a long evolutionary change from the fortified plateau sites to the accessible farming land of the plain.

A careful appraisal and interpretation of available data[19] had made possible some estimate of the total number of Indians in the Canandaigua region. Immediately preceding 1687, when a French expedition headed by de Nonville entered upper New York, there were probably five hundred Indians in the area under discussion, and between 1687 and 1779, when they were scattered by Major General Sullivan, there were as many as a thousand of them, mostly in the single village of Kanadarque (or Canadarq or Canandaigua).[20] In September, 1779, Sullivan found the village to consist of 23 unusually well-built houses. His men burned every house to the ground, destroyed the crops and orchards, and obliterated every means of subsistence possible, thus carrying out General Washington's order to force the Seneca from central New York. Ten years later, when white settlers began to swarm in from New England, the Indians were no problem whatsoever. And fifteen years later, in 1794, at their former castle of Canadarq, the Seneca nation assembled for the last time to sign what were virtually its own exclusion papers.[21]

Thus with the end of Iroquois occupance in 1779 closed the next-to-the-latest period in Canandaigua populational history. The Seneca, the Algonkians, and their predecessors were gone, and the stage was set for the European whites.

White Population History as Revealed by the Census[22]

The major part of this study of the Canandaigua region deals with the results of a study of habitation maps, supplemented in places by township census data, representing a century and a half of white man's occupance.

[19] Donaldson (1892), Milliken (1911, vol. 1, based on Greenaugh, Kirtland, and Johnson), Parker (in Doty, 1935, vol. 1, chap. 5), and McIntosh (1876).

[20] The very large increase is the result of a movement of Seneca villages into the area. Meanwhile the total Iroquois population dropped to one-half, then regained its former total (Donaldson, 1892).

[21] The last mention of Indian occupance is that of a wigwam which stood near Bristol Springs, in South Bristol Township, until 1815; a wigwam which was sporadically occupied by hunting parties. Indians at that time used to straggle past the neighboring farms in groups of two or three to twenty, sending the squaws into the farm houses to beg for loaves of bread.

[22] Federal census records are available at 10-year intervals from 1790 through 1930. State census records, taken in the middle of each federal intercensal period, give additional data, of questionable accuracy, from 1814 through 1875. Between 1790 and 1840 many new townships were split off from pre-existing ones. Hence it has been necessary to extrapolate the population of the offspring townships from the figure given for parent and offspring.

Example: Hopewell split off from Gorham in 1822. Prior to that, data for "Gorham Township" are actually the data for Gorham and Hopewell. The share of the total which belonged to Hopewell was computed by assigning it the same proportion of the total as it had on the three censuses following the split. Inaccuracy is minimized because parent and offspring were invariably similar environmentally.

It has already been suggested that the availability of maps for individual dwellings necessitates breaking the time-span into quarters: 1780–1820, 1820–1860, 1860–1900, and 1900–1940. An examination of the census record (fig. 6), on the other hand, shows that the population history of the region actually falls into three "natural," rather than arbitrary, periods: a period of growth from 1790 to 1840 (50 years), one of instability from 1840 to 1880 (40 years), and finally one of decline, from 1880 to 1930 (50 years).

By sheer good fortune the habitation maps reveal the distribution of population at approximately the mid-point of each natural period. It has seemed advisable to summarize the population changes of these natural periods before proceeding to a detailed study of the more arbitrary. Such a summary will not only familiarize the reader with the general trends in the region, but also with the limitations of a census study, although it is not to be inferred that all the possibilities of a census study have been explored here.

The Period of Growth, 1790–1840. The opening period, 1790–1840, is marked by rapid and continuous growth, from 464 persons in 1790 to 17,200 in 1840, an average increase of some 334 persons each year (fig. 6). This was the settlement period, when in common with the rest of upper New York and, later, with much of the Midwest, immigration was pouring in from New England, Pennsylvania and the Middle At-

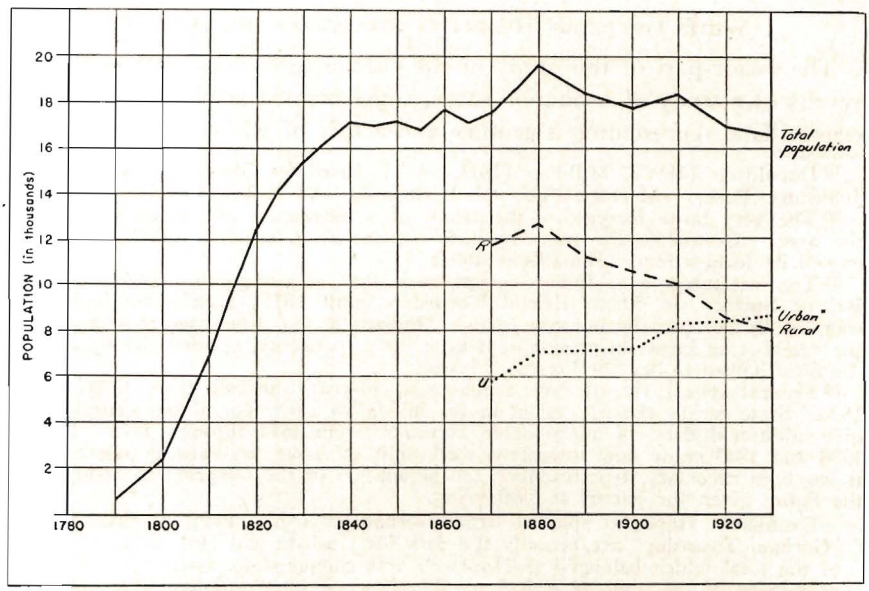

FIG. 6. Population history of the region. The "urban" figures are those of Canandaigua city and Naples village.

lantic states. The curve can be divided into halves, the first characterized by accelerating increase, the second by slight deceleration but nevertheless strong growth.

The first half of the period, was the time when the western Iroquois still gathered annually at Canandaigua to receive their land payments. It was the time when upper New York was the goal of westward moving settlers, when the Great Trail of the Iroquois, although widened to permit the passage of wagons, was still the main route of travel, and Canandaigua was on that route. It was the boom time for the Finger Lakes district.

Towards the end of the first half of the period of growth the War of 1812 was fought, taking much of the avilable man-power from Canandaigua farms but giving in return a flourishing market for cash crops among the army units which were strung out along Lake Ontario. Toward the end of the period construction of the Erie Canal began.

The Canal was completed soon after the close of the first half of this period of growth, bringing subtle but powerful changes in the location of the region. The main transportation route moved northwards from the old Iroquois trail of the plateau fringe onto the more level topography of the plain itself. Very gradually the Canandaigua region felt the effect of this shift, for although the Canal was completed in 1825, it was not until 1840 that the population curve of the region as a whole began to fluctuate uncertainly. The success of the waterway was not recognized immediately and even after its future was assured there was a possibility of a feeder line to connect Canandaigua Lake with the main canal.[23] Meanwhile, the markets of the east moved closer, for what had originally been a month-long journey to Albany was now only a five-day trip, a growing cash-crop market seemed assured, "Genesee wheat" was acquiring a reputation, and the lands continued to populate. With the coming of the Erie Canal the death-knell for Finger Lake agriculture had been sounded, though it was mistaken for another kind of music and growth continued at only a slightly decreasing rate.

The 50-year period of expansion did not affect all parts of the Canandaigua region equally, as the census curves for the individual townships (fig. 7) show. Every township experienced marked growth, but there the similarity ceases. Canandaigua outstripped all the others from the very beginning, and at almost every date during the period had twice as many people as any other township. Gorham and Hopewell reached their peaks in 1830, ten years before it was reached for the area as a whole, and Naples continued to populate even during the period which we have designated for the region as a whole as one of instability.

[23] The branch canal (McIntosh, 1876) was to have been 19½ miles long, dropping 225 feet by means of 23 locks. The expense proved prohibitive.

Some of the factors contributing to the township variations are not difficult to determine. The unique growth of Canandaigua Township is due almost solely to the growth of the village, a fact which can be inferred, even without specific figures, from the behavior of similarly-located but non-urban Hopewell Township. Gorham and Hopewell, both of which grew rapidly during the first half of the period, reached their peaks early, probably accompanied by rural Canandaigua, for two reasons. First, they were populated more rapidly, and hence became saturated sooner, and second, there was a larger cash-crop element in their economy, which made them first to feel the competition of the more accessible plain to the north, and more easily-farmed lands of the Midwest.

South Bristol, Middlesex and Italy, all plateau townships, were populated more slowly, and hence drew settlers after the plains had ceased to attract them. Their comparative inaccessibility engendered a subsistence economy which enabled them to withstand agricultural competition for a longer period of time.

Naples Township, very much like the other plateau units in many ways, nevertheless contained a metropolis which in the days of slow transportation was entrepôt for a large section of the plateau. This local commercial pre-eminence was not threatened until much later, when good roads and rapid transportation brought the region within the economic sphere of Canandaigua city. Hence Naples was the last township to show a net decline in population.

The date 1840, which closes the period, is the most significant one in all Canandaigua's history, for it marks the end of an era of growth which had been continuous ever since the region was opened, and the beginning of an era of uncertainty, which was to be followed by a period of decline, not yet ended in 1941.

The Period of Instability, 1840–1880. In marked contrast to the continuous increase in population during the early period is the tendency towards alternate increase and decrease of the middle period, 1840–1880 (fig. 6). During this 40-year interval the population curve oscillated downward, then upward, three times, but resulted finally in a net increase of 14 percent. The period concluded with the largest population ever concentrated in the Canandaigua region, 19,705 people, an average density of 66 people per square mile. At present, even in summertime when several thousand transients move into the area, the total figure would not exceed that of 1880.

If the last half of the preceding period was the Canal period, this was the railroad period, for the first train crossed Hopewell and Canandaigua Townships in 1840. The line ran from Syracuse to Rochester, taking a considerable southward detour in order to pass through Canan-

daigua village. It touched only the northern part of the area, entering along Canandaigua Outlet channel, and leaving by way of Padelford (fig. 2). In 1851 another line was laid, from Canandaigua village southeast across Hopewell Township and the northeastern corner of Gorham to Penn Yan and Elmira in the southern part of the state. Two years later, in 1853, this line was extended westwards from Canandaigua to Niagara Falls. It was only the northern townships which received any direct benefits, however, and the railroad isolation of the four plateau townships continued well into the next period.

An era of plank, and later of gravel, road building accompanied the expansion of the railroad, improving considerably upon the turnpikes of the Canal era. The resultant speeding of transportation was paralleled by a quickening of industry. Both changes were important in the Canandaigua region, but were considerably more important farther north where accessibility was even greater; hence the wavering oscillations of the population curve.

A considerable part of this fluctuation may be more imaginary than real, for the state census invariably shows a smaller population than does the federal compilation (fig. 7). The magnitude of this discrepancy is not uniform, either from decade to decade or from township to township. Hence a correction factor could not be applied, and the state figures have been disregarded in the discussion which follows. Even without them, enough oscillation exists to justify calling this a period of uncertainty.

The first two decades (1840–1860) may be thought of as a time of rural decline and slight urban gain, for all the townships lost population except Canandaigua and, for a brief period, Naples. The last two decades were an era of both rural and urban gains, initiated in the eastern townships, regardless of urbanity, by the stimulus of the Canandaigua-Elmira Railroad, and involving every township by 1880 regardless of urban tendencies or transportation facilities.

The 1880 peak is secondary in importance to the peak of 1840, even though greater in magnitude, for it represents only a brief reversal of downward trend in every township except Canandaigua. The powerful depopulating forces which preceded and followed this date were only temporarily neutralized by a brief rush of immigration. Perhaps half the local gains were experienced in Canandaigua village, the remainder being concentrated largely in the plateau where the rapid rise of viticulture attracted many farmers of German extraction.

Summarizing the unstable middle period, it was a time of slight decline, then rise, culminating in an all-time population peak for the region. Several other tendencies appeared among the individual townships, but they differed from one another not only in intensity but also in kind, mak-

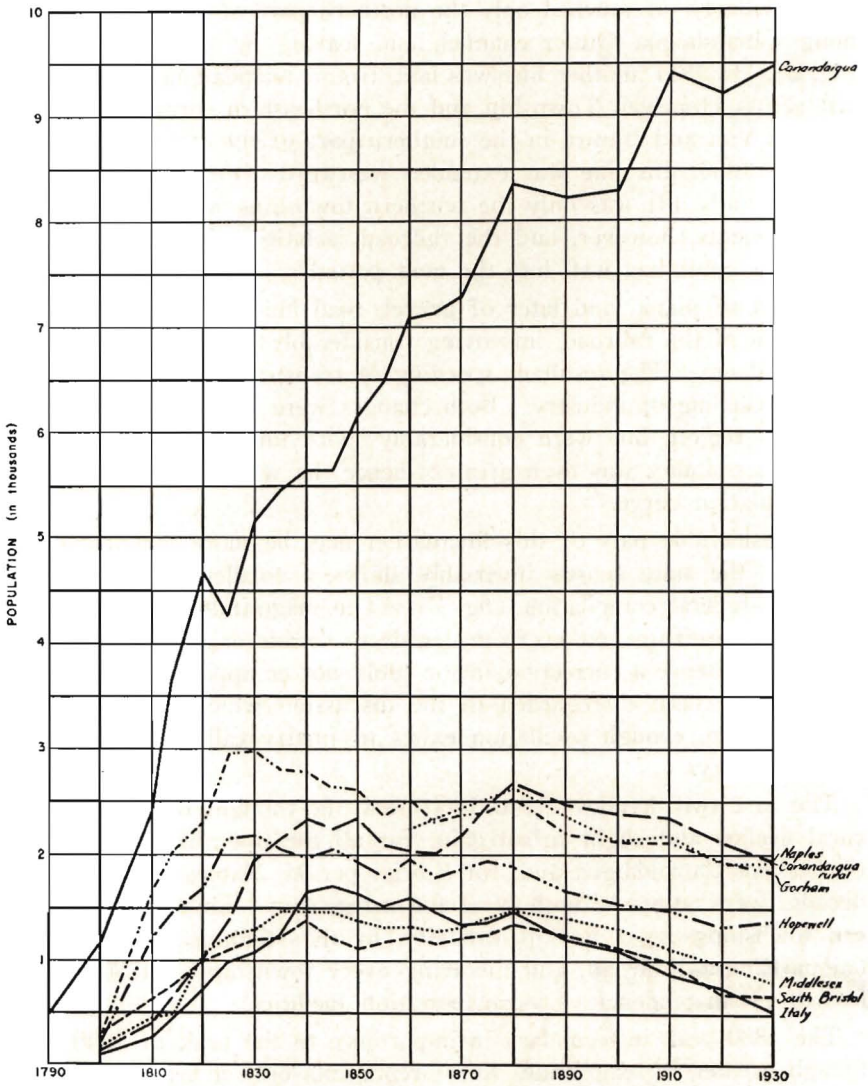

FIG. 7. Population history of individual townships.

ing the graph of township population curves a tangle of crossing and re-crossing lines which tend to cancel each other. The only important local exception is Canandaigua Township, which grew continuously, although at varying rates, throughout the entire period, because of increasingly important urban functions.

The Period of Decline, 1880–1930. So far as the census records show, the uncertain days of Canandaigua population ended in 1880, even as

the palmy days had ended in 1840. From 1880 to the present, depopulation has been continuous excepting only Canandaigua city (see curves for Canandaigua Township and "Canandaigua rural," fig. 7).

Even at the opening of the period of decline the original pioneer enthusiasm had long since disappeared. Indeed, if it was present in any one of the region's residents it led to his moving westward, for by 1880 upper New York was far removed from the pioneer scene. Viticulture, together with its associated wine-manufacture, may have slowed the decline somewhat, but was powerless to check it. The small, scattered factories which had used local water-power were gone, and no large power sites were available to take their places. By 1911 the only power development was a small hydroelectric station on the Canandaigua Outlet. Except for the wineries of Naples, the Lisk enamelware factory and the McKechnie Brewing Company were the only significant manufacturing industries soon after the beginning of the present century.[24]

Seasonal occupance of the lakeshore by summer cottagers began just prior to the opening of this period, but did not become important until the arrival of the macadam road and the automobile, shortly after 1900. The beneficial influence of lake resorts on the census curve even today is largely limited to a stimulation of growth of Canandaigua village, which is the center for the carpentering and construction trades and also for the purchase of household supplies.

All of these influences: growing resort business, increased manufacturing, and improved transportation, were powerless to neutralize the effect of wholesale farm abandonment on the population curve. In many ways these elements actually hastened the rural decline, for certainly the rise of rapid transportation, the lure of new manufacturing plants, and the ability to sell a run-down farm to a city worker for a summer cottage helped to draw off the less successful and the more ambitious farmers. Depletion of small amounts of soil fertility, loss of considerable topsoil through erosion, and competition with Midwestern farms were also important factors.

During the period of decline the census figures reveal population changes not only by townships, but also by rural and urban categories (fig. 6). Thus at present 48 percent of the population is rural and 52 percent "urban,"[25] the two curves having crossed in 1920.

[24] Among the manufacturing plants which came and went prior to 1911 were a chilled-plow works, a sash-balance factory, a general iron works, a brick-making plant, and a paper pail manufacturing company. Since 1911 the McKechnie Brewing Company also has closed its doors, but the Roper Knitting Company, manufacturing swimming suits, sweaters, and related recreational clothing, has been established since that date.

[25] The term urban, as used here, includes both Canandaigua and Naples villages, in spite of the fact that the latter has never had a population of 2500. If Canandaigua alone were so classified, 45 percent instead of 52 percent would be urban.

Canandaigua city grew continuously during the 50-year period. Naples village, smaller and less accessible, by no means fared so well, its curve resembling that of the rural townships more closely than that of Canandaigua city. Like the rural areas, its 1880 peak was its last one, for since that time it has remained static. Evidently the region can only support one metropolis, Canandaigua.

Rural population has been decreasing continuously in every township except two.[26] Losses have been exceptionally high in the plateau, where Middlesex, South Bristol, and Italy have lost 43 percent, 50 percent, and 65 percent of their population respectively.

The magnitude of the 65 percent decline can be suggested best by stating that Italy Township, which contained 1444 persons in 1880, had only 510 persons in 1930. In spite of macadam roads, which brought the township within a half hour of Canandaigua, within three-quarters of an hour of the main line of the New York Central Railroad, and within an hour of a transcontinental airport, Italy has returned to a population smaller than it had when Canandaigua was a hard day's drive away, when the Erie Canal was still a draftsman's plan, and when Rochester was little more than a cross-roads settlement. In short, Italy has returned to the population it had about 1815.

Assimilating all of the material contained in this study of census records, it is seen that they yield a clear picture of fluctations in population of the region from decade to decade, and suggest several broad inferences regarding the way external and internal forces have influenced township units. Some generalizations regarding the comparative behavior of plain and plateau, village and rural area, can be made. For this study, however, the census figures supply a relatively fine-mesh chronological framework on which the detailed areal pattern of population changes will be woven.

IV. HABITATION MAP ANALYSES: SETTLEMENT OF THE REGION AND SOME LATER SHIFTS

Creation of the Basic Population Pattern, 1788–1820

For nine years after the Senecas were scattered by General Sullivan's army, that is, from 1779 to 1788, the Canandaigua area stood virtually unoccupied. It was by no means forgotten, however. The soldiers of the expeditionary force, returning to their New England homes, gave enthusiastic reports on the fertility and beauty of the Lake Ontario coun-

[26] The two exceptions are Naples Township, where the rural component increased between 1890 and 1900 because railroad connections finally reached the village in 1892 by way of Middlesex; and Canandaigua Township, where the rural population increased between 1900 and 1910 in response to an upward surge in Canandaigua city.

try, and before long a business venture unprecedented in American history was initiated,[27] with the objective of opening this new land to settlement. Led by Oliver Phelps, a financier of Windsor, Connecticut, and his partner Nathanial Gorham, a group of interested persons purchased from the State of Massachusetts all the land in New York between the meridian of Seneca Lake and the Genesee River.[28]

The Period 1788–1800

Phelps himself came into the area in 1788, selected Canandaigua as the site of his headquarters, put up a storehouse, cut a sleigh road along the Great Trail of the Iroquois eastwards from Canandaigua towards Geneva, and cleared a wagon road to the head of navigation on Canandaigua Outlet, about six miles northeast of the present site of the city. These things accomplished, he returned to New England. The following spring (1789), vigorous settlement began. By autumn of that year "the place was full of people; residents, surveyors, explorers, adventurers; houses were going up. It was a busy, thriving place" (Turner, 1852).

All the early settlers were from New England, the home of most of Sullivan's men, and of Phelps and Gorham. Furthermore, although a month was required to negotiate the difficult all-water passage into the region from Schenectady,[29] it was the only feasible route at that time, and because New England lay just beyond its eastern end it tended to draw men from that region. Usually the settlers came in groups, consisting of several families which had been neighbors in the Berkshires or the Western Upland of New England. Later, with the opening of a wagon road along the valley bottoms of the Allegheny Plateau, some people from the Middle Atlantic States joined the inflow.

Expansion from Points of First Settlement. The relationships between points of first settlement and the general impopulation of each

[27] Here the county-township-range system of land subdivision was used for the first time in America, and the first regular land office opened. "Each township was sold by selection, accompanied by another chosen by lot, both at the same price" (Corbett, 1898).

[28] For this 4000-square-mile tract the Phelps and Gorham firm paid the State of Massachusetts $100,000 and the resident Indians $5,000, with the promise of an additional $500 annuity "forever." The last of the "forever" payments probably was made about 1815. The Indians were to have hunting and camping privileges in the region for 20 years—until about 1810. But few remained after the settlers arrived.

[29] Flat-bottomed batteaux were built at Schenectady, and poled up the Mohawk to its headwaters at Rome. There boats and food were portaged a mile to the headwaters of Wood Creek, down which they drifted into Oneida Lake; thence across Oneida Lake, down its outlet to the Oswego River, up against the current of the Oswego, the Seneca, the Clyde, and Canandaigua Outlet to Manchester, from which a ten-mile wagon road led to Canandaigua village. Other portages were necessary at Little Falls and Seneca Falls. The trip from Schenectady to Canandaigua took a full month.

township merits discussion. The sites settled first in each political unit may be termed township nuclei, or secondary nuclei, to distinguish them from the major regional, or primary nucleus, of Canandaigua village. After the establishment of the primary nucleus in 1788, the secondary nuclei were formed, in regular southward progression: those of Gorham, South Bristol, and Middlesex during the next year (1789), that of Italy two years later (1790), and of Naples three years later (1791) (fig. 8).

From each of these township nuclei, and from the primary nucleus as well, the peopling of the countryside took place, by two different methods. Where regional relationship formed a strong focus upon a single site,

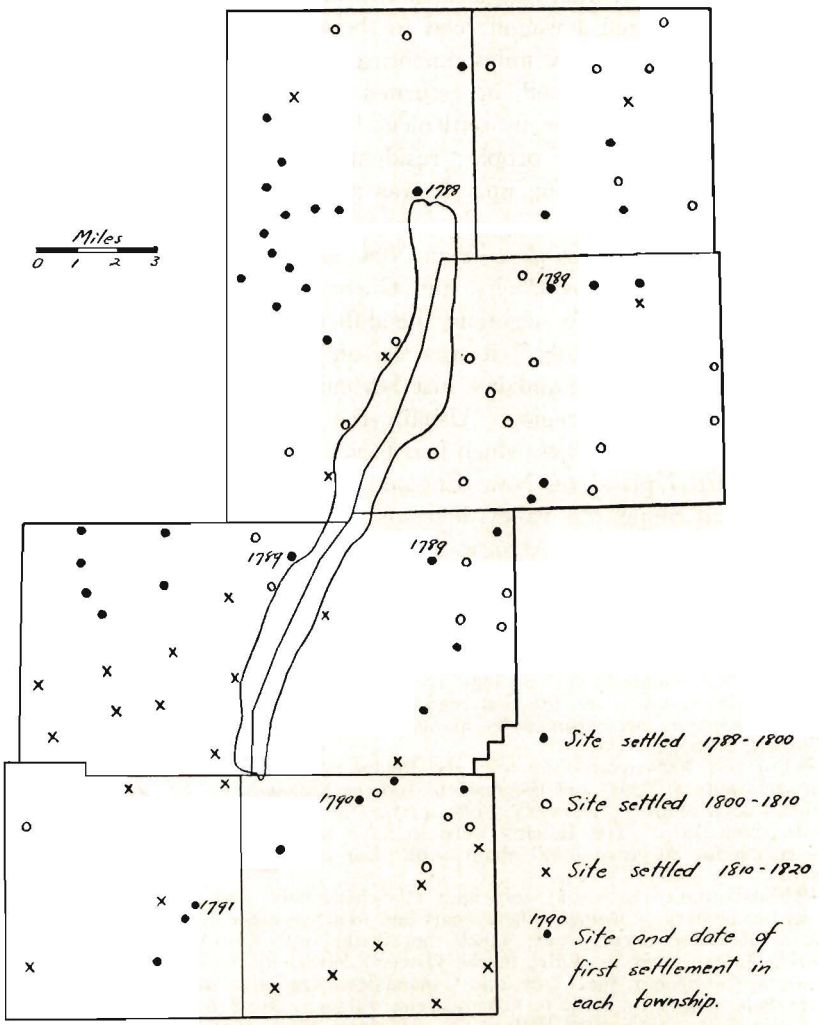

FIG. 8. Populating of the region, 1788 to 1820.

settlement tended to take the form of expansion around the original point, whereas in the regions of less striking focality newcomers tended to break from the township nuclei into remoter regions, starting centers of a third order. So it was in South Bristol, where Seneca Point, the township nucleus, did not expand until after considerable growth had occurred in the more remote tertiary centers of the back country. Similarly, in Italy Township, three new tertiary nuclei developed before the original settlement had expanded at all. In Middlesex Township, although the original nucleus was probably at Overacker Corners, subsequent settlement was at scattered points along Middlesex Valley.

In contrast to such scattered expansion is the contiguous system, shown in Canandaigua, Hopewell, and Naples. Here the strategic importance of the initial site was so great that incoming settlers built up the contiguous area to a considerable population before scattering over the adjacent countryside. This category includes both the townships of the plains, and in addition hub-and-spokes Naples Township at the southern end of the lake. In Gorham Township, where the topography is transitional between plain and plateau, both settlement types appear, for contiguous expansion occurred in the north while a scattered pattern developed along the southern boundary.

Points of Original Settlement as Present-Day Strategic Sites. Because all of the seven townships except Hopewell were settled as independent units, the question as to whether the sites of initial settlement had permanent strategic value is cogent. The answer lies in whether or not these six sites still dominate their respective townships. In the case of two of them the answer is definitely affirmative, in two more the answer is only partially affirmative, and in another it is negative.

The point where Phelps and Gorham began their first settlement and opened their land office is today not only the commercial nucleus for Canandaigua and Hopewell Townships, but still remains entrepôt for the entire region. Strategic factors will be amplified later in a discussion of urban areas, but location at the foot of Canandaigua Lake, on the well-travelled Ontario Lowland, is obviously of paramount significance. Similarly, the locale of initial settlement in Naples Township, now Naples village, has continued to be regionally important. In South Bristol Township, Seneca Point was commercially important for several decades, but was finally eclipsed by the inland valley site of Bristol Springs, and in Middlesex Township, Overacker Corners, an upland site, enjoyed only a brief period of township supremacy before it was overshadowed by the valley-site of Middlesex village. In Italy Township, West River probably never even enjoyed the local prestige of a gristmill.

From the foregoing discussion of development within the townships, it can be seen that physical differences produced important differences in settlement history, and that gradually the individual strategic sites in each township have either increased or decreased in importance depending upon their relative strategic value in terms of the entire Canandaigua basin. Additional evidence of the relative unimportance of the township boundaries is at hand.

Of the 24 plateau settlements shown on the map to have been made prior to 1800, 19 were in the valley bottoms, 4 on the upland, and 1 on the lake shore. With regard to the plain, data are lacking for the area close to Canandaigua village, but of the 20 settlements which are mapped 18 lie in the land above the area of former glacial lake action, on moderately high, rolling, well-drained land. Thus, within each of the two regions of similar environment, the same tendencies were present, regardless of political boundaries.

The best single example of physiographic influence is found in the long line of scattered settlements along the bottom of the continuous Naples-West River Valley, stretching for 15 miles through the four townships of Naples, Italy, Middlesex and Gorham, by the year 1800. Because the valley was settled from four different township nuclei it was so to speak, discovered independently from each of the four centers.

The Decades 1800 to 1810 and 1810 to 1820

During the decade 1800 to 1810 the plain continued to populate faster than the plateau (fig. 8). On the lowland most of the expansion was contiguous, but it tended to push people onto less well-drained land, and farther from the village, for the better areas had already been occupied. On the plateau, although immigration was much lighter, gaps along the valley floors began to fill in, very few settlers going elsewhere. The most important demographic event of the decade, however, was the occupance of the well-drained but only moderately sloping lands of the transitional area between plain and plateau, in central Gorham and southern Canandaigua Townships.[30]

The period 1810 to 1820 finds the southern townships receiving for the first time the dominant percentage of the incoming agriculturalists. By the end of the decade the major part of the floodplains had been settled, at least thinly, and many a moderately-steep slope in each township had received its first plowing; but few people had yet occupied the uplands. In general these stand out as the great unsettled areas at the close of the first quarter of white populational history.

[30] This paper makes no attempt to analyze the quality of the people in relation to the quality of the land. In describing the populating of the southern half of Canandaigua Township, however, McIntosh (1876) characterizes the region around Cheshire as "poor land, with poor settlers."

The settling of the Canandaigua region was now well advanced, its 12,500 people representing more than half the total number of inhabitants and probably more than three-quarters of the rural population which the area was to contain at its most populous period, that is, about 1880. The War of 1812 with its increased cash-crop market had come and gone, the Erie Canal was under construction, and the pioneer period was closing.

A Settlement Detail: Italy Hollow

Before leaving the period of settlement a type example of the settlement of a plateau valley should be described. Italy Hollow has been chosen as the model.

The Hollow is one of the deeply-incised pre-glacial valleys in the old Tertiary peneplain (fig. 2). The modern floodplain is about three-quarters of a mile wide and above it rise thousand-foot precipitous slopes of shales and sandstones, originally heavily forested. The valley at one time joined Canandaigua Valley just northeast of Naples, but Pleistocene glaciation half filled the southwestern end with morainal debris, as can be readily seen from the topographic map. Present drainage is by Flint Creek, an underfit stream which rises on the moraine near Barker Church and flows northeast along the valley bottom, receiving a small tributary from the shale hills just before it leaves the northeastern corner of the township. At this point, in 1794, the first two farmers in Italy valley located. The decade from 1800 to 1810 brought four more settlers into the region. Three of them settled just up the valley from the original occupants, making an "extension" of the original nucleus. The fourth went a mile or so further up the valley beyond his neighbors, making an "outlier." [31]

The third decade, 1810–1820, brought 15 or 20 new families, which filled in the gap between the outlier and extended nucleus, and ran their own continuous extension several miles farther up the valley to the edge of the moraine, where the change in topography, soil, and probably in vegetation determined the limit of general advance. One courageous individual, however, went a couple of miles upstream on the moraine and created a new outlier.

In a similar way the other plateau valleys were populated. First a nucleus, in most cases tertiary; then creation of outliers and extension of the nucleus; then filling in of the gaps, further extension, and further outliers, until all of the habitable area was populated.

On the Ontario Plain the sequence was similar, even though started from a single primary nucleus instead of from tertiary nuclei. Here on

[31] Between 1794 and 1800, three additional settlers tried the high flats above Italy Valley, but gave up and moved away almost immediately.

the level plain concentric rings are the corollary of the "extension of nucleus" in Italy Valley. Outliers were formed, and then the rings grew outwards until these were absorbed, but meanwhile new outliers had sprung up.

By some such method of creation of nucleus, then establishment of outliers, followed by an expansion of the nucleus, most pioneer settlement probably progresses.

At the end of the first quarter, by 1820, most of such pioneering in the Canandaigua region was completed, and the basic populational pattern set. Although the total number of people continued to increase for ten years more, the first quarter of white populational history was over.

Some Details of Regional Readjustments, 1860–1940 [32]

The last two quarters of white populational history, from 1860 to 1900, and from 1900 to 1940 have been the subject of careful analysis by a comparison of the habitation maps which begin and close the periods. The details of this analysis are reported elsewhere (Simpson, 1940), and only a few of the more interesting facts will be repeated here. They have been organized by townships in order to preserve regional relationships.

Italy Township. Italy, where in 1860 there were 1605 people and now are only 457, is the most depopulated township in the Canandaigua region. The extreme decadence of one small area is shown in figure 9. This three-and-a-half square miles of upland on the eastern edge of the township contained 19 habitations and 7½ miles of road in 1864, 13 inhabitations and the same amount of road in 1900, and no habitations and only 4 miles of road (plate 2A) in 1937, a change from a density of 28 people per square mile to complete abandonment.

Lured into the region by cheap land which could be purchased on the installment plan,[33] and by gently rolling upland topography which belied its thin, acid soil, the settlers here found themselves as time went on less and less able to compete with more accessible farms having better soils. As pavement and social amenities began to appear on the more

[32] No detailed study of the second quarter, 1820 to 1860, has been made. During that period the population grew by less than half as many people as it had during the preceding quarter (5,253 as compared with 12,493). The increase was largely confined to three areas: the previously unoccupied moraine of Naples Township; the similarly uninhabited hilltops of the entire plateau, but especially those of Italy Township; and finally, Canandaigua village and its environs. Only a few isolated hilltops and the steepest of the valley walls remained unpopulated in 1860, and even on a surprising number of steep walls, homes had been built and fields were being cultivated.

[33] Aldrich (1892) refers to the primitive settlers of Italy Township as "almost all poor." Even at this early time poor farmers, on poor land, migrated frequently, as shown by the fact that there was only one instance in Italy Township (prior to 1892) of the title to a piece of land staying in a family for two generations.

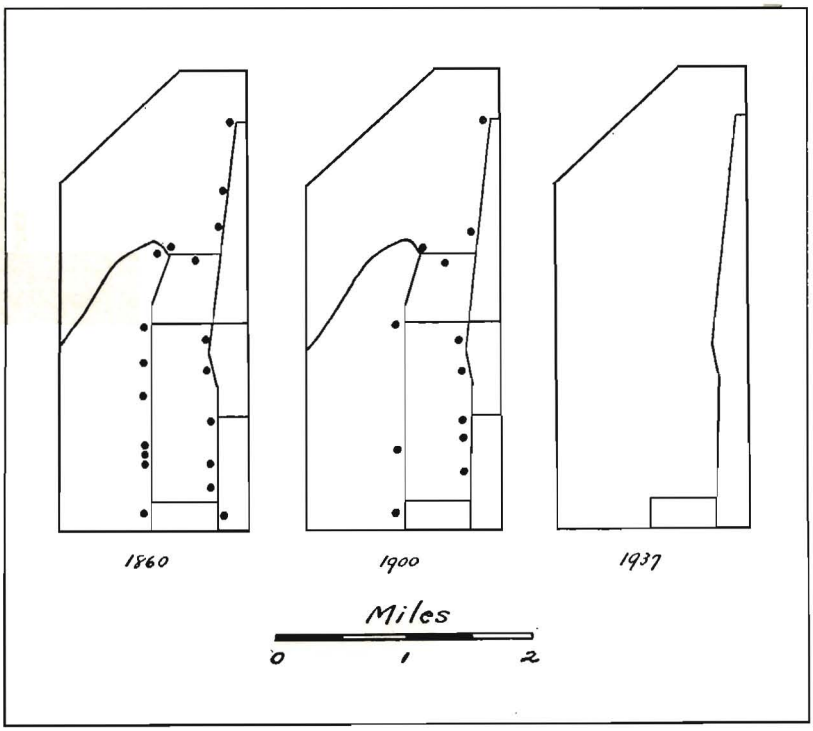

FIG. 9. A decadent area. Part of Italy Hill, Italy Township. Each dot represents one habitation. Lines represent roads.

populous valley bottoms, the upland farmers began to emigrate, making it increasingly difficult to provide public services for those remaining.

An interesting example of the migration of a village is afforded by the hamlet of Italy, which lies in the bottom of steep walled, thousand-foot deep Italy Valley (plate 3B). In 1900 the village lay where two roads dropped precipitously down from the upland on either side to join the main artery along the valley bottom, and not far to the north another road from the upland slanted down into the valley bottom (figs. 2, 10). By 1937 two of the upland roads which had given strategic importance to the site of the village had been abandoned, and the increasing importance of large Naples village, eight miles to the west, was tending to draw the remaining upland traffic westwards in such a way as to by-pass Italy village. So filling-station, garage, and store were built at the point most suitable to tap that traffic, one-half mile west of the old site, leaving only two public-service buildings, both of them churches, behind. The total number of buildings at the former site declined from 13 to 10, and at the new site increased from 15 to 16, during the 37-year interval.

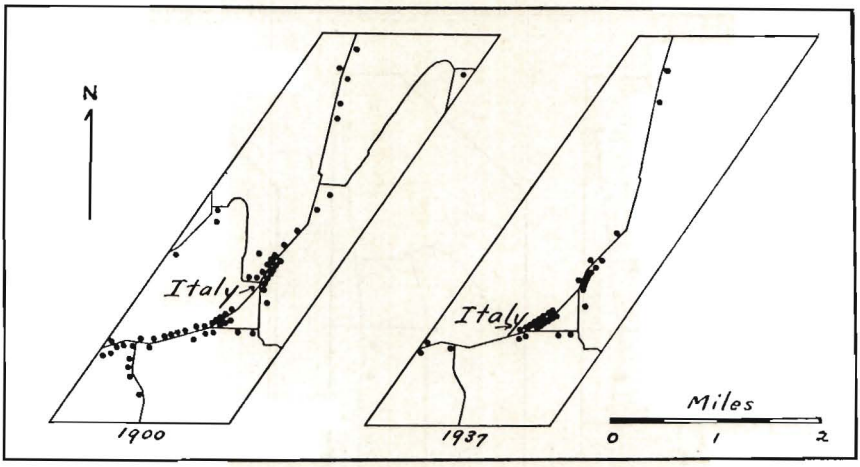

FIG. 10. Migration of Italy hamlet, 1900 to 1937.

Middlesex Township. "Prosperity (can be secured)," wrote Lewis C. Aldrich (1892) to the Yates County farmers "by industrious economy and sobriety." If this were entirely true we might not have to look further to explain the fact that Middlesex Township has suffered somewhat less depopulation than has Italy. But, in spite of general environmental similarity, there are differences in opportunity which cannot be overlooked. In Middlesex the broad valley of the same name is higher and better-drained than it is in Italy, and characterized by Genesee soils rather than Muck (plate 3A). The gentle upland slopes are mantled with Ontario loam, more fertile than any soil in the neighboring township, and Canandaigua Lake washes one side of the area. Furthermore, the railroad reached Middlesex 40 years earlier than it did Italy. In spite of all these advantages, however, the broad summit of South Hill, where formerly there were twelve houses, today has not a single dwelling.

South Bristol Township. Across the lake from Middlesex is South Bristol Township, characterized by the same types of soil but by a somewhat "finer-mesh" topography and hence by a greater percentage of steep interior slopes (plate 1B). Its lakeward slopes, however, are less steep than those of Middlesex. It is the only township in the region without a railroad (fig. 12), and through almost all of its history it has been the least densely populated township.

An example of the way in which two very similar parallel roads on the same kind of terrain can differ in populational history is shown in figure 11. The two roads not only parallel each other, but also parallel contours along the lakeward flank of Stid Hill (fig. 2). The western-

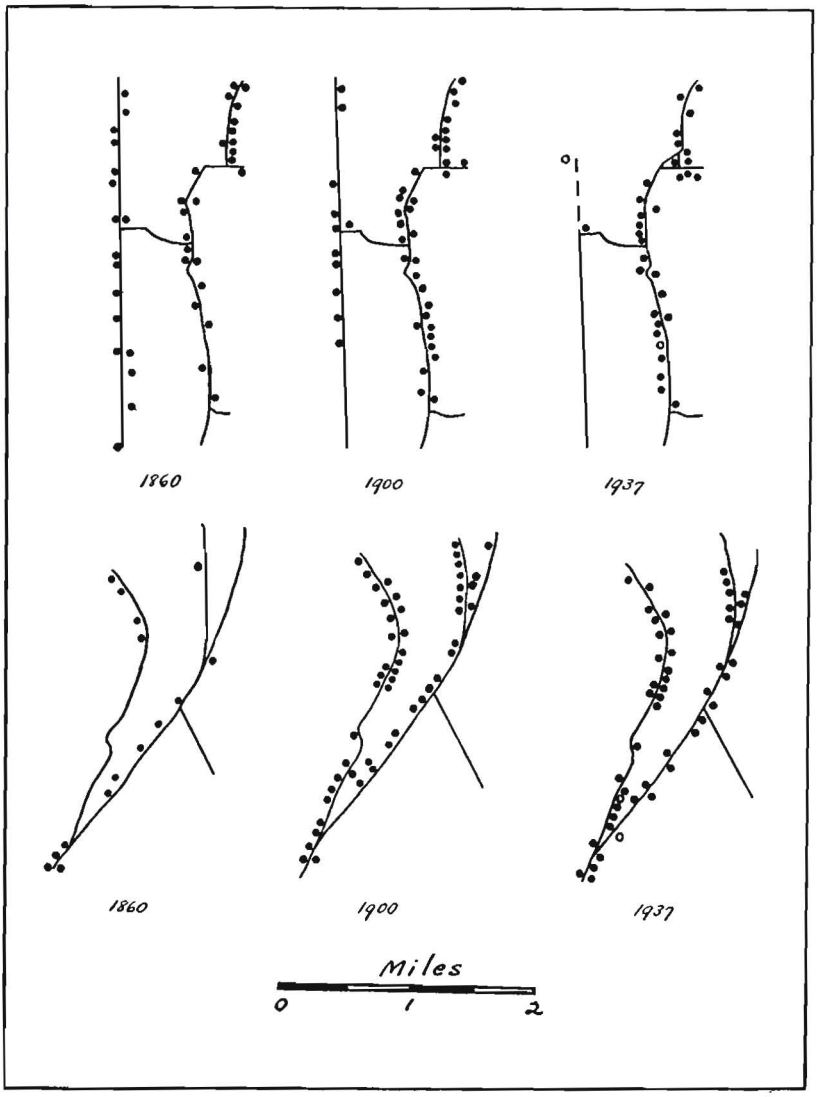

FIG. 11. Contrasting population shifts, 1860 to 1937. Solid dots represent permanently-occupied dwellings; open dots, summer cottages. Upper Series.—Two parallel roads on lakeward slope of Stid Hill, South Bristol Township. Lower Series.—Road fork along western flank of Naples Creek valley, 2½ miles northeast of Naples village.

most road lies between the 1800- and 1900-foot contours, the eastern one runs along the 1300-foot level. Extreme decadence characterizes the upper road in contrast to relative stability on the lower one. Other variables are:

(a) considerable thin, acid Volusia shale loam on the upper road, and a corresponding proportion of relatively thick, calcareous Ontario loam on the other.

(b) the upper road is four or five hundred feet higher above the lake vertically, and a half-mile farther away from it horizontally, than is the lower road.

(c) the upper road is unsurfaced, the lower one macadamized.

(d) the upper road has somewhat less sloping land.

The last-named factor can be eliminated as an influence on population change because areas which have similar slopes along both roads nevertheless have contrasting histories. Factor (c) is shown to be of negligible importance by study of comparable roads on Gannett Hill, three miles further south, where part of the upper road has held considerable population in spite of lack of pavement. Thus pedologic and microclimatic factors are paramount.

The township probably had the first summer cottages on Canandaigua Lake (plate 4A, D). From the windows of the earliest cottages, built in the 1860's but still occupied today, the grandparents of the present generation of cottage folk looked out across the lake to one of its most splendid panoramas: the towering walls of thousand-foot high South Hill and Bare Hill, their lower slopes newly cut into steep flights of vineyard terraces, their middle and upper slopes heavily forested with hardwoods and a sprinkling of evergreen, their summits covered with a patchwork of fields. Between the hills lay the broad gentle slopes of Vine Valley.

Similarly, South Bristol is the first township to have a large number of back-country summer cabins, a result of as great proximity to Rochester as is commensurate with picturesque landscape and people (for stories of the folkways of the district see Carmer, 1936).

Naples Township. Naples is a hybrid township, having some characteristics of the plateau areas,[34] a few characteristics of the plain,[35] and many qualities which are unique.[36] Quite in contrast to the peculiar decline of the small area in South Bristol Township previously referred to, is that of a small bit of Naples Township. Here both roads were thinly populated in 1860, but on each of them densities have increased greatly since that date, as shown in figure 11B. The easternmost road runs

[34] Large areas of Volusia loam, great relief and surface configuration, relatively fine-textured drainage pattern, and heavily declining population.

[35] Total population large, and contiguous rather than scattered expansion of early settlements.

[36] Location astride great Canandaigua Valley, thick deposits of recessional moraine, large areas of Canadea soil, outward-radiating valley system, population peak in 1880 rather than 1840.

along the low, alluvial fill of the Canandaigua Valley, whereas the western road climbs steeply up the slopes to the upland (fig. 2). Thus differences in gradient are not reflected in differences in population shift, the advantages of air drainage on the steep southeast-facing slope, coupled with proximity to Naples village having been important enough to attract population during the viticultural boom of the 1870's, and to hold them since that time.

The village of Naples can be explained only with reference to Canandaigua Lake, to which it owes much of its local pre-eminence. In fact, every important village in the Finger Lake district is located strategically with respect to a lake, being either at the northern or southern end.[37] At these points north-south traffic and east-west traffic converge, and since traffic is heavier at the northern, or lowland, end, the northern cities tend to eclipse the southern ones in size. So Naples, although important, is overshadowed by Canandaigua city.

Canandaigua Township. This township dominates the region, for it has 52 percent more area and five times as many folk as any other township. If, however, the city of Canandaigua is excluded and the figures reduced to an areal basis, Canandaigua is found to rank considerably below Gorham and Hopewell (Canandaigua, 32 people per square mile; Gorham, 37; Hopewell, 38, according to the 1930 census).

Although its population and shifts have been much more evenly distributed than those of townships previously discussed, regional differences are noticeable even here. Thus, the pattern of distribution in the northern part is one of radiating lines along the roads leading out of Canandaigua city whereas the pattern of the southern part is one of rather evenly-spaced distribution. The central part of the township, which corresponds quite closely to the area of Ontario soils, has not suffered appreciable decline since 1900. In contrast, the northern third, largely on the Dunkirk soils of the old lake bottoms, has declined somewhat, and the southern third, rolling, drumloidal, and characterized by Volusia soils, has declined greatly during the fourth quarter.

The city of Canandaigua has grown by periodic surges of immigration, separated by periods of stagnation, as can be inferred from figure 7. Since initial impopulation, there was a rapid increase between 1870 and 1880, and again between 1900 and 1910, the latter caused largely by increasing resort, and possibly factory, population, the former by widespread agricultural immigration.

[37] The following cities stand at the lower ends of the six major Finger Lakes: Canandaigua (Canandaigua Lake), Penn Yan (Keuka Lake), Geneva (Seneca Lake), Seneca Falls (Cayuga), Auburn (Owasco), and Skaneateles (Skaneateles). The southern ends of the lakes, named in the same order, support Naples, Hammondsport, Watkins Glen, Ithaca, Cascade, and Glen Haven.

Of more interest, however, is a comparison between the population declines of two small villages: Cheshire and Centerfield. In spite of similar early history, the two hamlets have taken opposite trends since 1900. Cheshire, situated on the Canandaigua-Naples road, which is now State Highway 21, has suffered abandonment of two grocery stores. Centerfield, in contrast, has enjoyed some commercial expansion because of increasing importance of the old Iroquois footpath, now U. S. Highway 20, over which thousands of cars run daily. The village boasts two more buildings now than it had in 1900, both of them filling stations. Thus it represents an interesting type of modern economic specialization. It is a hamlet without garage, without blacksmith shop, and even without general store. It consists of 13 homes, one church, and three filling stations. Modern high speed automobiles may be bringing Centerfield closer to the wholesale and retail stores of Canandaigua city, but it still takes a quarter of a gallon of gasoline to get there.

Hopewell Township. Hopewell Township has the best situation for farming in the Canandaigua region. It has the least surface configuration consistent with moderately good drainage of its somewhat clayey soils, for most of its streams lie 10 to 30 feet below the general elevations, whereas in Gorham most of them are 40 to 60 feet below it, and in the level parts of Canandaigua they are scarcely below it at all. Hopewell can best be compared topographically with the central third of Canandaigua Township. From the standpoint of agriculture it is the premier township, for its farm population density is greater, its farm lands more valuable, and its farms smaller than those of any other township (U. S. Dept. Commerce, Bur. of Census, 1935).

The township has never developed any agglomerations of more than 100 inhabitants, for Canandaigua city, just beyond its western border, served as settlement nucleus in the early days and has functioned as shopping center ever since. The most definite gridiron population pattern of any township is evident in Hopewell, for here level topography and lack of urban development permitted full use of the township-range system.

Hopewell has had conservative and rather uniform tendencies in population change. Although the best farming township in the area, it has lost population slowly and continuously since 1830. Regional differences are slight, but reflect differing distance from Canandaigua not at all, presence of an important highway somewhat,[38] and soil characteristics to a greater degree.

[38] The commercial value of highway traffic even to farmers is seen by the fact that of the 50-odd farms along this road, more than 20 percent sell tourist services and goods (overnight rooms, antiques, etc).

Gorham Township. Gorham Township is comparable to Hopewell in many respects, for in approach to optimum surface configuration, in intensity of farm utilization, and in development of gridiron population pattern it ranks second only to its neighbor on the north. In population change, too, it has been very similar to Hopewell.

In Gorham, which is not only near the northern end of the lake, but also is unhampered by steep shoreline bluffs, the density of summer cottages reaches its maximum, an average of one every 127 feet. Not a quarter-mile of lake front remains unpopulated, and back of the shore is an entire village composed only of summer cabins, which house a summertime population of almost 500 people. It is not surprising, then, that the population of this already populous township is doubled on weekends during the resort season.

Having shown in the preceding pages that the kaleidoscopic shifting of population around the basin of Canandaigua Lake is related to other mappable elements, the next chapter will attempt to isolate and evaluate certain of these relationships.

V. SOME RELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS AND POPULATION CHANGE

Farmers constitute only about 37 percent of the Canandaigua population, but they utilize 85 per cent of the land. Thus they are of great importance in an areal study of population shift. In the following pages the results of a comparison of such shifts with other mappable factors, namely physiography, soil, road type, distance from lake, and distance from village, will be made.

The method used has been as follows. Dot maps showing the actual location of each farm building in approximately 1860,[39] 1900, and 1937 were prepared on transparent drafting cloth. Copies of these three maps, basic to the entire study, are shown as figure 13 following page 50. By superimposing each of the dot maps on a map of soil types, for example, the number of dwellings on each type at each date could be counted, and magnitude of density and shifts computed. A tabular form has been worked out to present the findings of such comparisons, not only for soils, but also for other environmental factors. Such environmental units occupy the left-hand vertical column (for example, see table 4). From left to right, also in vertical columns, are recorded successively the area of each environmental unit, and for each date considered, the following items: number of habitations, percentage change in number of habita-

[39] Specifically in 1859 for the Ontario County townships of Canandaigua, Gorham, Hopewell, and South Bristol, and in 1864 for the Yates County townships of Middlesex and Italy.

tions, density of habitations, an index figure, and a translation of habitation density figures into population density figures.

Two of these elements should be described further. First is the "index figure." It is a number which shows how much of its areal share of the population a given district is carrying. Thus from table 1 it can be computed that Canandaigua township in 1860 had 20 percent of the land area of the entire region, but only 18 percent of the population. So it was carrying eighteen-twentieths or nine-tenths of its chance share of the people and its index figure becomes .9. Similarly, all areas carrying less than their share of the population have an index of less than 1.0 and all districts with more than their areal proportion have an index greater than 1.0.

The second element needing fuller explanation is that of "farm population density." Obviously, the actual number of people living in a given district at any date can be computed by multiplying the number of habitations by the number of persons per dwelling. This calculation would be simple if the latter number were always uniform, but it varies both with time and place. In 1855 there were 5.3 persons per dwelling in the region as a whole, but the number varied from 5.8 in Canandaigua and Hopewell to 4.8 in Gorham, according to the State Census of 1855. This variation is especially striking when one remembers that Hopewell and Gorham are contiguous townships of similar physical and social backgrounds. Likewise, the figure has varied with time, such as from 5.3 for the entire region in 1855, to 4.0 in 1930.[40] Consequently it has been deemed advisable throughout the study to discuss habitation changes rather than population changes, even though actual population figures are given in the last three columns. The population figures are based upon 5.3 persons per habitation in 1860, 4.2 persons in 1900, and 4.0 in 1937. Figures for 1860 and 1937 are accurate to within 10 percent, those for 1900 to within 15 percent.

With the phenomenon of decreasing number of persons per habitation in mind some of the seeming peculiarities of the tables are explained.

[40] This is the number of people per home in Ontario County in 1930. In 1935 there were 3.9 persons per farm home. Census figures useable in computing the number of persons per farm home differ greatly in type from census to census and are totally lacking for many dates. Some enumerations apply to whole counties, others to individual townships; some were for number of persons per dwelling, others for number of persons per family; some differentiated between rural and urban, others did not. Out of various data the following figures were obtained for number of persons per farm dwelling in the region:

1855	5.3
1865	5.0
1875	4.5
1920	3.9
1930	4.0

They probably are accurate to within five percent for the region as a whole and within 10 percent for any single township.

For example table 4 shows an increase in number of dwellings between 1860 and 1900 on level and gradually-sloping land, but at the same time a definite decrease in population, because the number of persons per farmhouse declined almost twice as fast as did the number of farmers.

That the accuracy of the dot maps can be relied upon has been ascertained in a number of ways. The one for 1937 was made by the author, and checked against a published map of habitations for Ontario County which appeared shortly afterwards (Rural Directories, 1938). That for 1900 is derived from topographic maps of the United States Geological Survey (U. S. Dept. Interior, 1902, 1903a, b, c), and checked in certain critical areas by consultation with long-time residents. The map for 1860 is based upon published wall-maps of the two counties involved (Beers and Beers, 1859, 1865), maps which show evidence of painstaking preparation. A final check of the number of habitations shown on each map has been made by converting the number of dwellings in each township to figures for total number of people, and comparing these with the census reports. Discrepancies were almost all less than 10 percent, the discrepancies probably being a result of census error as much as of dot map error.

Population shifts for the entire region and for the individual townships are summarized in table 1.

It will be seen that in 1937 the Canandaigua region had 1694 farmhouses, an average of 5.68 to a square mile, but that the latter figure varied from 8.5 in Hopewell to only 2.7 in Italy. In terms of actual population, the region averages 22.5 persons per square mile, attaining only 10.8 in Italy but 34.0 in Hopewell. Examination of the index figures reveals that this great variation from township to township was formerly much less, for today Italy is carrying only .5 of its areal share of population and Hopewell carries 1.5 times its share, whereas in 1860 Italy carried .9 and Hopewell 1.2.

Physiography and Farm Habitation Change

Ontario Lowland versus Allegheny Plateau. Since the three northern townships correspond to the Ontario Lowland and the four southern townships to the Allegheny Plateau, it is possible to recapitulate table 1 to show the differences in farm habitation change between the two physiographic provinces. This has been done in table 2.

Similar data for the three western townships in comparison with those of the four eastern ones have also been included (table 3), to show the minimal differences between two arbitrarily selected regions.

It is seen that each physiographic province carried its proportional share of the total in 1860, but the plain has increased its share, period by period from 1.0 to 1.1 to 1.2, while the plateau declined from 1.0 to .9

TABLE 1.

Farm habitation changes by townships.

	Area	Farm habitations												Farm population density		
		Number			% Change			Density			Index					
	sq. mi.	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
Entire region	298	1988	2359	1694	+19	–28	–15	6.68	7.91	5.68	1.0	1.0	1.0	35.5	33.2	22.5
Canandaigua	61	386	485	391	+26	–19	+1	6.3	7.9	6.4	1.0	1.1	1.2	33.4	33.2	25.6
Hopewell	36	282	335	305	+19	–9	+7	7.8	9.3	8.5	1.2	1.2	1.5	41.3	39.1	34.0
Gorham	49	348	401	313	+15	–22	–9	7.1	8.2	6.4	1.1	1.1	1.1	37.6	34.4	25.6
Italy	41	246	255	111	+4	–56	–55	6.0	6.2	2.7	.9	.8	.5	31.8	26.0	10.8
Middlesex	39	233	286	187	+23	–35	–20	6.0	7.3	4.8	.9	.9	.8	31.8	30.7	19.2
Naples	41	258	320	229	+25	–32	–12	6.3	7.8	5.6	.9	.9	1.0	33.4	32.8	22.4
South Bristol	31	235	277	158	+18	–43	–33	7.6	9.0	5.1	1.1	1.1	.8	40.3	37.9	20.4

TABLE 2.

Farm habitation changes, Ontario lowland and Allegheny plateau.

	Area	Farm habitations												Farm population density		
		Number			% Change			Density			Index					
	sq. mi.	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
Entire region	298	1988	2359	1694	+19	–28	–15	6.68	7.91	5.68	1.0	1.0	1.0	35.5	33.2	22.5
Ontario lowland	146	1016	1221	1009	+17	–17	0	6.9	8.4	6.9	1.0	1.1	1.2	36.6	35.3	27.6
Allegheny plateau	152	972	1138	685	+17	–39	–29	6.4	7.5	4.5	1.0	.9	.8	33.9	31.5	18.0

TABLE 3.

Farm habitation changes, western and eastern halves of the region.

	Area	Farm habitations												Farm population density		
		Number			% Change			Density			Index					
	sq. mi.	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
Entire region	298	1988	2359	1694	+19	–28	–15	6.68	7.91	5.68	1.0	1.0	1.0	35.5	33.2	22.5
Western half	133	879	1082	778	+23	–27	–6	6.6	8.1	5.9	1.0	1.1	1.1	35.0	36.1	23.6
Eastern half	165	1109	1277	916	+15	–27	–16	6.7	7.7	5.6	1.0	.9	.9	35.5	32.3	22.4

TABLE 4.

Gradient and farm habitation changes

	Area	Farm habitations												Farm population density		
		Number			% Change			Density			Index					
	sq. mi.	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
All types	29.2	208	252	193	+21	–23	–7	7.1	8.6	6.6	1.0	1.0	1.0	37.6	36.1	26.4
Level land	5.7	60	72	61	+20	–15	+2	10.2	12.6	10.7	1.5	1.5	1.7	55.1	50.0	41.6
Gradual slopes	13.2	102	114	87	+12	–24	–14	7.7	8.6	6.6	1.1	1.0	1.0	40.8	36.1	26.4
Marked slopes	3.7	27	35	25	+30	–28	–7	7.3	9.5	6.7	1.0	1.1	1.0	38.7	39.9	26.8
Steep slopes	6.6	19	31	20	+62	–35	+5	2.9	4.7	3.0	.4	.6	.4	15.4	19.7	12.0

to .8. Farm population density on the plain has decreased by 24 percent since 1860, while on the plateau the decline has been 47 percent.

Gradient and Farm Habitation Change. Slope of farm land influences its population-carrying capacity in several ways, largely by affecting type of land utilization and yield and value of products. Steep gradients mean high production and marketing costs, and low returns per acre. Thus, each slope farmer must utilize more area to support his family, and small population densities result.[41] Because the hillside farmer can produce almost no crops as cheaply as his contemporaries on more level land, every increase of farm acreage on level land cuts into his margin of profit and forces him either to decrease his standards of living or to increase his acreage, or both. Every increase in mechanization of agriculture and every improvement in transportation is apt to favor level land more than sloping land and thus increase the farmer's handicaps (Baker, 1921). Furthermore, steep gradient produces rapid soil erosion[42] and leads to greater acreage of cover crops. Land with a gradient greater than 15 percent should not be planted to crops, and that with more than a 25 per cent slope should be left in forest (Baker, 1926, pp. 461–462). Marked gradients do facilitate drainage, an important asset in areas of hardpan or impervious bedrock such as much of the Canandaigua region, but with increasing slope, soil erosion increases so much faster than drainability that in regions of pronounced gradient the disadvantage outweighs the gain.

Gradients in the Canandaigua region vary greatly (fig. 2). Almost one-third of the area of the northern townships has less than a three percent gradient, as a result of the smoothing action of Pleistocene lakes on a land already relatively level (plate 1A). In contrast, the southern region shows many square miles with gradients ranging from 25 to 50 percent and hence unfit for anything but permanent forest (plates 1B; 3A, B, C, D).

In order to measure correlation between gradient and population shifts, as well as that of other factors to be discussed later, sample strips of land were selected. There are three of these strips, each a mile wide and so selected as to sample each of the various environmental types. The location of them is shown, between the double ruled lines, in figure 2, and their validity as samples is suggested by the following figures:

Area: 9.8% of entire region (29.2 sq. mi.).

[41] Grapes are an exception to this principle, for they are so valuable that they repay the cost of terracing the slopes, i.e., converting the declivities into a series of narrow flats.

[42] Soil erosion increases in greater than arithmetic progression as the gradient is increased. A 3½ percent slope has been proven steep enough to lose 20 tons of soil per acre per year, and an 8½ percent slope sufficient to lose three times that amount. Experiment cited in Howe and Adams (1936, pp. 14–15).

Population: 10.0% of total in 1860, 10.6% in 1900, 11.4% in 1937.

	Density of farm habitations		
	1860	1900	1937
Sample strips	7.1	8.6	6.6
Entire region	6.6	8.0	5.8
Percentage error of samples	+7.6	+7.5	+13.8

For purposes of gradient analysis the land in the sample strips was classified according to steepness of slope. Four categories were recognized:

(a) level land: slopes less than 100 feet per mile (less than 2%)
(b) gradual slopes: slopes of 100 to 500 feet per mile (2 to 10%)
(c) marked slopes: slopes of 500 to 900 feet per mile (10 to 17%)
(d) steep slopes: slopes of more than 900 feet per mile (more than 17%)

Only level land can be considered free from erosion, although much of the gradually-sloping land has little of it. None of the steep land should be cultivated, according to Baker (1921).

In 1860, after 70 years of farming, unmistakable adjustments to gradient can be seen, density ranking roughly in inverse proportion to gradient, as shown in table 4. Level lands were carrying 1.5 times their areal share of population, whereas steep slopes supported only .4 of their allotted portion.

At the time of the 1860 census, decline in farming population was well under way, and the brief upward surge of 1870 to 1880 had not begun. When expansion did commence, it was not distributed evenly on the different types of slopes. Marked and steep slopes actually gained population while gradual and level categories lost (table 4). In fact, the year 1900 found steep slopes more densely populated than gradual ones. That viticulture was the major cause of such changes can be inferred from preceding discussions, and has been verified positively by comparing the figures for the sample strips of the plains, which have grown almost no grapes, with those for the entire sample area.

Following the influx of grape-growers, however, former tendencies reasserted themselves, and since 1900 areas of great slope have been the heavier losers.

Level Land and Farm Habitation Change. Although the more level land in the Canandaigua region has not always been the most favored type, it has generally been so, and the question arises as to whether such land has been favored regardless of other aspects of its physiography. Have the relatively level but high hilltops of the summit peneplain responded in the same way as the equally flat valley bottoms below them? Because the amount of level upland in the sample strips was too small to give satisfactory results, a different method was used. The two most typical plateau townships, South Bristol and Italy, were divided into three classifications; "upland flats," which are level to gradually sloping; "val-

ley-bottom flats," which are similar; and "valley walls," almost all of which are classed as "steep" or "marked" in gradient. Table 5 shows the population changes on these three types, which together constitute 76 square miles of the Allegheny Plateau.

Even in 1860, when transportation was by horse and wagon, the high flats were so difficult of access and their thin, shaley soils so poorly drained that they carried only .8 of their share of the population of the plateau, while the more-favored valley-bottoms supported 2.1 times their areal quota. The years between 1860 and the present have greatly increased this differential, so that today, the valley-bottom index number is 2.3, and that of the uplands only .4. Although 32 people occupy each level square mile of the valley bottoms, only 6 occupy each similar area of the uplands.

Because two different sizes of high flats are found in the region of study, an attempt was made to determine whether large summit areas fared any differently than small ones. The Italy uplands are two in number, each containing about ten square miles, whereas South Bristol has six of them, each of which contains about one and one-half square miles. The small flats were found to have supported somewhat fewer people per square mile at each date, but more importantly, to have suffered heavy decline at an earlier date than did the large summits (before 1900 rather than after that date; table 6).

The earlier decline of the small areas is apparently related to the fact that fewer people can occupy them. An upland with only four families on it has greater difficulty combating isolation than one with several times as many occupants, and the loss of one or two families is a serious blow.

Combining the foregoing observations regarding the three types of relatively level land in the plateau, it is found that they have ranked in the following order as regards ability to hold population: first, valley-bottom flats; second, large upland flats; third, small upland flats.

Other Relationships between Slope and Farm Habitation Change. Two other problems were considered in connection with the question of gradient and farm habitation change, but really significant results are lacking. One was the matter of relative merit of lake slope as opposed to interior valley slope, and the other was that of north-facing versus south-facing valley walls.

Regarding the latter question, it can be said that neither slope supports a significant number of people and that even where use is made of the sides of valleys, farm buildings are usually located at the bottom. Hence the best approach to the problem would be through studies of land utilization.

The only steep slope which is intensively utilized over a large area is that on the northwest side of Naples village (fig. 2). This valley wall,

TABLE 5.

Farm habitation changes, selected physiographic areas.

	Area	Farm habitations												Farm population density		
		Number			% Change			Density			Index					
	sq. mi.	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
Entire unit	76	480	490	273	+2	–44	–43	6.3	6.5	3.6	1.0	1.0	1.0	33	27	14
Upland flats	30	159	143	42	–10	–70	–74	5.3	4.8	1.4	.8	.7	.4	28	20	6
Valley walls	32	137	151	118	+10	–22	–21	4.3	4.7	3.7	.7	.7	1.0	23	20	15
Valley-bottom flats ..	14	184	196	113	+6	–42	–38	13.1	14.0	8.1	2.1	2.2	2.3	69	59	32

TABLE 6.

Farm habitation changes, large and small upland flats.

	Area	Farm habitations												Farm population density		
		Number			% Change			Density			Index					
	sq. mi.	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
All upland flats	30	159	143	42	–10	–70	–74	5.3	4.8	1.4	1.0	1.0	1.0	28	20	6
Large upland flats (Italy)	20	116	111	32	–4	–71	–72	5.3	5.1	1.6	1.1	1.1	1.1	28	21	6
Small upland flats (S. Bristol)	10	43	32	10	–26	–72	–77	4.3	3.2	1.0	.8	.7	.7	23	13	4

with a 50 percent gradient, faces southeast, and opposite it, on the other side of the village, is a similar slope which faces northwest. No other important differences between the slopes exist. The southeast-facing wall is completely covered with vineyards, rising terrace above terrace in the Italian and German manner, whereas the other slope is in full-grown forest. Probably 50 people per square mile are supported by the one, none by the other.

The other question raised in connection with slopes is that of the relative merit of lake slopes in comparison with those of interior valleys. Unfortunately there are only two good slopes reaching down to the lake, one in Middlesex Township and another opposite it in South Bristol, and the extraneous variables are numerous. The only generalization which can be made with assurance is this: that the interior valley walls have always been sparsely populated, and have declined at about the same rate as the general regions in which they lie, whether that be South Bristol or Middlesex, whereas the lake slopes, depending largely upon steepness of slope and thickness of soil, have either sustained their population well or have never been populated.

Naples Recessional Moraine and Farm Habitation Change. R. H. Whitbeck (1913) made an important study of the Driftless Area of Wisconsin, showing how the glaciation of Wisconsin had favored its agriculture. Opportunity is afforded in the Canandaigua region to study the influence of several glacial types upon habitation changes. Two brief studies have been made, comparing changes on the thick recessional moraine which blocked the southern end of the Canandaigua Valley with those on the very thin ground moraine of the valleys around it, and one comparing depopulation on the drumloidal hills of the plain with that of the more normal ground moraine on the opposite side of the lake.

The Naples recessional moraine (plate 3C) has been assumed to coincide with the area of Canadea soils in Naples Township (fig. 5). The remainder of the rural part of the township, except the low-lying, marshy alluvium at the southern end of Canandaigua Lake, has been used to exemplify thin ground moraine. The hummocky, swell-and-swale configuration of the recessional moraine is characteristic of such features everywhere, but it departs from typicalness in its drainage, which has been rather well integrated by north-flowing streams that drop at the rate of about 200 feet to the mile. The thin-tilled or "non-moraine" area has a similar stream pattern, but is less well-drained because of the West Hill sandy shales which lie just below the surface almost everywhere.

By 1860 the drift-built sector had a decided populational advantage over the "non-moraine," the density being 54.4 per square mile on the latter and only 15.9 on the former (table 7), but during the third quarter this differential was partially overcome by the erection of 41 new

TABLE 7.

The Naples moraine and farm habitation changes.

	Area	Farm habitations												Farm population density		
		Number			% Change			Density			Index					
	sq. mi.	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
Entire unit	36	201	243	175	+21	–28	–13	5.6	6.8	4.9	1.0	1.0	1.0	29.7	36.4	27.2
Recessional moraine	13	133	134	96	+1	–28	–20	10.2	10.3	7.4	1.7	1.5	1.5	54.4	43.3	29.6
Thin-tilled (non-moraine) area	23	68	109	79	+60	–28	+16	3.0	4.7	3.5	.5	.7	.7	15.9	19.7	14.0

TABLE 8.

Glacial deposits of the plain and farm habitation changes.

	Area	Farm habitations												Farm population density		
		Number			% Change			Density			Index					
	sq. mi.	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
Entire unit	39	254	314	285	+24	–9	+12	5.2	8.0	7.3	1.0	1.0	1.0	27.6	33.6	29.2
Drumloidal area	15	77	107	95	+39	–11	+22	4.5	7.1	6.3	.8	.8	.9	23.9	29.8	25.2
Ground moraine	24	177	207	190	+11	–9	+7	7.4	8.6	7.9	1.1	1.1	1.1	39.2	36.1	31.6

buildings on the non-moraine and only one on the moraine.[43] Incoming grape-growers were largely responsible for this change, but mixed farming may have been influential, judging from crop data contained in the state censuses of 1845 and 1855, which show that Naples was the best agricultural township in the plateau region even prior to the great spread of viticulture. Its farmers had almost as many acres of rye planted as did the other three townships together, and the yields per acre were outstanding. Furthermore, Naples topped all other townships in cheese production. Such mixed farming, later combined with grape culture, drew immigrants into many parts of the township; and because the moraine was already rather densely settled, increments were much greater on the thin-soiled non-moraine.

Since 1900, with the influx of new farmers stopped, both moraine and non-moraine have depopulated identically, preserving the proportions of 1900 and showing conclusively that the temporary advantages which the non-moraine enjoyed were the result, not of any differing ability to withstand depopulation, but rather of a variation in ability to attract compensating immigration. Today the moraine has densities slightly greater than the average for the entire Canandaigua region, plain and plateau included, whereas the thin-tilled hills and valleys of Naples are exceedingly sparsely settled.

Drumloidal Area versus Ground Moraine. Generally speaking, soil is the most important physical variable on the plain because physiographic differences are comparatively subtle there. Nevertheless, one striking topographic form is found, the drumloidal hills of central Canandaigua Township (fig. 2, plate 2B). For reasons not clearly understood they are absent across the lake in southern Hopewell and northern Gorham Townships, over which more level ground moraine, somewhat modified by glacial lake action, is spread.

The drumloidal area is a region of considerable surface configuration, like the plateau, but of little relief, like the plain; the ground moraine which was selected for comparison with it has little of either relief or surface configuration. Soils and accessibility of the two areas are comparable, and lake shore has been excluded from the computations for both types.

Differences in habitation density between the two kinds of landforms (table 8) were much smaller than those between the morainal types of Naples Township. Nevertheless the drumloidal area was so much less densely populated in 1860 that it registered large gains during the en-

[43] Here the advantage of habitation figures over population figures becomes apparent. Although the population of the moraine declined from 54.4 to the square mile in 1860 to 43.3 in 1900, there was one more dwelling on the moraine at the later date.

suing 40 years, increasing 39 percent in contrast to the 11 percent increment on the ground moraine. Before the ice-moulded sector had attained the number of farm dwellings held by the more level area, however, decline set in and both regions depopulated proportionately, with the result that today the densities stand in the same proportions as they did in 1900.

The four glacial types studied compare as follows in habitation density today:

Ground moraine of the plain	7.9	habitations per square mile
Naples recessional moraine	7.4	" " " "
Drumloidal region of the plain	6.3	" " " "
Naples thin-tilled area	3.3	" " " "

As further summary, a final table (table 9) has been compiled showing changes in number of persons in each of the physiographic types studied. The categories are not, of course, mutually exclusive.

Soil and Farming Habitation Change

Three studies were made to learn whether there were any similarities between soil regions and those of farming population changes since 1860. One is a survey of relationships on the sample strips, another is an analysis of Naples Township, and a third examines a part of the Ontario Lowland where soil is the only important physical variable.

Study of the Sample Strips

The soils of the sample strips were grouped in three different ways in order to ascertain what influence, if any, they had on population changes. The first grouping is by soil types or units, the second by textures, and the third by series.

Analysis by Soil Types. Six different types of soil have areas of more than one square mile on the sample strips and hence were judged large enough to warrant separate analysis. Each of the soils was described in chapter III and will be discussed here only in relation to the sample strips. Table 10 shows the habitation and population data for the six important soil types and is followed by table 11, in which soil types have been ranked in descending order of habitation density for each of the three dates. In successive columns to the right are given the habitation density, the thickness of the A horizon, and the texture of the B horizon.

Close correspondence between thickness of A horizon and habitation density existed in 1860. Ontario fine sandy loam, which has not only a favorable A horizon but an unusually porous B horizon, was the only soil to sustain a denser population than its topsoil would lead one to expect. Although figures for total thickness of A, B, and C horizons, that is,

TABLE 9.

Summary of physiography and farm habitation changes.

Physiographic units (In order of decreasing population density, 1860)	Farming population per square mile					
	Number			Comparative rank		
	1860	1900	1937	1860	1900	1937
Valley bottom flats	71.1	60.1	24.4	1	1	9
Lake slopes of S. Bristol township	55.1	50.0	41.6	2	3	2
Level gradient	54.1	53.0	42.8	3	2	1
Naples recessional moraine	47.2	37.4	25.6	4	5	7
Gradual slopes	40.8	36.1	26.4	5	6	6
Ground moraine (most of Gorham and Hopewell townships)	39.2	36.1	31.6	6	7	3
Marked slopes	38.7	39.9	26.8	7	4	5
Ontario Lowland Province	35.5	35.3	27.6	8	8	4
Entire Canandaigua Region	34.7	33.2	22.5	9	9	10
Allegheny Plateau Province	33.9	31.5	18.0	10	10	11
Large upland flats	28.1	21.4	6.4	11	12	15
Upland flats (large and small)	28.1	20.2	5.9	12	13	16
Drumloidal area	23.9	29.8	25.2	13	11	8
Small upland flats	23.9	13.4	4.0	14	17	17
Plateau slopes (of lake and interior valleys)	22.8	19.7	14.8	15	15	12
Steep slopes	15.4	19.7	12.0	16	14	14
Thin-tilled (non-moraine) area (Naples township)	14.8	18.9	13.2	17	16	13

TABLE 10.
Soil type and farm habitation changes.

	Area	Farm habitations												Farm population density		
		Number			% Change			Density			Index					
	sq. mi.	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
All types	29.2	208	252	193	+21	–23	–7	7.1	8.6	6.6	1.0	1.0	1.0	37.6	36.1	26.4
Ontario loam	9.0	82	95	85	+16	–11	+4	9.1	10.6	9.4	1.3	1.2	1.4	48.2	44.5	37.6
Livingston silty clay loam	3.4	25	28	25	+12	–11	0	7.3	8.2	7.3	1.0	.9	1.1	38.7	34.4	29.2
Volusia loam [1]	5.1	22	28	17	+28	–39	–23	4.3	5.5	3.3	.6	.6	.5	22.8	23.1	13.2
Volusia silt loam	2.6	12	13	5	+9	–61	–59	4.2	4.6	1.9	.7	.6	.3	22.3	19.3	7.6
Volusia shale loam [2]	4.5	9	12	12	+33	0	+33	2.0	2.7	2.7	.3	.3	.4	10.6	11.3	10.8
Ontario fine sandy loam	1.2	8	12	13	+50	–8	+63	6.7	10.0	10.9	.9	1.0	1.7	35.5	42.0	43.6
Miscellaneous [3]	3.4	50	64	36	+28	–43	–27	14.7	18.8	10.6	2.0	2.1	1.5	77.9	79.0	42.4

[1] Includes Wooster stony silt loam of 1916 survey (Italy and Middlesex townships).
[2] Includes Lordstown stony silt loam of 1910 survey (Italy and Middlesex townships).
[3] Includes all types having an area of less than one square mile.

TABLE 11.
Farm habitation ranking of soil types, 1860–1937.

Soil types	Thickness of A horizon (inches)	Texture rank (B horizon)	Total thickness of A, B, and C horizons	Habitations per square mile					
				Number			Rank		
				1860	1900	1937	1860	1900	1937
Ontario loam	8–12	3½	"many feet"	9.1	10.6	9.4	1	1	2
Livingston silty clay loam	10	6		7.3	8.2	7.3	2	3	3
Ontario fine sandy loam	8–10	2		6.7	10.0	10.9	3	2	1
Volusia loam	10	3½		4.3	5.5	3.3	4	4	4
Volusia silt loam	5–8	5	"more than 3 feet"	4.2	4.6	1.9	5	5	6
Volusia shale loam	4–6	1	"less than 3 feet"	2.0	2.7	2.7	6	6	5

depth to bedrock, are fragmentary, those which are available show a correspondence in rank between thickness of A horizon and thickness of all unconsolidated material (table 11). Hence habitation density is related, not only to thickness of A horizon, but presumably to distance to bedrock as well.

Because the early settlers usually judged the quality of a soil in terms of the size of the trees which it supported (Cleveland, 1873), they settled on the thicker and better drained soils first, thus indirectly establishing a crude relationship between population density and thickness of A horizon. During the eighty years of settlement adjustment prior to 1860 this relationship probably was not altered. Even today it is clear, although somewhat weakened by two changes: the rise of the Ontario fine sandy loam from third rank to second and finally to first by virtue of a unique increase in habitations since 1900; and by the rise of the very poor Volusia shale loam from the bottom of the list to the next higher position. In both of these exceptional cases, good drainage and accessibility seem to have been responsible. In receiving an actual gain in habitation between 1900 and 1937, the Ontario fine sandy loam became unique. No other kind of soil, nor any category of gradient or physiography, shares this distinction.

The other relationship tested in table 11 is that between habitation density and soil texture. No correspondence in rank appears at any period.

Analysis by Soil Texture. Although no similarity between habitation density and soil texture appeared in table 11, it seemed possible that more generalized tabulation might reveal gross relationship, so another grouping was made.

This time all of the 23 soil types found on the sample strips, regardless of area, were put in one of the following texture categories: (a) coarse loams (the sandy, gravelly and shaley textures), (b) fine loams (the silty and clayey textures), (c) simple loams, (d) clays, or (e) muck. After tabulation, the clays and muck were eliminated because they totalled less than one square mile of area. The results are shown in table 12. Even on this generalized basis it will be seen that there was no relationship between rank of texture and rank of habitation density in 1860 or in 1900, but that by 1937 some correspondence was evident. Such relationship is largely a result of important increases on the shale (coarse) loams of the plateau valley walls between 1870 and 1880, followed by relative stability between 1900 and 1937 while the other textural classes declined considerably.

Hence in recent years a faint relationship between texture and population density has developed.

TABLE 12.

Soil texture and farm habitation changes.

	Area	Farm habitations												Farm population density		
		Number			% Change			Density			Index					
	sq. mi.	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
All categories	29.2	208	252	193	+21	–23	–7	7.1	8.6	6.6	1.0	1.0	1.0	37.6	36.1	26.4
Coarse loams [1]	3.5	17	33	31	+94	–5	+84	4.9	9.5	9.0	.7	1.0	1.3	26.0	39.9	36.0
Loams	11.9	98	114	99	+16	–13	+1	8.2	9.6	8.3	1.2	1.1	1.3	43.4	40.3	33.2
Fine loams [2]	13.1	93	110	60	+18	–45	–35	7.1	8.4	4.6	1.0	1.0	.7	37.6	35.2	18.4
Miscellaneous [3]	.7	0	3	3	0	0	0	0	4.3	4.3	0	.4	.5	0	18.1	17.2

[1] Sandy, gravelly and shaly loams.
[2] Silty and clayey loams.
[3] All types having a total area of less than one square mile (specifically, clay and muck).

TABLE 13.

Soil series and farm habitation changes.

	Area	Farm habitations												Farm population density		
		Number			% Change			Density			Index					
	sq. mi.	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
All series	29.2	208	252	193	+21	–23	–7	7.1	8.6	6.6	1.0	1.0	1.0	37.6	36.1	26.4
Ontario	10.4	91	112	98	+23	–13	+8	8.8	10.8	9.4	1.3	1.3	1.5	46.6	45.4	37.6
Livingston	3.4	25	28	25	+12	–11	0	7.3	8.2	7.3	1.0	.9	1.1	38.7	34.4	29.2
Volusia [1]	13.2	59	74	40	+26	–46	–32	4.5	5.6	3.0	.6	.6	.4	23.9	23.5	12.0
Miscellaneous [2]	2.2	33	38	31	+20	–22	–7	15.0	17.3	14.1	2.1	2.0	2.1	79.5	72.7	56.4

[1] Includes Wooster and Lordstown of Italy and Middlesex.
[2] Includes all series having an area of less than one square mile.

Analysis by Soil Series. Discussion in preceding sections has shown that there was strong relationship between population and thickness of A horizon, although this has weakened somewhat in recent decades; also that an almost insignificant association between habitations and texture has become evident in late years.

To round out this study of the sample strips the soils were reorganized for a third time, according to series. Only three of them have areas greater than one square mile. These are shown in table 13, ranked in the descending order of thickness.

At each of the three dates population density ranked the same as soil thickness, and the differential is much greater today than it was in 1860, as shown by the change in indices. Hence the study by series and the study by texture each corroborate the findings of the study based upon soil type or unit.

Study of Naples Township

In an earlier section the recessional moraine of Naples Township was seen to have begun the period under examination with more than three times the population density of the surrounding "non-moraine," an advantage which was reduced by one-third as a result of the late 19th century immigration. Because the recessional moraine is composed of two soil types which have in common great thickness of parent material, but in contrast very different textures, they were analyzed separately, and compared with the neighboring thin-tilled soil types, of which there are three (Volusia loam, shale loam, and silt loam).

The two morainal soil types are the Canadea gravelly loam, with a seven-or-eight-inch A horizon and a B horizon containing considerable interstitial sand; and the Canadea silt loam, with a slightly thicker A horizon (8 to 10 inches) and considerable silty and clayey interstitial material in both A and B horizons. Thus drainage in the silt loam is only fair, and the soil is subject to considerable erosion.

Table 14 shows that there have been great differences in the number of people on the various soil types of Naples Township. Section A shows that here, as on the sample strips, the thicker series has had the denser population. Here, however, the differential has declined somewhat since 1860. The great viticultural immigration to Naples, because it took little cognizance of soil conditions, tended to populate the thin soils more than had been the case on the sample strips.

Section B of the table shows that, as is to be expected, texture and population had little in common, but that there was an increasing tendency towards relationship, as revealed by the following summary.

TABLE 14.

Soil and farm habitation changes, Naples township, 1860–1937.

	Area	Farm habitations												Farm population density		
		Number			% Change			Density			Index					
	sq. mi.	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
Entire unit	36	201	243	175	+20	–27	–12	5.6	6.7	4.9	1.0	1.0	1.0	29.7	28.1	19.6
A.																
Canadea series	13	133	134	96	+1	–28	–20	10.2	10.3	7.4	1.7	1.5	1.5	54.4	43.3	29.6
Volusia series	23	68	109	79	+60	–28	+16	3.0	4.7	3.5	.5	.7	.7	15.9	19.7	14.0
B.																
Gravelly loam	8	93	93	70	0	–25	–25	11.6	11.6	8.8	2.0	1.7	1.8	61.5	48.7	27.2
Shale loam	9	17	53	48	+212	–9	+182	1.9	5.9	4.7	.3	.8	1.1	10.1	24.8	21.2
Loam	8	31	30	18	–3	–40	–42	3.9	3.8	2.3	.7	.6	.5	20.7	16.0	9.2
Silt loam	11	60	67	39	+12	–42	–35	5.5	6.1	3.5	1.0	.9	.7	29.2	25.6	14.0

TABLE 15.

Soil type and farm habitation changes, Ontario plain.

	Area	Thickness of A horizon	Farm habibtations												Farm population density		
			Number			% Change			Density			Index					
	sq. mi.	(inches)	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
Entire unit	40.2	–	257	322	279	+25	–13	+9	6.4	8.0	6.9	1.0	1.0	1.0	33.9	33.6	27.6
Dunkirk clay	9.5	7	49	61	48	+24	–21	–2	5.1	6.4	5.0	.8	.8	.7	27.0	26.9	20.0
Dunkirk silty clay loam	15.0	8	89	110	99	+24	–10	+11	5.9	7.3	6.6	.9	.9	.9	31.3	30.7	26.4
Ontario loam	15.7	8–12	119	151	132	+21	–13	+11	7.6	9.6	8.4	1.2	1.2	1.2	42.3	40.3	33.6

	Textural rank	Habitation density 1860	1900	1937
Gravelly loam	1	1	1	1
Shale loam	2	4	3	2
Loam	3	3	4	4
Silt loam	4	2	2	3

In Naples Township, as on the sample strips, there has been a tendency for change from correlation of population density with thickness of A horizon to one with texture of the same stratum.

In passing, it should be said that Naples Township affords striking illustrations of the many interesting populational details which are apt to go unrevealed in census reports. Thus, this area of forty-one square miles, if studied from census reports, would show population density changes as follows:

1860	30.1 persons per square mile
1900	32.7 " " " "
1937	21.3 " " " "

Actually there were, in clearly defined physical units, densities as different as these:

1860	17.5 to 61.5
1900	18.1 to 48.7
1937	8.8 to 27.2

Study of Part of the Ontario Plain

The extreme northern part of the Canandaigua region is very uniform topographically, and thus the soils become the important physical variable. For this reason, and also because much of the soil belongs to the Dunkirk series, which has not elsewhere been related to changes in the distribution of habitations, Dunkirk soils of the Ontario Plain are analyzed in the following paragraphs.

They consist of two textural types, the Dunkirk clay, derived from fine glacio-lacustrine sediments, and from which water tends to escape only with difficulty; and Dunkirk silty clay loam, which is somewhat better drained in both A and B horizons. To them, for comparative purposes, has been added the Ontario loam, the other important soil type on the Ontario Plain.

A moderate population differential exists between each of the three types (table 15) in spite of the absence of contrasts in topography and accessibility. Because the ranking of both texture and thickness are identical for these soils, habitation densities correspond to both. Differentials have not changed in magnitude importantly since 1860, as shown by the indices.

Accessibility and Farming Habitation Change

The two most important aspects of local accessibility namely, presence of paved roads and proximity to town, have been studied briefly and will be commented upon. In addition, an analysis of the changing distance of farm population from the lake has been included in this section, although it is recognized that not only accessibility, but also micro-climate has been important in influencing the shift.

Quality of Roads as a Factor. The history of road improvement here has been long. By 1860, which was the beginning of the third quarter, the days of turnpikes and plank roads had gone, and gravel was being applied to the main thoroughfares. Shortly after the opening of the fourth quarter the first macadam was applied, and at present concrete pavement is common on through highways. There is today one mile of "surfaced" road (that is macadam or concrete) to each 2.7 square miles of area (fig. 12).

The road pattern at present is essentially the same as it was 80 years ago. Only a few isolated connecting roads in the back country have been abandoned, as a result of depopulation and the speeding-up of transportation.

It is a simple matter to determine population densities along the present-day paved and unpaved (i. e., surfaced and unsurfaced) roads and thus to evaluate road quality as an influence upon contemporary population densities. In order to project this analysis into earlier periods, however, it has been assumed that the routes on the sample strips which are surfaced today have been the best roads ever since 1860. Certainly in very few instances has the relative quality of a thoroughfare changed significantly since that date.

With this assumption as basis, an analysis was made of population changes on the sample strips since 1860 in relation to present-day road condition. Table 16 reveals that in 1937 paved roads supported more than twice as many families as did unpaved roads, and that furthermore, even in 1860, the roads later to be paved had almost as great a populational advantage over those not to be paved as they have today. Evidently the gravel and plank thoroughfares of 1860 were only slightly less superior to their contemporary natural roads than present-day macadam and concrete are to the coexistent gravelled and unimproved roads.

The fact that there was less differential between the two kinds of roads in 1900 than at either of the other two dates reflects greater scattering of the population at that time, when upland flats had not yet been severely depopulated, but steep slopes had already been settled.

Distance from Village as a Factor. In an attempt to answer the question of how far away from a village the population density is affect-

TABLE 16.

Road type and farm habitation changes.

	Length, linear miles	Farm habitations: Number			Farm habitations: % Change			Farm habitations: Density			Farm habitations: Index			Farm population density		
		1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
All types	48.5	208	252	193	+21	–23	–7	4.3	5.2	4.0	1.0	1.0	1.0	22.8	21.8	16.0
Roads paved in 1937	12.5	90	104	95	+16	–9	+6	7.2	8.3	7.6	1.7	1.6	1.9	38.2	34.9	30.4
Roads unpaved in 1937	33.2	115	146	98	+27	–39	–15	3.5	4.4	3.0	.8	.9	.8	18.6	18.5	12.0
Roads abandoned in 1937	2.8	3	2	0	–33	–100	–100	1.1	.7	0	.3	.2	0	5.8	2.9	0

TABLE 17.

Distance from town and farm habitation changes.

	Area sq. mi.	Farm habitations: Number			Farm habitations: % Change			Farm habitations: Density			Farm population density		
		1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937
Entire unit	48	339	453	376	+32	–17	+10	7.1	9.4	7.8	37.6	39.5	31.2
Land within ½ mile of village ..	10	88	148	126	+68	–15	+43	8.8	14.8	12.6	46.6	62.2	50.4
Land ½ to 1 mile	16	122	151	122	+26	–19	+9	7.0	9.4	7.6	37.1	39.5	30.4
Land 1 to 1½ miles	22	129	154	128	+19	–17	–1	5.9	7.0	5.8	31.3	29.4	23.2
Entire Canandaigua region	298	1988	2359	1694	+19	–28	–15	6.7	7.9	5.7	35.5	33.2	22.5

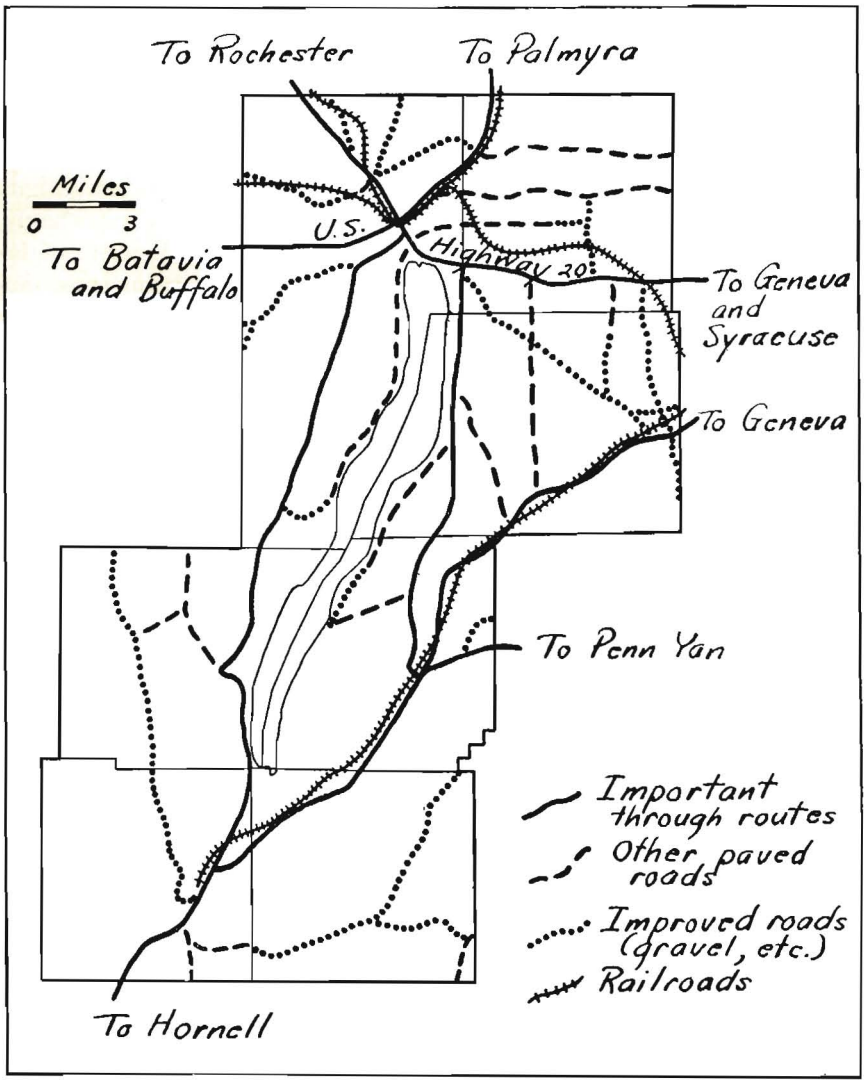

FIG. 12. Transportation map, Canandaigua region.

ed by that village, belts one-half mile wide were drawn around each of the four leading villages and the population at each different period within these one-half mile belts was computed (table 17). By comparing these figures with those of the area as a whole, it was apparent that the half-mile zone had greater than average density, and that the differential has increased at each period.

The second belt plotted around each village included all land between one-half mile and one mile from the edge of town. At this distance dif-

ferentials were less, but still significant (table 17). Here, too, they increased from 1860 to 1900, and from 1900 to 1937.

Between one mile and 1½ miles from town, urban influence was ineffective until after 1900, but by 1937 a slight response was observed, as shown in table 17. Hence the radius of village influence has increased.

It was also found that only the two largest towns, namely Canandaigua (7,541 people) and Naples (1,070) affected their environs importantly, and that Naples, although the smaller town, had the larger sphere of influence. This is because viticulture is more dependent upon proximity to shipping point or winery than are the general types of agriculture found around Canandaigua.

Distance from Lake as a Factor. Canandaigua Lake influences the farming population of the area in two ways: first, it tempers the climate, thus prolonging growing season and benefiting agriculture; second, its valley has somewhat better roads than does the back country, because of lower elevation and much heavier traffic during the summer season. Hence most people have chosen to dwell rather near the lake, a preponderance which is increasing (table 18). Whereas the median distance of the land in the sample strips is 3.12 miles from the lake, the median distance of population was 2.84 miles in 1860, 2.56 in 1900 and 2.37 in 1937.

Although distance from lake has declined consistently over the area as a whole as shown in table 18, the plains portion of the sample strips has reacted in exactly the opposite direction, as shown in the following analysis of median distance of farms from lake:

	Miles		
	1860	1900	1937
Plains samples (Canandaigua and Gorham)	2.23	2.78	2.62
Plateau samples (South Bristol and Middlesex)	2.22	1.34	1.50

On the plain the surrender of farm land to summer cottagers has helped to swing the center of populational gravity landward, while elsewhere heavy interior depopulation has pushed the median towards the lake shore.

Changing Distribution of the Summer Cottages

Entirely missed by the Federal Census is that great group of transient but important residents of the Canandaigua area, the summer folk. At any time between Memorial Day and Labor Day there are thousands of them, employing laborers, paying taxes, and buying almost everything from food to farms. They double the population of at least one township[44] during "the season," and populate an entire village which ranks

[44] Gorham has approximately 461 permanently-occupied dwellings and 469 summer cottages.

TABLE 18.

Distance from lake and farm habitation changes.

	Area	Farm habitations												Farm population density		
		Number			% Change			Density			Index					
	sq. mi.	1860	1900	1937	1860–1900	1900–1937	1860–1937	1860	1900	1937	1860	1900	1937	1860	1900	1937
Entire unit	29.2	208	252	193	+21	–23	–7	7.1	8.6	6.6	1.0	1.0	1.0	37.6	36.1	26.4
0 to 1 mile	4.0	22	41	38	+86	–7	+73	5.5	10.3	9.5	.7	1.1	1.4	29.2	43.3	38.0
1 to 2 miles	5.0	46	56	44	+22	–21	–4	7.2	11.2	8.8	1.3	1.3	1.4	48.8	47.0	27.2
2 to 3 miles	5.0	43	52	39	+21	–25	+19	8.6	10.4	7.8	1.9	1.2	1.2	45.6	43.7	31.2
3 to 4 miles	5.0	30	33	22	+10	–33	–27	6.0	6.6	4.4	.8	.8	.7	31.8	27.7	17.6
4 to 5 miles	4.0	36	37	24	+3	–35	–33	9.0	9.3	6.0	1.3	1.2	.9	47.7	39.1	24.0
5 to 6 miles	3.0	15	17	15	+13	–12	0	5.0	5.7	5.0	.7	.7	.8	26.5	23.9	20.0
6 to 7 miles	3.0	12	13	10	+8	–23	–17	4.0	4.3	3.3	.6	.5	.5	21.2	18.1	13.2
7 to 8 miles	.2	4	3	1	–25	–67	–75	20.0	15.0	5.0	2.0	1.0	1.0	106.0	63.0	20.0

as the third largest in the area.[45] They increase the entire population of the region by 24 percent, and the rural population by 49 percent, not including the hundreds of people who live in tents, tourist cabins, trailers, and hotels during the summer months.

More factors than the beauty of the clear blue water backed by rolling slopes or rugged hiles (plate 3D) are necessary to explain this great concentration of recreation seekers. The elongated shape of Canandaigua Lake has resulted in a shoreline of 33.7 miles, more than twice the length it would have if the lake were circular. Within a 30-mile radius of the lake are a total of more than 600,000 people (ten different states of the Union have less). Largest of the urban centers is Rochester, only 25 miles from the northern end of the lake, a city of 328,000 people with standards of living somewhat above the national average. A modern concrete highway, four lanes wide in places, as well as a railroad and a bus line, link Canandaigua to Rochester.

In spite of many favorable qualities, the lake is not ideal for the development of great cottage densities, for shale bluffs rise so steeply from the water along some miles of frontage that cabins must either be perched at the top of them or utilize the very small bits of alluvium at their bases. In an attempt to gain isolation and a picturesque setting on the shores of this densely populated lake, a level site for at least one cottage has been blasted from a rocky protrusion (plate 4B). Beaches almost everywhere are composed of chips of shale, and while not so pleasant for bathing as those of quartz sand, are nevertheless quite satisfactory except where shore currents have placed the fragments on edge. A further disadvantage lies in the competition for resort business which is offered by several other Finger Lakes and by Lake Ontario.

By 1876 the advantages of seasonal living in this scenic and accessible basin were recognized and resort development began, aided by regular steamboat connections on the lake itself, by railroad, and later by a trolley line overland from Rochester. By 1900 there were probably 150 summer cottagers in the area (in any case not more than 180 nor less than 50).

Partly because of greater accessibility in a period of slow travel, the western side of the lake had 50 percent more cottages than the eastern side, and the northern end a few more than the southern end in 1900. Even before automobiles became popular, and at about the period when the main roads were being paved, cottage construction entered its boom period. By 1911 Gorham Township had an average of one cottage to every 500 feet of shoreline.

Today there are more than a thousand cottages along the lake shore, an average of one every 174 feet, in spite of several miles with few cot-

[45] Cottage City, in Gorham Township, has 162 dwellings.

tages or none at all. Cottage densities can be summarized by townships as follows:

	Number of cottages	Number of miles of shoreline	Number of feet per cottage
Canandaigua	308	11.2	190
Gorham[1]	307	7.4	127
Middlesex	110	7.2	346
South Bristol	123	7.3	312
Italy	4	.5	660

[1] Cottage city, with 162 cottages, not included.

The northern half of the lake has twice as great densities as the southern half, which is from five to 15 miles farther from Rochester and has a much greater proportion of shoreline bluffs.

Canandaigua vacationists enjoy arguing the merits of the eastern shore versus the western shore as the ideal cottage location. Judged by the number of people who have settled on each side the decision goes conclusively to the "east-siders," for on that side there is a cottage every 143 feet, while on the west side dwellings are scattered at an average interval of 242 feet. Because any given place on the eastern shore is only a mile or two farther from Rochester than the corresponding point on the west side of the lake, and because the concrete environmental qualities are quite similar on both sides, one wonders whether such abstract factors as the beauties of the sunset and the view of the lofty Bristol Hills from the east side have really influenced population densities.[46] Easterliness is, however, less important than northerliness.

Cottages in the Back-Country. Partly for esthetic reasons, but largely because of cheaper real estate, many resort cottages have been built back in the hills, away from the lake. This movement did not gain importance until the economic depression of the 1930's, but already there are 38 of these isolated cottages. Thirty-five of them are in the regionally-famous Bristol Hills section of South Bristol Township and the southwest corner of Canandaigua Township. Of this 35, 20 are in valley-bottom locations and only 10 are on the lofty flat tops which provide such fine panoramic views, but are apt to be inaccessible in wet weather and in winter. Twenty-six of the 35 are in the extreme western part of the area, mostly in the Frost Hollow district, and only four are on the lake slopes. This, too, is the result of accessibility, for increasing distance from the lake means decreasing distance from Rochester, and the back-country cabin owners are more apt to be week-enders or over-night commuters than season-long occupants.

[46] No investigation of comparative real estate costs was made, nor of a possible tendency for west-siders to own wide beach frontages which they have not cared to subdivide.

Of the 35 hill-country resort cabins only three are on pavement, but all are within 1½ miles of it. At least half of them were farmhouse sites in 1900, a fact which helps to explain why 33 of them are on the poor Volusia soils and only two on the better Ontario soil.

The three remaining hill cabins are widely separated, two being in Naples Township and only one on the east side of the lake, in Italy. The great hills and valleys of Middlesex and Italy could support hundreds of such cottages in comparative isolation, and probably will do so as the best sites on the western side of the lake are taken, as automobile travel speeds up, and the working day is abbreviated. The popularity of hill-country cabins will increase in the future, somewhat as that of lake cottages has done in recent decades. As farm population continues, the resort development of the area can proceed almost indefinitely.

Changing Distribution of the "Urban" [47] Population

Because changes in urban population affect such small areas they do not constitute an important part of this study. But they deserve mention because the villages and cities of the Canandaigua region contain more than half the present population. In 1930 the area had 16,623 people, of whom about 10,003 were "urban" and 6,620 were "rural." On the basis of population changes since 1860, the villages can be divided into three groups.

The first category is that of agglomerations which gained population during each of the last two quarters. The incorporated city of Canandaigua with 7,541 persons or 46 percent of the total, is the only urban unit in this class. In contrast to all other areas studied, except that of the Ontario sandy loam, the site of this city gained population during each of the last two quarters, and in fact has never lost population during any decade since its history began. Growth has not, however, been continuous. Census figures since 1860 show that there have been two great waves of increase separated by periods of stagnation. The first wave, between 1870 and 1880, is adequately explained by the immigration of that period. More than one-third of the regional increase of that decade was localized in Canandaigua city. Three new railroads, within 25 miles of the city, were completed at that time, and several new manufacturing enterprises attempted.

Another surge, from 1900 to 1910, increased the Canandaigua population by 17 percent, yet was not accompanied by increases in any whole township in the region, nor even in the next largest village, Naples. Rapid increase in resort business, development of the Lisk Enamelware Manufacturing Company and of the McKechnie Brewing Company were important factors.

[47] The term "urban," as used here, includes all agglomerations, even hamlets.

Appoximate stability has characterized the population since 1910, although the decade 1920 to 1930 brought slight increases, based largely upon resort activity.

The second category of urban population is the group of villages which show, like the first category, a net gain in population between 1860 and the present but which lack the populational increase of 1900 to 1910. Naples is the type example. It shows a definite surge between 1870 and 1880, but approximate stability ever since. Hence the curve for this village and of others in the group is more like the curve for rural population than like that for Canandaigua city. Included in this group, in addition to Naples (population 1,070 in 1930), are Gorham with 400 people,[48] Middlesex with 250, Cheshire with 150, and Bristol Springs with 50.

The third category is made up of the agglomerations which have remained stable, or have declined, since 1860. It includes Chapin, with about 125 people; Hopewell Center with about 70; Centerfield, with 50; Italy, 35; and Italy Hill, with only about 20 inhabitants. These are the hamlets whose reason for existence almost disappeared with the coming of the automobile. At best they are to the families of the neighborhood what the corner store is to the city resident. With but one exception (Chapin), they are the smallest agglomerations in the region. Situated on both plain and plateau, they indicate that their character is more a function of size than of location.

Thus it can be seen that population changes in villages and cities are more a function of size of village than of geographical location.

VI. RECAPITULATION AND SUMMARY

This study has described and analyzed the changes in number and distribution of people inhabiting the Canandaigua basin and some of the most important findings will be recapitulated here.

There are many similarities between the Indian occupance and that of the whites, even though the Indians were only one-tenth as numerous as their successors. Early Seneca history was marked by abandonment of the Allegheny Plateau in favor of the Ontario Plain, probably because of better agricultural conditions on the lowland. Indian population, even as that of the whites, had its periods of marked decline, although they were the result not so much of migration as of the Colonial Wars. At least one-half of the Senecas lived, as today almost half of the whites do, in a single village at the foot of Canandaigua Lake. The village was so large that if it were recreated today it would rank as the third largest agglomeration in the region.

[48] This figure and the following ones are only approximate, being based upon habitation counts.

The history of white settlement does not include a period of active competition with the Indians, for most of the aboriginals were driven westwards ten years prior to the arrival of the first New Englanders. Impopulation, begun at Canandaigua village, spread southward, the dates of settlement of most areas being a function of elevation above sea level, thus making the map of population at the close of the first quarter (1820) resemble a crude hypsometric map. Expansion from original township nuclei tended to be contiguous on the plain and scattered on the plateau, for on the latter the distribution of good farm land was spotty. The land settled first in about half of the townships had strategic significance, as proven by a tendency for original sites to maintain economic focality down to the present.

During the last half of white population history certain areas have been more favored than others. Thus, depopulation of the Ontario Lowland has been less rapid than that of the Allegheny Plateau. No other generalizations regarding large areas can be made. It was found impossible to construct an isarithmic map of either habitation or population change, because of the extremely spotty distribution of these phenomena and the absence of transition zones, facts which reflect complex environmental backgrounds on the plateau and widespread uniformity on the plain.

There are, however, many scattered points which fared better than average throughout either the third or fourth quarters (1860–1900, 1900–1937) or both. During the third quarter these were areas of actual net gain in habitations whereas in the fourth quarter they have been merely areas of minimum loss.

The localities of unusual third-quarter increment include part of the environs of the three largest towns and several sites with an unusual combination of viticultural advantages, such as open-valley topography with significant south-facing slope components less than five miles from an important town. The few remaining areas are based upon miscellaneous qualifications.

During the fourth quarter the only area which has been favored because of proximity to an "urban" site has been that around Canandaigua. In addition, some of the viticultural sites which had been important gainers during the preceding quarter have remained, by virtue of only slight losses, among the favored sites. Good roads were an additional asset shared by many, but not all, of these little-depopulated areas. But it appears that on the plateau each township tended to have a single area which was superior even if only in comparison with the poor land around it. Very few of the especially favored local areas were on the plain, because population changes there tended to be as uniform as the topography.

It is not easy to generalize on the characteristics of sites which suffered greater-than-average loss of population. During the third quarter most of these were localities of low accessibility, poor soil and steep slope, but a varying combination of these three items, rather than the predominance of any one, was responsible. Throughout the last quarter all the districts of maximum loss have been on plateau uplands, some of them being almost barren today after having supported as many as thirty or forty persons to the square mile.

Thus identification and study of areas of radical tendency showed that distance from town, quality of road, degree and direction of slope, type of soil, and several miscellaneous factors were involved. The next step was the evaluation of the relative importance of each of these factors by measuring the population changes which took place upon them.

The density of rural population in the Canandaigua region ranks in inverse proportion to steepness of land, level land having more than three times as many people per square mile as has steep land. But differences in gradient are less important today than they were in 1860, thus running contrary to the general principle that as civilization progresses, the returns, from the farming of steeper lands diminish. This exception is the result of the spread of viticulture after 1860.

Not all level or gently sloping land is densely populated, however. The summit peneplain remnants, with their poorly drained soils and their steeply-pitched connecting roads, have only one-sixth as many people to the square mile as have the valley bottoms below them, and only one-third the density found on the slopes which separate the uplands from the bottoms. This is true today in spite of the fact that the ratio of people to area on the valley floors has dropped from twice that of the plain to approximately the same number. Furthermore, the small peneplain remnants have somewhat smaller densities than the larger ones.

The four different types of glacial deposits in the region support widely differing population densities. Until very recently the thick, well-drained recessional moraine at the southern end of Canandaigua Lake, which played such an important part in the physiographic evolution of the lake, has supported more people per unit of area than has the ground moraine or the drumloids of the plain, and many more than the very thin-tilled areas characteristic of the plateau. Here, then, is an area on the plateau which has had a much denser population than that of the lowland.

The distribution of people throughout the Canandaigua basin is a function of thickness of A horizon of the soil, and bears only slight relationship to the texture of that soil. These statements apply today with slightly less force than they did in 1860. The Volusia soils, with eluviated zones averaging only four to eight inches in thickness, have less than

one-half the population density of the Ontario soils, which are characterized by A horizons eight to ten inches thick. The same relationships apply, to almost as great a degree, to soil types or units.

Road condition, too, has a direct effect upon population density. Those thoroughfares which are surfaced today have always had at least twice the population of those at present unsurfaced. As the pavement is actually applied these differentials are increasing somewhat.

The presence of a village of more than five hundred people induced greater than average population densities to a distance of one mile until 1900, and to one and one-half miles since that date. Maximum effect was found in 1900, after the markets and transportation facilities represented by the agglomerations were well developed, but before the automobile had disseminated the influence of these factors over very large areas. Villages with fewer than five hundred people have exerted no influence during either period.

Finally, in a general way distance from lake bears a direct relationship to population density, for the median distance of farms from Lake Canandaigua has been constantly declining throughout the region as a whole. On the plain, however, where the tempering effect of water on climate is minimal and the opportunity to sell farm land for recreational uses is maximal, farms have gradually retreated from the shore.

Thus each of the factors analyzed correlates either directly or inversely, at least in a general way, with population density. The factors road type and distance from lake are increasing slightly in importance, while the others remain static or decline somewhat.

The first summer cottage in the Canandaigua basin was built about 1876, and since then seasonal dwellings have become so numerous that when all of them are occupied the population of the region is increased by 24 percent, the rural population by 49 percent, the number of people in one of the townships is doubled, and an entire village, desolated in winter, becomes the third largest town in the region.

Among the factors which give such magnitude to this seasonally-pulsating population change are the unusually long shoreline of attenuated Canandaigua Lake, and the presence of more than a half-million people within a distance of thirty miles. Almost two-thirds of the cottagers live around the northern half of the lake, in order to be near their permanent residences and to avoid the steep bluffs which flank so much of the southern half.

In recent years several additional cabins have been built in the hills of South Bristol, several miles from the lake, where distance from Rochester is at the minimum consistent with refreshing landscapes and isolation. Few of these cabins are on hilltops where the scenery is best, but most of them are on the valley bottoms, which are more accessible;

few of them are on pavement which can be travelled easily in all kinds of weather, but all are within one and one-half miles of it. The potential increase in the number of these habitations is almost infinite, whereas that of the lake-front cottages is limited by the already dense population, the unwillingness of many lake-front landowners to subdivide their property, and the presence of several miles of shoreline bluffs.

The only city in the region is Canandaigua, with 7,541 persons, or 46 percent of the total, although the presence of several villages and hamlets brings the number of people living in agglomerations to 60 percent. Based upon population changes, these towns fall into three classes: those which gained during both the third and fourth quarters; those which gained only during the third quarter; and those which gained during neither. Canandaigua is the only representative of the first class; several villages with populations ranging from 50 to 1,000 inhabitants constitute the second group; and hamlets having from 20 to 125 people comprise the third. Since there is little relationship between the locality of a village and the class in which it is found, it can be said that "urban" population change is a function of size rather than of direct environmental qualities.

In conclusion it should be stated that most, but not all, of the important findings of this study would have been impossible without the series of maps showing the location of individual habitations at various dates. On the other hand, not all of the possibilities of these maps have been realized. They are eminently suited, for example, to exploration of population changes by the method of correlation coefficients, too long neglected by geographers.

Regarding the broad problem of decadence in the Canandaigua region, it can be said that the principle of comparative advantage, operating in a region which has only limited physical assets in the usual sense of the term, holds both the explanation of the past and the key to the future. The once glorious farm lands of the basin were fertile and rich only in comparison with the inadequate agricultural resources of New England. As the rolling, calcareous prairies of the Midwest were turned to the plow, the comparative advantage of upper New York State in the production of grain and meat was largely neutralized, and later, when the route to the Midwest moved northwards onto lower, more level stretches of the Ontario Plain, decline set in.

The region has been able to offer two major challenges to decadence, each based upon an unusual economic advantage. One, her steeply-sloping grape land, was developed in the 1870's; another, her inland lake with its attractive scenic setting, came into productivity shortly after 1900. Future decades may bring some new activity which the lake or plain or hills of the Canandaigua region can turn to new advantage.

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