LAND USE IN THE GUN LAKE OUTWASH PLAIN

Thesis for the Degree of M. A.
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Philip Shea

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by

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AN ABSTRACT

Submitted to the College of Science and Arts
Michigan State University of Agriculture and
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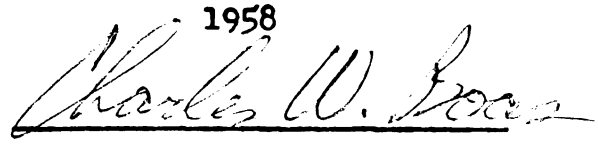
Approved 

Philip Shea

ABSTRACT

This thesis was undertaken as a geographical description and analysis of the present land use in the Gun Lake outwash plain. Evidence gathered during this study indicates that there are three distinct types of land use in the outwash plain: agricultural, recreational, and land utilized for settlement and transportation facilities. Description and analysis are designed to present the location, form, and function of these three types of land use. In the course of description, numerous contrasts between these land use types are noted. Some of these contrasts are the result of a direct relationship with the elements of the physical environment, some are the indirect result of this relationship, while others seem to be completely unconnected with the physical environment.

Agricultural land use in the outwash plain is composed of two diverse operations. One is the extensive small grain and dairy farming of the non-organic soils area, the other the intensive specialty crop farming of the muck soils area. Small grain and dairy farming has been active in the outwash plain at least a century. This type of farming is extensive in operation, the farms averaging over 80 acres in size. It covers a total area of approximately seventy per cent of the outwash plain, and utilizes gently rolling terrain. Muck soil specialty crop farming operations are intensive, and are developed on the flat black muck land which occupies ten per

cent of the surface area of the outwash plain. The muck farming operations have been developed for a period of fifty years. With the exception of several large and important establishments the farms are small, constituting farm holdings of twenty or forty acres. Onions, celery, potatoes, and corn are the main crops.

Recreational land use is classified in this thesis under two categories. One is the private cottage development at Payne, Barlow, and Cobb Lakes, and the cottage and resort development at Gun Lake; the other is the state-owned recreational land comprising the Yankee Springs State Recreational Area, and the Barry County State Game Area. Private development of land for recreational purposes first occurred in the outwash plain at Gun Lake during the latter half of the nineteenth century. Government development of recreational land began in the 1930s and has continued since that time,

Land use devoted to settlement and transportation facilities includes the villages, which function as service centers for the agriculturalists, villagers, and those who pass through on the main highways; rural settlement development; the highways which provide land access to the plain; and the railroads which provide freight service to the area.

This thesis, therefore, explains that an outwash plain can exhibit diversity and contrast in both its physical and cultural aspects. It is intended to be a contribution to the understanding of the geography of a portion of southwestern Michigan, and in particular, of the land use in the Gun Lake outwash plain.

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PREFACE

Many people contributed suggestions and information to this study. It is practically impossible to adequately express the gratitude of the author to all these people. Soil conservation officials, county agricultural agents, farmers, and grain elevator operators were especially helpful.

I am most indebted to Professor Charles W. Boas, the chairman of my thesis committee. Dr. Boas provided untiring guidance and advice throughout the development and final compilation of this study.

Professor Lawrence M. Sommers, head of the Geography Department of Michigan State University, has extended valuable ideas and criticism. Acknowledgment is also made to Dr. Allen K. Philbrick for suggestions concerning the maps. Miss Helen Martin, of the Geological Survey Division of the Michigan Department of Conservation, provided information which enabled me to delineate the boundaries of the Gun Lake outwash plain.

P.S.

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CHAPTER I

INTRODUCTION

The farmers of southwestern Michigan have maintained important agricultural production throughout the history of commercial farming in the state. A variety of products including apples, cherries, wheat, corn, mint, celery, and onions are marketed locally and nationally. These crops are grown under varying soil and climatic conditions. This portion of the state is marked by extremely diverse post-glacial terrain, and the type of farming activity varies with the nature of the surface features. Among the most valuable areas are the nearly level outwash plains, which lend themselves to several kinds of agricultural practices.

One of the most prominent plains is the Gun Lake outwash plain, which covers a surface area of approximately 121 square miles in Allegan and Barry Counties. Aligned in a northeast-southwest axis, this compact outwash plain is oblong in shape. The boundaries of the plain consist mainly of high, rolling moraine.

The Gun Lake outwash plain exhibits contrasting patterns of land use upon its gently rolling upland and flat muck surfaces. In general two main types of agricultural activity have been developed. The upland non-organic soils

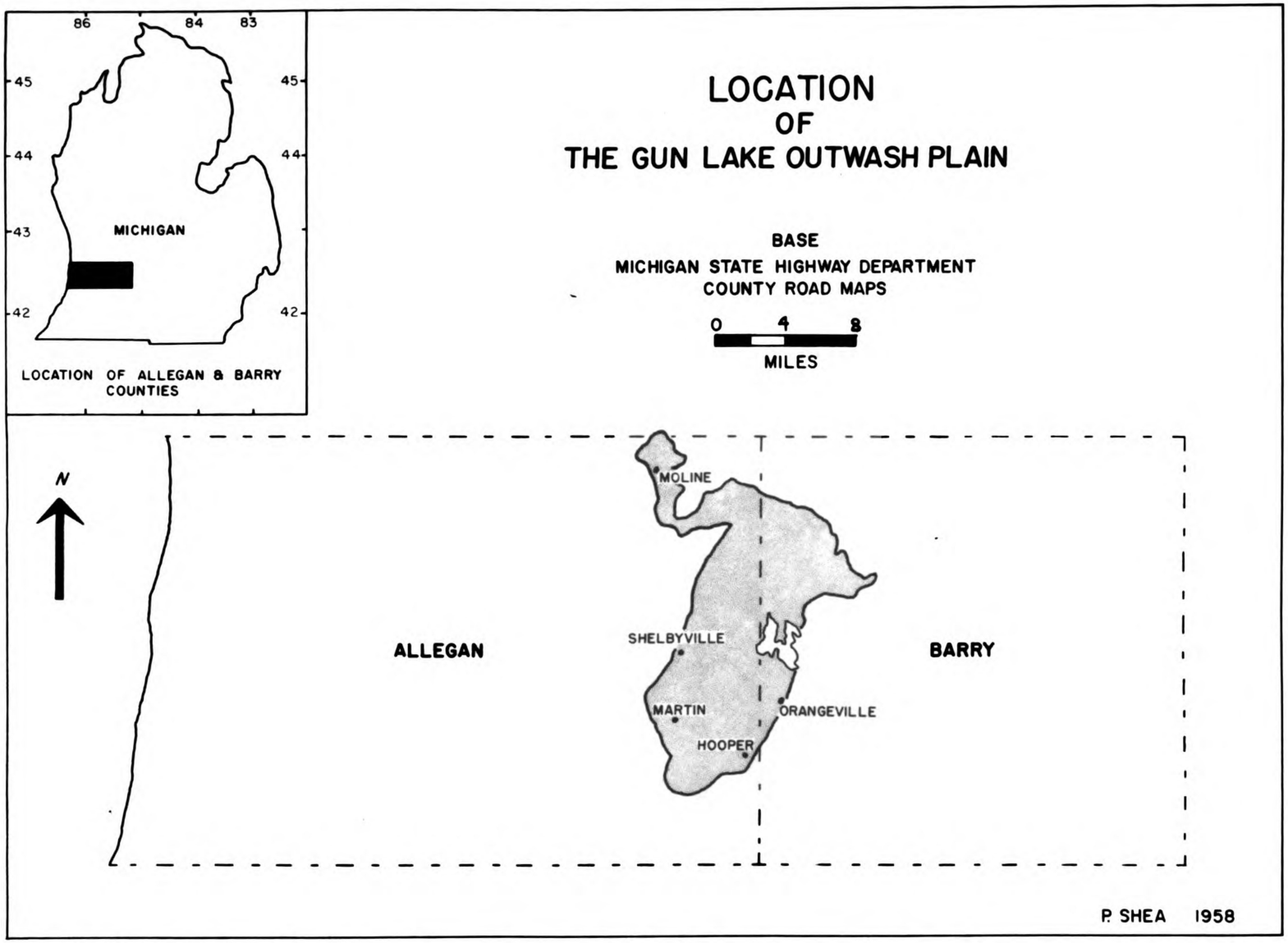

Figure 1. Location of the Gun Lake outwash plain.

support small grain and dairy farming, while the lower, more level organic soils are utilized for more intensive farming operations. An extensive area of land has been developed for recreational use by private interests, and by the state of Michigan.

Statement of Problem

The purpose of this thesis is to geographically describe and analyze the present day land use of the Gun Lake outwash plain. Therefore it is hoped that this thesis will contribute to an understanding of the geography of this particular portion of southwestern Michigan. Included will be an examination of: the nature of the small grain and dairy farming operations; the history and nature of the intensive farming operations on the organic soil of Gun Marsh; the extent and function of the settlement patterns and the transportation facilities which serve them; and the historical development and present extent of the recreational facilities.

A topical rather than a regional approach is utilized to describe the aspects of land use. This would seem to be an effective treatment for this small and compact outwash plain. No attempt is made to present a compage study;[1]

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[1]"Compage," as used here, refers to "something less than totality; but it does include all of the features of the physical, biotic, and societal environments that are functionally associated with man's occupance of the earth." This definition is taken from: Preston E. James and

instead only those aspects most directly connected with the existing land use are described and analyzed.

Methods of Investigation

Field study in the Gun Lake outwash plain was accomplished during the months of July, August, October, and November, 1957, and March, April, and May, 1958. Initial field work was preceded by the delineation of the boundaries of the outwash plain upon county road maps. These boundaries were established from the study of published and unpublished maps of Helen Martin and S. G. Bergquist.[1] These county road maps were then used during several days of preliminary field work while a reconnaissance, or rapid survey, was accomplished. During this brief survey an over-all impression of the area was gained, and the boundary lines were checked for accuracy.

Following completion of the reconnaissance, actual land use mapping was begun. This was accomplished by the notation of land use upon 1950 aerial photography of the area. Later this information was transferred to a base map.

Clarence F. Jones, editors, American Geography: Inventory and Prospect (Syracuse, N. Y.: Syracuse Univ. Press, 1954), p. 54.

[1]Unpublished material includes notes made by Miss Martin during her personal field mapping of the surface features in the area, and annotated field maps used by Professor Bergquist for class field trips. Published material refers to a map compiled by Helen Martin et al., Surface Formations of the Southern Peninsula of Michigan (Lansing: Michigan Department of Conservation, Geological Survey Division, 1955).

Field mapping was supplemented by interviews of such people as county agricultural agents, United States Department of Agriculture soil conservation officials (U.S.D.A.), grain elevator operators, farmers, personnel of the Gun Lake Chamber of Commerce, and village librarians.

As this thesis is basically the result of field research, only a minor portion of the actual study was devoted to library research. This consisted of an examination of available books, pamphlets, and maps for information on land use, climate, soils, surface formations, and cultural phenomena of the outwash plain area.

CHAPTER II

PHYSICAL CHARACTERISTICS OF THE OUTWASH PLAIN

Surface Features

The shape and development of the Gun Lake outwash plain are a result of the period of Wisconsin glaciation, which occurred thousands of years ago. This glaciation and the associated after effects created the several morainic systems, the lake bed, the drainway, and the several till plains which delimit the outwash plain. These surface formations may be observed in Figure 2, the accompanying map of glacial surface features.

The Kalamazoo moraine which forms the eastern boundary was deposited by the action of an ice lobe centered in the Lake Michigan basin. It is the most prominent, in relief, of the moraines which flank the outwash plain. The southern boundary is provided by the bed of a former lake and a small till plain, which developed between the outwash plain and the Kalamazoo moraine. Marking the western side of the plain is the Valparaiso moraine, also a result of the ice lobe in the Lake Michigan basin. The northern boundary is composed of a small till plain and the Charlotte moraine, which were created by glacial activity associated with an ice lobe centered in the Saginaw basin.

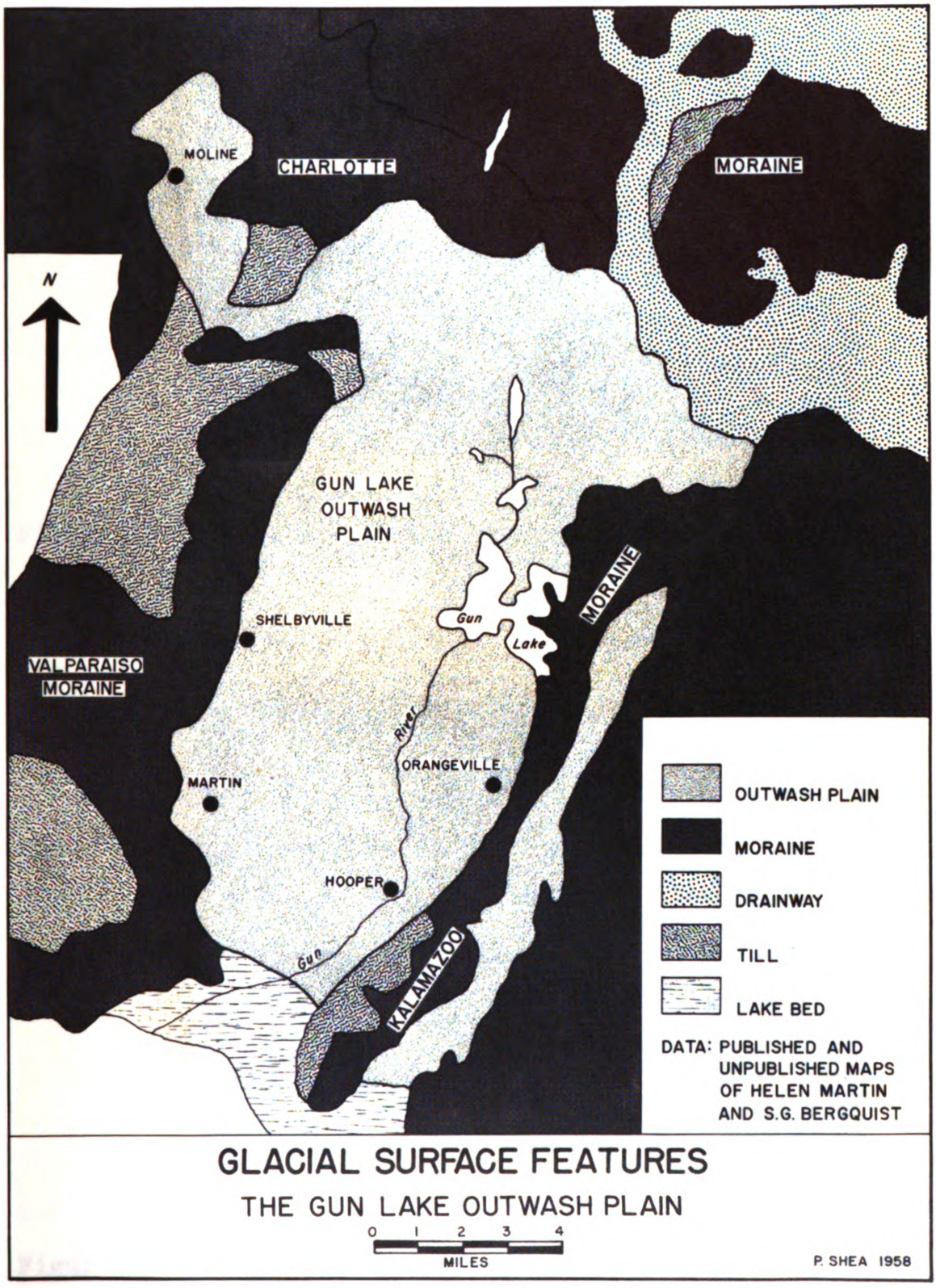

Figure 2. Glacial Surface Features of the Gun Lake Outwash plain.

Figure 3. Gun Lake. The Kalamazoo moraine of the Lake Michigan ice lobe is visible in the distance.

Figure 4. Southeastern portion of the outwash plain. In the distance is the Kalamazoo moraine of the Lake Michigan ice lobe. Sheep graze in the foreground.

Outwash plains are built of water-sorted, roughly stratified material which has been washed out from the ice fronts. They are generally flat and composed of sand, gravel, and small boulders. The soil, in places sandy or stony, is subject to over-drainage. The area of land which is the Gun Lake outwash plain was formed by streams of water proceding south and east from ice fronts on the north and west. The curious protrusion, which is attached to the main body of the outwash plain in the northwest, was formed by deposition of outwash as streams flowed southeastward out of that portion of the Charlotte moraine and toward the vicinity of the Gun River.

This outwash plain exhibits considerable variance in configuration. While the surface of the outwash protrusion in the northwest is gently rolling, the main body of outwash gently slopes eastward and southward to Gun Lake and the flat area of muck soils which border the Gun River. The greatest relief of this sloping land is present in the concentration of gravelly and sandy hills located north and northeast of Gun Lake. Small post-glacial lakes and ponds are scattered in the plain, north and west of Gun Lake.

Gun lake occupies a 2680 acre area in the eastern outwash plain; the eastern shore is flanked by the Kalamazoo moraine. According to Scott, Gun Lake "may be described as a pit of shallow depth but very complicated in shoreline. The basins represent the spurs of the moraine, fragments of

Figure 5. Portion of a gravel pit in the northern outwash plain.

Figure 6. Rolling upland near Martin. This is a portion of the small grain and dairy area of the outwash plain. Note the Holstein cows on the permanent pasturage.

the outwash plain, or swells of the undulating till plain not covered by outwash."[1] Such pits are developed as a result of glaciation. Ice blocks calved from the main body of an ice sheet are stranded as the ice sheet retreats, and while the outwash plain is formed the block of ice is buried or partially buried by debris. As the ice melts a pit is formed, and in some places where conditions permit a permanent lake or pond occupies that pit.

The Gun River emerges from the southwestern portion of Gun Lake, and flows in a southwesterly direction through the plain. This river is bordered by an area of muck soils which is known as Gun Marsh.

In summation, the surface formations which surround and include the Gun Lake outwash plain are a result of glacial action of the Wisconsin period. The plain is delineated by moraine, till plains, a drainway, and an old lake bed. The surface configuration of the outwash plain presents a picture of contrast when the flat muck land of Gun Marsh is compared to the gently rolling land in the west, and to the rough hilly land in the northeast. Lakes and ponds exist but do not monopolize the total land area. Gun Lake, however, is a rather conspicuous feature.

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[1]I. D. Scott, Inland Lakes of Michigan (Lansing: Michigan Geological and Biological Survey, 1921), p. 195.

The Climate

The climate acts as an influence on both the length of the recreation season, and the length of the agricultural growing season. Therefore, climate is important to the land use in the outwash plain. The average date of the last killing frost in the spring occurs about May 5th, although the planting of some muck soil crops is delayed until May 15th to minimize the danger of frost. The first killing frost of the fall is usually about October 10th, although in some years frost comes to the muck area in late September. Thus the length of the growing season for the outwash plain averages between 150 and 160 days, with perhaps a shorter period for Gun Marsh.[1]

Lack of sufficient rainfall, evenly distributed during the growing season, can and has been costly to both the small grain and dairy farmers and the muck soil farmers. During the past thirty years, only the years 1936 and 1946, stand out in this respect; although in other years, such as the summer of 1957, the lack of sufficient rainfall has had an injurious effect on the onion crop.[2] Lack of enough

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[1]As there are no official U. S. Weather Bureau recording stations within the outwash plain, the appendix includes statistics for the Allegan and Hastings stations. As each of these stations is approximately 10 miles from the outwash plain, Allegan to the west and Hastings to the east, the temperature and precipitation statistics should provide an approximate picture of the climatic conditions of the area.

[2]Personal conversation with muck farmer, H. Boysen.

moisture results in smaller crop yields, dries up pasturage, and lowers the quality of the products. In a droughty condition, the muck soil is especially subject to wind erosion.

Climate has an effect upon the recreational activities and land use. The period May 30th to Labor Day is the most active recreational season for the people utilizing the facilities at Gun Lake. This is the season both of the most pleasant conditions of the lake water for swimming and boating, and the time of the year for school summer vacations. The cool and sunny days of fall provide the ideal season for hunting deer and small game at the Barry County State Game Area and on private land in the outwash plain. Relatively little recreational activity is pursued during the cold winter months, except for some ice fishing on the lakes. No special facilities have been constructed for the winter sports season.

The climate can, therefore, be viewed in two respects as an influential factor which concerns land use in the Gun Lake outwash plain. The climate limits the growing season of agricultural crops to between 150 and 160 days; it also facilitates the season of recreational activity in the summer and fall.

Soils

The nature and distribution of the six soil associations observable in the Gun Lake outwash plain must be regarded as substantially related to the land use in the

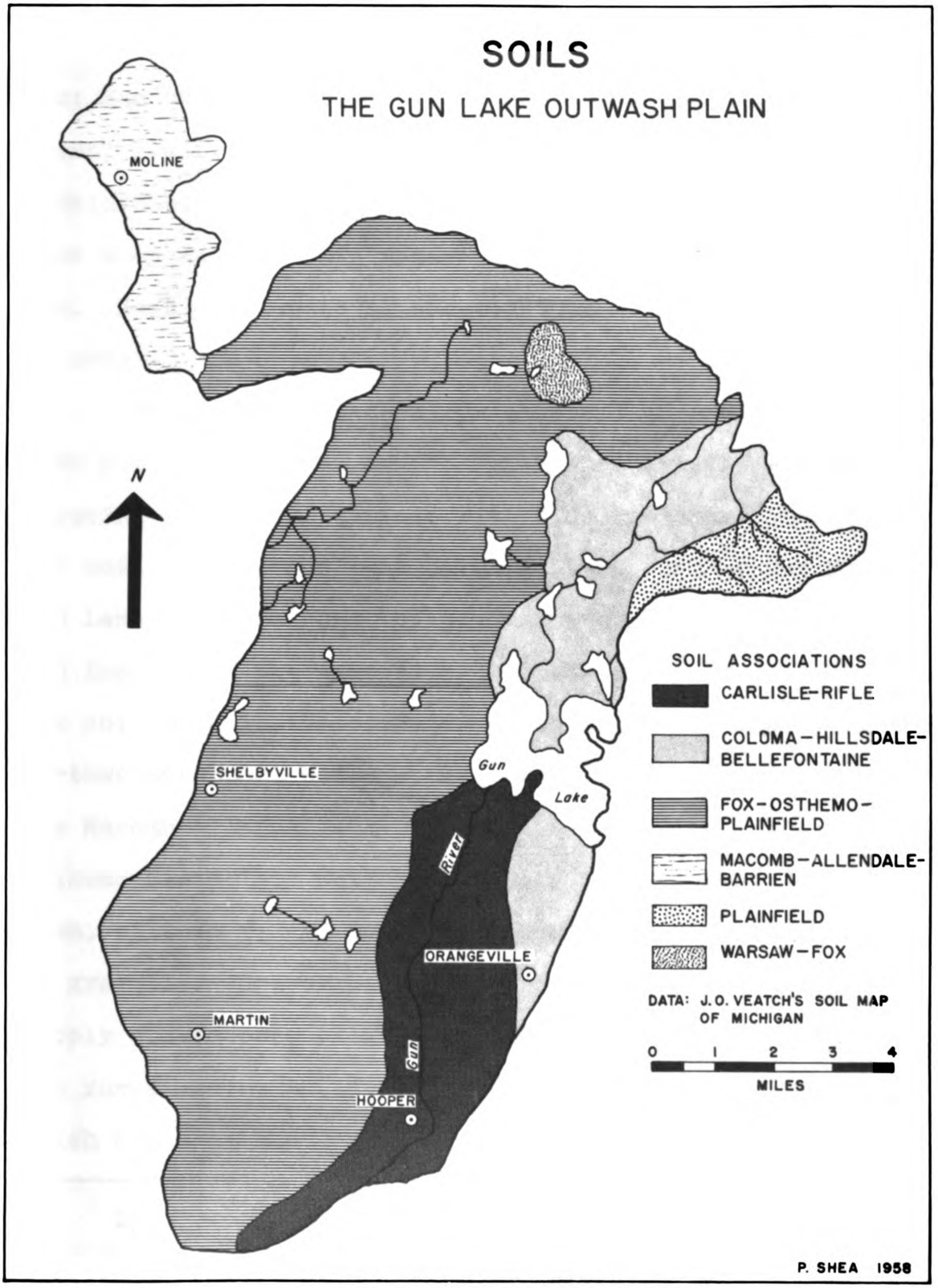

Figure 7. Soils of the Gun Lake Outwash Plain.

plain.[1] This distribution may be seen in Fig. 7. The soil associations by name are: Fox-Osthemo-Plainfield; Warsaw-Fox; Macomb-Allendale-Berrien; Coloma-Hillsdale-Bellefontaine; Plainfield; and Carlisle-Rifle. These soils vary considerably in their ability to support agriculture and have been adapted to a number of different types of land use. Each of these soil associations will now be described in detail.

Approximately two-thirds of the land area of the outwash plain is covered by the Fox-Osthemo-Plainfield soil association. This coverage with two exceptions includes the entire portion of the outwash plain west of Gun Marsh, Gun Lake, and that part of the outwash plain northeast of Gun Lake. The two exceptions are the small area of Warsaw-Fox soil association situated north of Barlow Lake, and the northwestern protrusion of the plain, which is covered with the Macomb-Allendale-Berrien soil association. The Fox-Osthemo-Plainfield soils are mainly sandy loams, but some loam, silt loam, and sand are present; in places the soil is gravelly. Gravel pits are in operation by building supply contractors (Fig. 5). The soil is of medium fertility but ranks medium to low in retention of moisture, a fact which explains the comment by several farmers in the area

[1]Detail not gained by field work is supplemented in this soils section from information taken from J. O. Veatch, Soils and Land of Michigan (East Lansing: Mich. State Univ. Press, 1953).

Figure 8. Muck soils in the southeastern part of the outwash plain. Note the storehouse and the hilly deposits of the Kalamazoo moraine in the background.

Figure 9. Roadside cut in the Yankee Springs Recreational Area. Note the sandy soil.

that drought was at times a very meaningful problem to them. However this soil does support most of the small grain and dairy farmers. Oaks, hickory, sugar maples, and beech are the most prevalent of the forest cover. The soil profile is in the gray-brown podzolic group as are all the soil associations except for the muck soils of the outwash plain. A weak, upper gray horizon, and a well developed reddish and yellowish clay B horizon are displayed.

The Macomb-Allendale-Berrien soil association mantles the land occupied by the protrusion of outwash plain in the northwest. Consisting of mixed wet, stony, gravelly clay and sandy loams, as well as semi-wet and dry sandy soils, this soil association covers a gently rolling area with little local relief; therefore some drainage problems are present. The soils of this portion of the outwash plain would seem to be of medium fertility.

A small isolated section of the Warsaw-Fox soil association, surrounded by the Fox-Osthemo-Plainfield soils, is located north of Barlow Lake. Of medium fertility, this association is composed mostly of loams and silt loams but includes some sandy loams and sand. It is covered with a thick humus layer, dark brown to nearly black in color. Soil profiles have been developed under grass. The B horizon is brown.

Extending in a northeasterly direction from Gun Lake to the northeastern border of the outwash plain, is a band of Plainfield soils. A band of these soils also extends

Figure 10. Upland agriculture near Martin. Note the light textured soil and the bean crop.

Figure 11. Cabbage on black muck soil.

south of Gun Lake and is located between the Kalamazoo moraine and the muck soils of Gun Marsh. The Plainfield soils are mainly loamy sand, with some fine sand and sandy loams. These soils have thin or weakly developed horizons. They are acidic, low in organic content, overly drained, subject to wind erosion, and of low to medium fertility. Farming activities within the outwash plain covered by these soils have experienced poor to moderate results; much of this land has been developed into the Barry County State Game Area and the Yankee Springs State Recreational Area (Fig. 9). The Plainfield soils south of Gun Lake are occupied by abandoned and idle farm land, a few meadows and hay fields, and by a forest which includes oak, pine, and hickory.

The extreme northeastern tip of the outwash plain is mantled with the Coloma-Hillsdale-Bellefontaine soil association. These acidic soils are composed of sandy loams and sands over clay. The soils are of low to medium fertility and have not proved to be especially good in this area for agricultural purposes. Much of this land has also been incorporated into the Barry County State Game Area.

The Carlisle-Rifle soil association of muck soils cover the land which borders the Gun River. This band of post-glacial accumulations is approximately two miles in width. The muck is black on the surface, but is in part composed of brown and yellow strongly acidic peat. It varies in depth from several inches to over six feet. The

Figure 12. Shallow organic soil. Sand exposed on the periphery of the much soils area in the southwest. This soil condition constitutes a major problem. Onions and other crops cannot be satisfactorily grown.

Figure 13. Wind erosion. Dry muck sends up a small dust cloud as this corn field is plowed.

substratum is composed of clay, sand, or marl; it is readily discernible in some portions of the muck area when uncovered by spring plowing or tiling operations (Fig. 12). Known as Gun Marsh, the muck soil area formerly supported growth of elm, soft maple, ash, whitepine, and swamp grass. Dry muck is extremely susceptible to wind erosion; considerable amounts of the soil have been blown away (Fig. 13). Hedge-like spirea and willow trees have been planted along field boundaries in an attempt to halt wind erosion (Figs. 28 and 31). Onions, carrots, potatoes, and corn are among the crops cultivated on the muck. To make possible the most effective use of these soils which are waterlogged in the spring, drainage ditches have been constructed; the Gun River has been dredged to lower the water table.

Of all the soils which have been described, the Carlisle-Rifle muck soils have probably proven the most valuable in terms of total value of agricultural harvest per acre per year of cultivation. The Fox-Osthemo-Plainfield soil association has not been as spectacular in its agricultural yields to the dairy and small grain farmers, but has been most reliable in sustaining crop returns.

Drainage

The Gun Lake outwash plain is subject to surface and subsurface drainage. The importance of this drainage to the land use of the plain varies from place to place. Subsurface drainage is facilitated by the gravelly and sandy

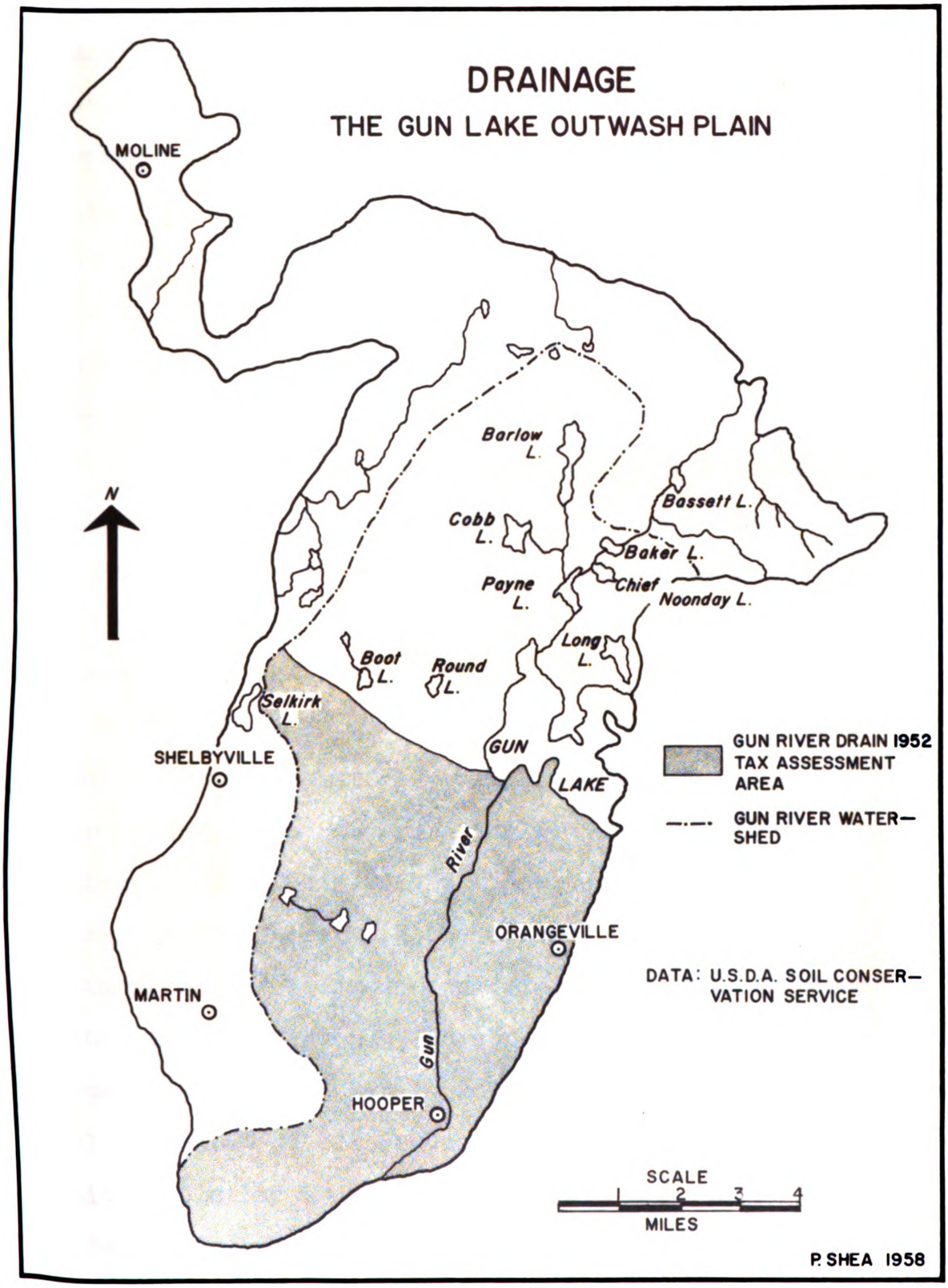

Figure 14. Drainage. Note the watershed of the Gun River, and the tax assessment area.

nature of the outwash plain; this is dealt with in the description of each soil association. Surface drainage is facilitated in most of the outwash plain by the gently sloping and rolling surface. Lack of adequate surface and subsurface drainage however has presented a problem in the muck soils area.

A study of the surface configuration of the outwash plain reveals that the plain slopes southward and eastward from the Charlotte and Valparaiso moraines thus carrying surface and subsurface drainage into Gun Lake, the various lakes which are interconnected with it, and the Gun River. United States Soil Conservation Service Maps indicate that this watershed of the Gun River covers approximately two-thirds of the outwash plain.

The nature of Gun Lake has been described previously. Briefly it is a relatively shallow pit lake, almost rectangular in shape, and covers a surface area of 2680 acres. As a picturesque blue lake, it functions as the locale of much recreational activity in the summer. North of Gun Lake are a number of small lakes, including, Long, Barlow, Cobb, Payne, and Chief Noonday Lakes, which drain into Gun Lake by means of several small brooks. These lakes are relatively small in size and are probably pit lakes created by ice activity similar to that which formed Gun Lake. The lakes, in terms of shape and size, can be described as follows: Long Lake, oblong in shape, and 140 acres in size; Barlow

Figure 15. The southwestern outlet to Gun Lake. This is the source of the Gun River. The height of the dam was established by court order.

Figure 16. The Gun River west of Orangeville. The river has been dredged to improve agriculture in the surrounding organic soils by lowering the water table.

Lake, oblong in shape, and 179 acres in size; Cobb Lake, rectangular in shape, and 109 acres in size; and Chief Noonday Lake, round in shape, and approximately 70 acres in size. Gun Lake is the source of the Gun River, which drains the lake in the southwest.

Gun River has a very slight gradient and therefore can be described as sluggish as it flows southward through the muck soils area. This river has been dredged twice, the first time in 1914, and the second in 1952. Its banks are steep, scarred, andgrass covered (Fig. 16). The width varies from about twenty-five feet at the source, to over thirty-five feet in the south. Over sixty miles of private and county drainage ditches have been dug in the inadequately drained muck soils to carry the excess water into the Gun River thus lowering the water table and making the soil more suitable for agricultural use.

The dredging operation on the Gun River in 1952 was accomplished only after a long court battle by the men who farm the muck soils against an injunction preventing the dredging of the river. This injunction had been held since 1905, by a Gun Lake property owners association. The agreement which lifted the injunction preserved the present water level of Gun Lake at 744.32 feet above sea level and allowed the dredging of the Gun River up to Gun Lake.[1] This agreement had the effect of pleasing both the property owners at

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[1]Decree of the Circuit Court for Barry County, June 3, 1950, Judge Archie D. McDonld presiding.

Figure 17. Small lake in the portion of outwash plain north of Gun Lake.

Figure 18. View of Gun Lake. This lake covers a surface area of 2680 acres.

Gun Lake, and the muck soil farmers of Gun Marsh. To pay for the dredging, the county drain commission apportioned the cost of dredging as a tax against the property owners within a prescribed area drained by the Gun River (Fig. 14).

The northeastern tip of the outwash plain is drained by several brooks which flow northward out of the plain. In the western portion of the outwash plain which is not part of the Gun River watershed are several lakes including Selkirk, Mud, and Pickerel Lake. These bodies of water and the surrounding land, including the outwash protrusion in the northwest, are drained by streams which flow westward out of the outwash plain.

In summary, both surface and subsurface drainage are present in the Gun Lake outwash plain. As described in the soil section, overdrainage exists in many places in the outwash plain thus causing droughty conditions which adversely affect agricultural land use. However, the muck soil area presents an inadequate drainage condition; it has been necessary to dredge the Gun River and to construct drainage ditches. The most prominent water features are Gun Lake, and Gun River, whose watershed includes slightly over two-thirds of the entire outwash plain.

Summary

This chapter describes the various physical phenomena which should be considered in their relationship to the land use of the Gun Lake outwash plain. The outwash plain and

the surface formations which delineate it are the result of Wisconsin period glaciation. The surface configuration exhibits considerable contrast between the flat land of Gun Marsh and the gently rolling upland. Climate is an important factor affecting the length of the agricultural season and the recreational season in the plain. Soils exhibit contrast between the black muck of Gun Marsh and the gray-brown forest soil of the upland. The most prominent drainage features are Gun Lake and Gun River, which drains approximately two-thirds of the outwash plain.

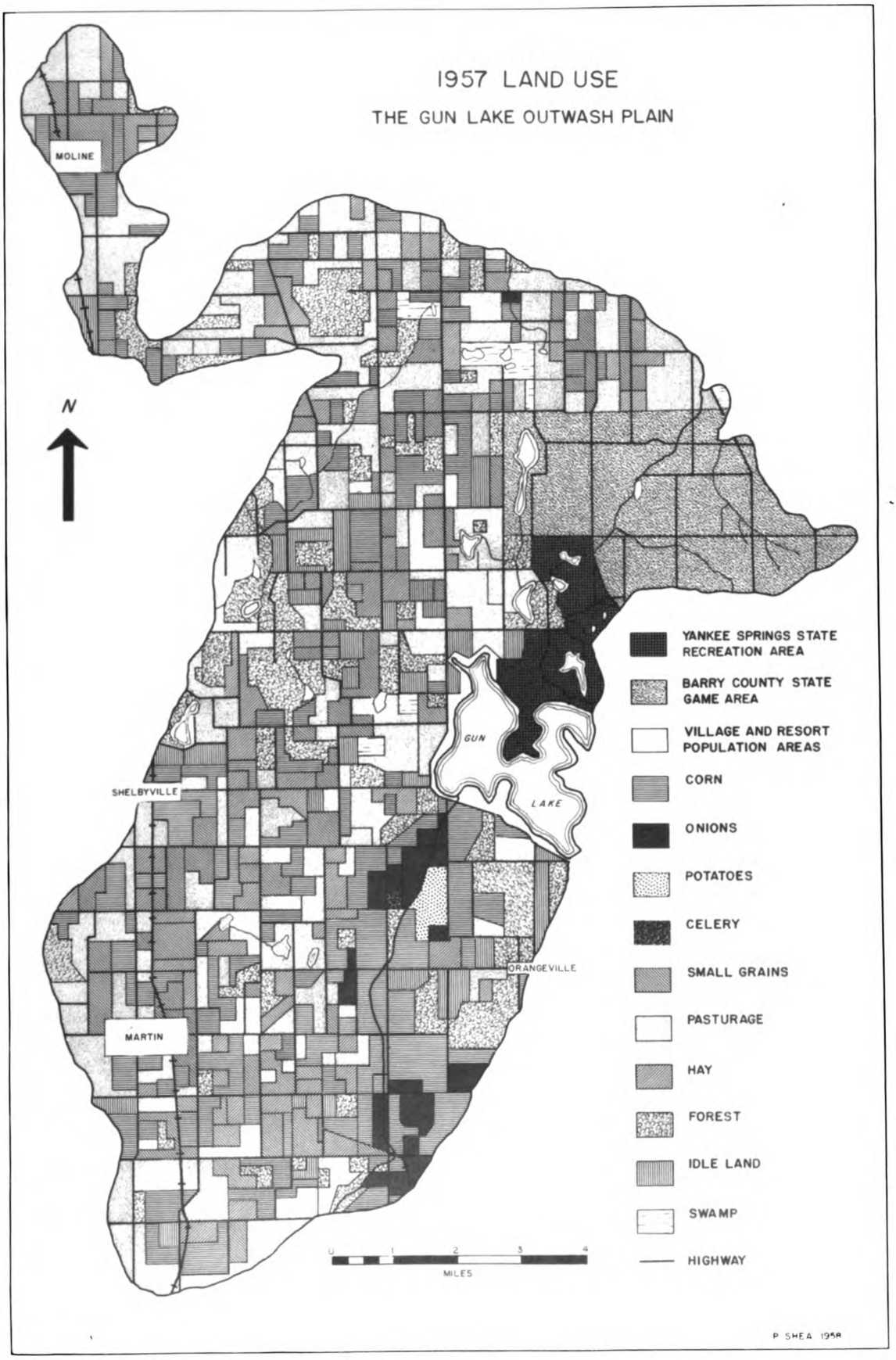

Figure 19. Land Use in the Gun Lake Outwash Plain.

CHAPTER III

AGRICULTURAL LAND USE

A history of over a century of farming lies behind the agricultural land use in the Gun Lake outwash plain. Two distinctly different farming types exist and while one of these, the small grain and dairy operation, dates back to the nineteenth century, the other, a muck farming venture, has been practiced for approximately fifty years. Agricultural land utilized by these two types of farming comprises eighty per cent of the total land surface of the outwash plain. A comparative study of the muck farming operation and the small grain and dairy farming activity reveals many interesting contrasts.

The muck soil farms utilize approximately twelve and one-half per cent of the total agricultural land. These operations are intensive in nature, require peculiar farm plant facilities, and generally yield specialty crop products.

Small grain and dairy operators utilize eighty-seven per cent of the total agricultural land. These farmers raise wheat, rye, corn, oats, and hay, as well as chickens, sheep, and some beef cattle; their cows produce dairy products.

Each of these distinctive farming operations is studied separately in this chapter. A general description

of each type of farming activity is followed by reports on two small grain and dairy farms and one muck soil farm.

The Small Grain and Dairy Farming Operations

Small grain and dairy farming has been maintained in the outwash plain for a period of about 130 years.[1] Utilizing seventy per cent of the surface area of the outwash plain, these farms average over eighty acres in size; there are approximately 170 large private holdings of 100 acres or more.

Farming operations are developed on generally rolling land. This farm land is covered with a checkerboard pattern of fields bearing crops of hay, wheat, rye, oats, and corn. Land is also occupied by permanent and rotated pastures, brush, and woodlots. Abandoned fields and brush lots occur where there is overdrained or poorly drained soil, or on rough or badly eroded land. The woodlots contain stands of maple, white elm, black ash, birch, beech, hemlock, and tamarack.

In general the better small grain and dairy farms are located in the western portion of the outwash plain which is covered by the Fox-Osthemo-Plainfield and the Warsaw-Fox soil associations (Fig. 7). The characteristics of these soils have been described in the soils section of this study.

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[1]Fact obtained from a description of early settlement in the area of the outwash plain by J. S. Schenck, "Gun Plain," A History of Allen and Barry Counties, Michigan (Philadelphia: D. W. Ensign Company, 1880), pp. 218-238.

Figure 20. A small grain and dairy farm. Crop in the foreground is brome grass.

Figure 21. Pasture in the small grain and dairy area.

Briefly it can be stated that they provide better drainage and fertility conditions than do the other soil associations in the plain. The northwest protrusion of outwash covered by the Macomb-Allendale-Berrien soil association, which presents inadequate drainage conditions, is generally utilized for pasturage and hay.

The northeastern portion of the plain and the area south of Gun Lake, which are covered by the Coloma-Hillsdale-Bellefontaine and the Plainfield soil associations, are subject to over-drainage and have generally proven poor for agricultural use. Much of the land in the northeast was purchased by the Federal Government in the 1930s as sub-marginal farm land; and it was converted to recreational use. The area south of Gun Lake where these soils occur is occupied by forest, brush land, and only a few acres of pasturage and hay.

Areas covered by forest are extremely limited in occurrence, as can be noted in reference to the land use map (Fig. 19). Forests utilize land in the west-central, northwest, and in the area south of Gun Lake.

Farm products are marketed either in villages in the plain or in nearby towns and cities. Corn, wheat, and other grains are grown partially under government crop subsidies. Grain which is marketed in the plain goes to the grain elevators located at Martin, Moline, and Shelbyville. The operation of the Martin Elevator Company, which transacts

Figure 22. A typical upland scene. Note the fields of oats and pasturage.

business with many of the outwash plain farmers, is described later in this study. Eggs and fluid milk are collected at the farms by wholesale egg and milk dealers. Hogs, chickens, sheep, and beef cattle are marketed through livestock sales in nearby cities.

The small grain and dairy farmstead exhibits little variance from farm to farm. The basic farm plant consists of the farm house, a dairy barn, a milk house, a silo, a livestock barn, a chicken house, a corn crib, one or two equipment garages, and a tool shed. The farm house is usually constructed of wood and is painted white. It is rectangular in shape, two stories in height, and contains at least eight rooms.

The dairy barns are of wood or wood and stone construction and are painted red with perhaps a little white trim; some barns are unpainted. The stanchion room, where the cows are milked and confined during the winter, is on the first floor. The loft above this room provides storage for feed and hay. The milk room, which houses the refrigeration equipment required to cool the milk, is either attached to the dairy barn or is immediately accessible.

The livestock barn contains a large room on the ground floor where young livestock are stabled during the winter. Sometimes this building has a loft which is used for the storage of hay. Plows, hay baler, hay rakes, planters, cultivators, trucks, tractors, and numerous other equipment

required on a farm of this type are stored in the equipment garages.

Having described small grain and dairy farming in general, two specific farming operations will now be studied. The first is the farm of Gerald Fenner which is located approximately two miles southeast of the village of Martin. The second is the farm of Wellington Jackson which is located just northwest of Cobb Lake. Both farms are located on the Fox-Osthemo-Plainfield soil association. These particular farms were selected to provide as representative a picture as possible of the activities and problems of the small grain and dairy farmer of the outwash plain.

The Farm of Gerald Fenner

This one hundred year old family farm consists of 140 acres of rolling land. In addition, 120 acres of land are rented to supplement the original acreage. The land is utilized as follows: 70 acres are planted in corn; 40 acres in hay; 25 acres in oats; 20 acres in wheat; 40 acres are devoted to pasturage; 40 acres supply hay; and 12 acres are occupied by a woodlot; the remaining land is unusuable. The average yield per acre of these crops is: corn, 70 bushels / acre; oats, 60 bushels / acre; wheat, 30 bushels / acre; hay, 3 tons / acre. The livestock of the farm consists of 52 head of Holstein cattle, 80 cross-bred hogs, and 25 White Rock chickens.

Figure 23. The Fenner farmstead. The dairy barn is in the background, the other buildings are used to store equipment.

Figure 24. The dairy barn of the Fenner Farm. Note the resemblance to the Jackson barn. It is similar to almost all the dairy barns in the area.

Income is chiefly derived from the sale of fluid milk, but the sale of hogs and grain, in that order, is important. The milk is collected at the farm, the hogs are sold at livestock sales in a nearby city, and the grain is sold to the grain elevator in Martin. Most of the farm labor is performed by the owner and his son-in-law. The farm plant consists of the farm house, the cow barn, a hay barn, an equipment barn, a chicken house, and a hog shelter.

The Farm of Wellington Jackson

The 108 year old farm of Wellington Jackson furnishes a comparison with the farm of Gerald Fenner, as well as providing a study of an upland farm located in the north-central portion of the outwash plain, This 240 acre farm was established by Mr. Jackson's grandfather who emigrated to the United States from England in the 1840s.

The land is rolling in nature, however, it contains more rough and swampy acreage than does Mr. Fenner's farm. The utilization of this land is: 30 acres planted in corn; 20 acres in oats; 19 acres in wheat; 6 acres in rye; 40 acres are planted in hay in rotation; 40 acres support a woodlot; 30 acres serve as rotated pasturage; and the remaining 95 acres contain swamp, permanent pasturage, and brush land. Livestock includes 20 head of Holstein cows, 85 laying hens, and 600 chickens. Eventually there will be 1200 laying hens.

Figure 25. The Jackson farm house.

Figure 26. The Jackson dairy barn. Note the silo and the milk house.

Principal income is gained by the sale of milk. Approximately 55,000 pounds of milk were sold last year at an average price of $3.50 a hundred weight. Other income is contributed from the sale of eggs, grain, and culled cattle. These products are sold to dealers in Barry and Allegan Counties.

The main farm buildings include the farm house, a one car garage, a cow barn, an equipment barn, a small chicken house, a silo, a milk cooler house, and a young-stock barn. The dairy and young-stock barns have lofts which are utilized for the storage of feed and hay.

Although this farm has always been basically a small grain and dairy farm, Mr. Jackson is contemplating the conversion of his farm operations to poultry raising and egg production. The reasons which he cites as the determining factors forcing his discontinuance of dairying are: the drop in the price received for milk from $5.00 at the end of World War II to $3.50 a hundred weight in March, 1958;[1] the expense in maintaining up-to-date milking equipment (he will have to purchase a bulk milk cooler tank at the cost of $2500, if he remains in the milk producing business); the difficulty in maintaining the standards required by the State Health authorities; and the problem of obtaining good

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[1]Figures obtained in personal conversation with Mr. Jackson, in March, 1958.

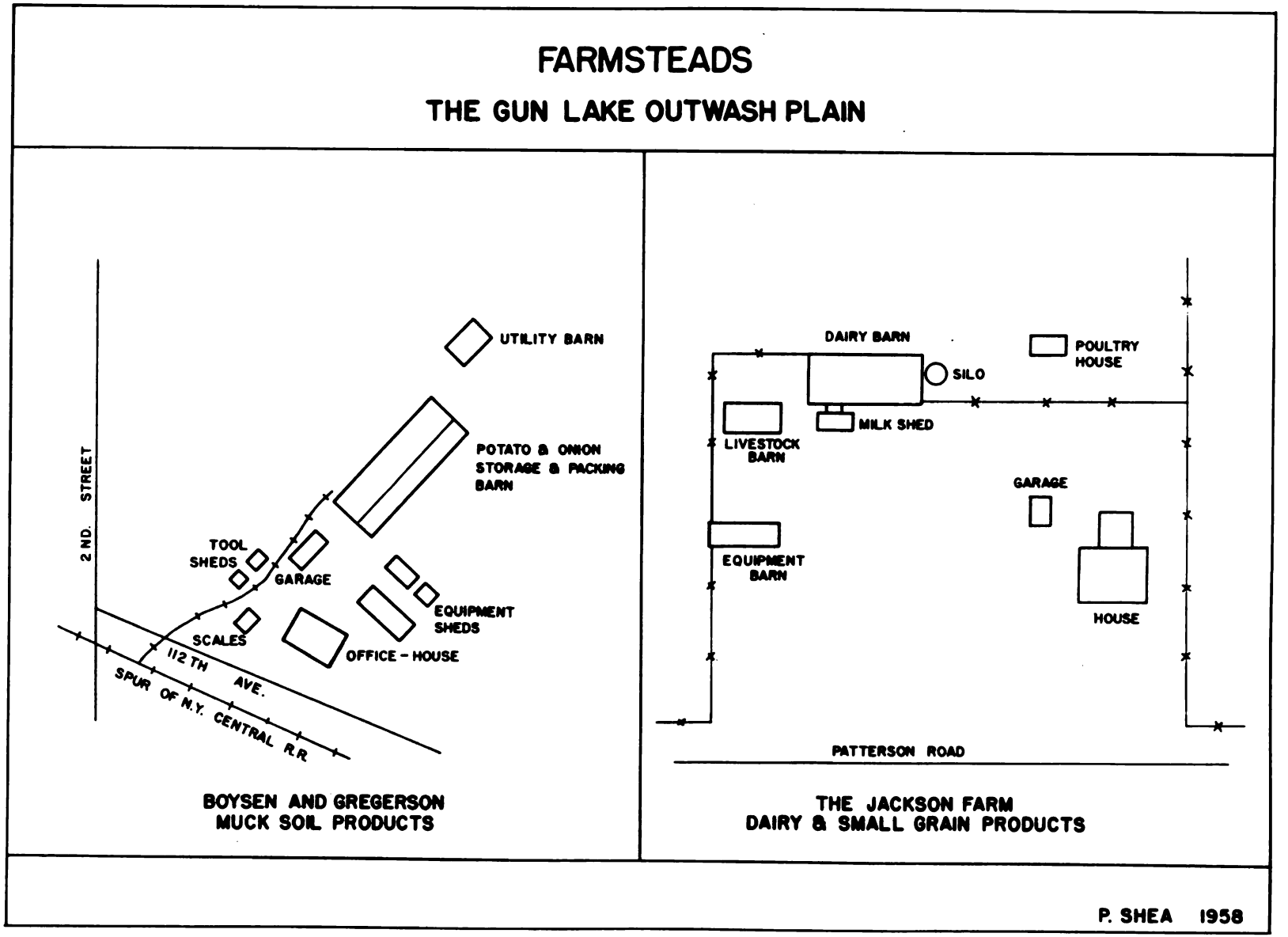

Figure 27. Farmsteads in the Gun Lake Outwash Plain. The small grain and dairy and the muck soil farms utilize different structures.

part-time help at harvest.[1] Mr. Jackson believes that because of these factors he will concentrate on raising sweet corn and chickens, which he said require less time and hard work than dairying.

In summary it is conceded that while it is a most difficult problem to ever select representative examples out of any group, it is felt that these two farm studies provide some insight into the activities and problems of the small grain and dairy farmer.

The Organic Soil Farming Operations

Prior to 1900, Gun Marsh, which contains the muck soils of the Carlisle-Rifle soil association, existed as an area where nearby farmers gathered some hay and utilized a portion of the land as pasturage. In one pre-1900 history of Allegan County the view was expressed "that by dredging and the cutting away of drift wood thousands of acres now valueless can and will be reclaimed."[2] As timber was cleared away, beginning in the early 1900s, farmers moved in to cultivate the muck. An early sawmill was operated at Hooper, which cut the timber removed from the marsh. Some of the first farmers to move onto the muck soils were onion farmers from the muck lands in Ohio.

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[1]Migrant laborers are not usually hired because of unpredictable reliability, and the cost of providing them with housing.

[2]Schenck, op. cit., p. 218.

Figure 28. Field scene in the muck soils area. Note the onions on the left, the row of corn in the right center, and the hedge-like spirea on the right. The spirea helps to reduce the force of the wind.

Figure 29. Corn field in the southern muck soils area. The Kalamazoo moraine lies in the distance.

By 1925, approximately 3000 acres were planted in onions. Heavy production of onions continued until about 1940, when a decline set in, and the planting of more acreage in potatoes and corn was begun.[1] Yield from the muck soil generally averages about 450--500 fifty pound bags of onions per acre, with the better land producing higher returns and the poorer soil much lower. Onion cultivation today requires much insecticide, fungicide, and fertilizer. In the early days these preparations were not required. The expense of such essentials, the cost of the necessary special equipment, the exhaustion of the muck, and the ups and downs of the onion market have combined to eliminate some farmers. A trend toward consolidation of land holdings is developing and as time goes on will probably be accelerated.

From approximately 1915 until the end of World War II, spearmint was grown on the muck. At one time six small mint distilleries were operated by farmers in the marsh (Fig. 40). It is no longer feasible to grow this crop. A disease commonly called mint wilt has attacked the crop, and it has been impossible to eliminate the disease from the area.[2] An

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[1]This decline was due to many factors. Seasonal labor was difficult to obtain during World War II. The fertility of some of the muck soils was diminished to the extent that onion growing was not profitable.

[2]Mint wilt is a vascular disease caused by a fungus, genus Verticilium, which lives in the soil, and attacks the plant through the roots. It invades the water conducting system of the plant and prevents it from obtaining water; wilt results.

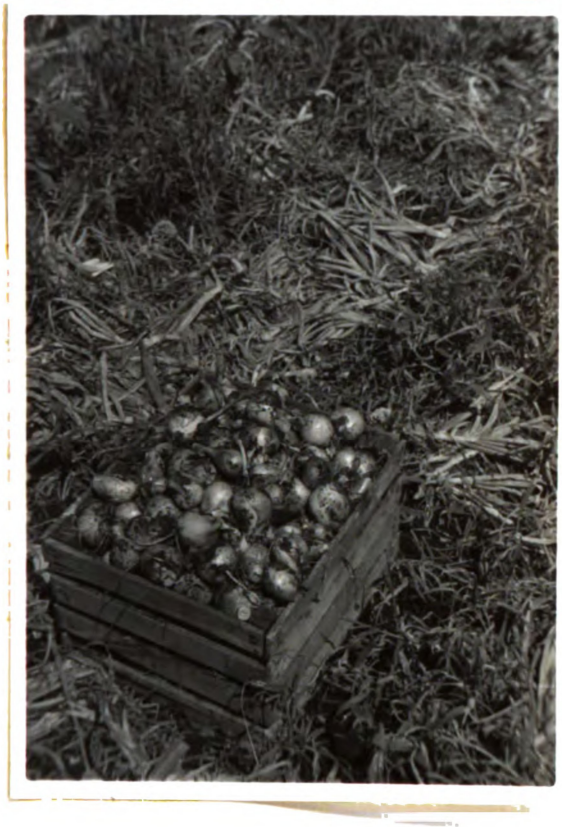

Figure 30. Crate of newly harvested onions.

Figure 31. Migrant laborers harvesting the onion crop. Note the willow tree wind break in the background.

attempt has been made to turn over the soil using deep-reaching plows, but this has provided only temporary relief. The opinion was expressed by one operator that the mint was a profitable crop to grow in Michigan, and would still be cultivated in the marsh if it were not for the disease. During World War I, mint grown in the marsh received a price of $25.00 a pound.[1]

During the period from 1930 to 1954, several hundred acres of carrots were grown. A cannery was operated in Martin. In 1957, approximately forty acres of carrots were grown. These were sold to local supermarkets.

Celery production has also been carried on in the marsh. Approximately twenty-five acres of celery were grown in 1957. Expensive equipment and exacting knowledge required in producing the crop appear to be limiting factors.

Since 1945, the acreage planted to potatoes and field corn has steadily increased, with the corn predominating in total acreage. In 1957, almost 2000 acres of corn were planted in the marsh. Corn is a fairly easy crop to plant and tend. Standard equipment is available for such use. Most of this corn is sold to purchasers who bring their own equipment into the fields to harvest the crop. This, of course, is significant as it eliminates the need for the grower to maintain harvesting equipment, and relieves him

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[1]Fact obtained from the county agricultural agent.

Figure 32. Potato storage and grading warehouse. It is located near Orangeville.

Figure 33. Blacksmith shop. Equipment used on the muck soils is rebuilt and repaired here.

Figure 34. Potato plants. Northern portion of the organic farming area.

Figure 35. Extensive potato field on the flat muck soils. It is located in the northern area of the marsh.

from the responsibility of recruiting a labor force to harvest the crop. Some sweet corn was grown and marketed locally in 1957. It is expected that in the future more of this crop will be grown.

Potatoes are grown for table use and potato chipping. Some farmers sell their potatoes to a warehouse which is located about a mile west of Orangeville (Fig. 32). There, potatoes are collected, graded, washed, and bagged for sale as table grade potatoes. Boysen and Gregerson in the southern end of the outwash plain grow potatoes for a potato chip company in Chicago. There are several facilities in Martin which are available for the storage of potatoes.

There has been extensive development of the muck to obtain its maximum use. The Gun River has been dredged twice, drainage ditches have been constructed, and tile have been laid sixteen and one-half feet apart in rows in almost all the fields, to eleviate water-logged soil conditions. There are hundreds of miles of tile beneath the surface of the marsh. Just as there is a probem in the spring and early summer from excess water in the soil, there is a problem at other times of the year from a lack of moisture in the soil. Dry muck burns readily, and therefore care must be exercised to make sure that fires do not start. In periods of especially dry weather, the fine dry particles of muck may be blown away. Farmers have planted spirea and willow trees on the borders of their fields to break the

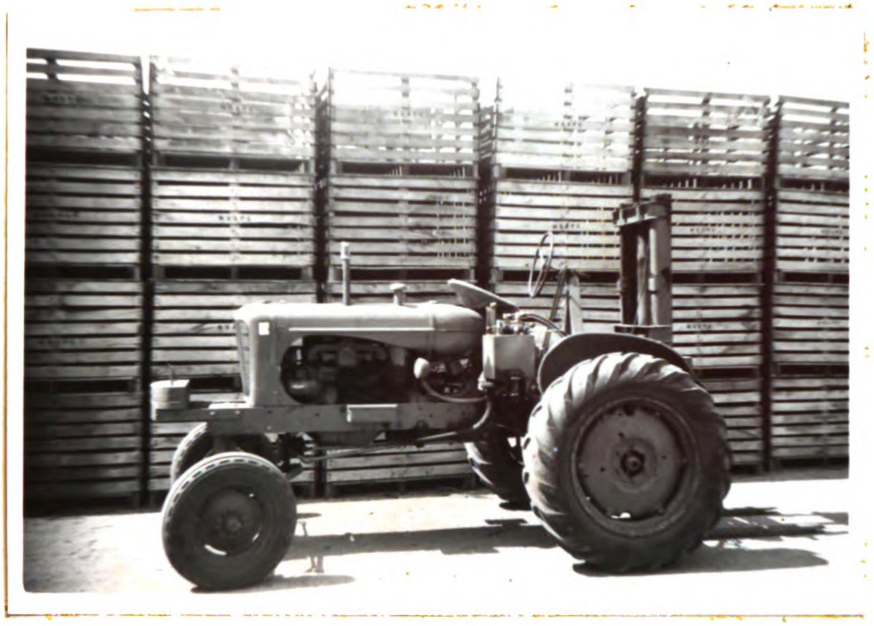

Figure 36. Field lift tractor. This tractor has been rebuilt for use in the muck fields. It is designed to lift the crates in the background.

Figure 37. Lime spreader used on the muck soils.

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force of the wind. Rye grass is planted on the fields in the fall to hold the soil and to provide green manure in the spring.[1]

Planting of the onion crop usually occurs in early May, while harvest begins in early August. Onions are sold to companies in nearby cities in Michigan. In 1957, a small co-op was formed by a dozen farmers, who organized to market onions. In the future they also hope to market sweet corn (Fig. 59). Almost all the equipment used to plant, tend, and harvest these onions has to be specially prepared for such use. Tractors, sprayers, and other equipment have to be rebuilt for use (Figs. 36, 37, 38, and 39). This, of course, adds to the expense of such equipment, and this cost usually is a deterrent factor to farmers wishing to establish onion planting on a small scale.

The harvest season is the period of peak employment in the marsh. During the rest of the year the farmers, their regular employees, and local school children form the main working force. The harvest season brings the migrant laborers to the marsh. The Mexican National makes up a large proportion of this group (Fig. 31). Some of these people are very fine workers, while many are definitely not. Muck

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[1]The addition of green manure to muck soil which still have visible fibre in it and has not reached the finely powdered condition of decomposition is not regarded as sound policy. However, older muck soils in the finely powdered condition generally show a marked satisfactory response to green manure.

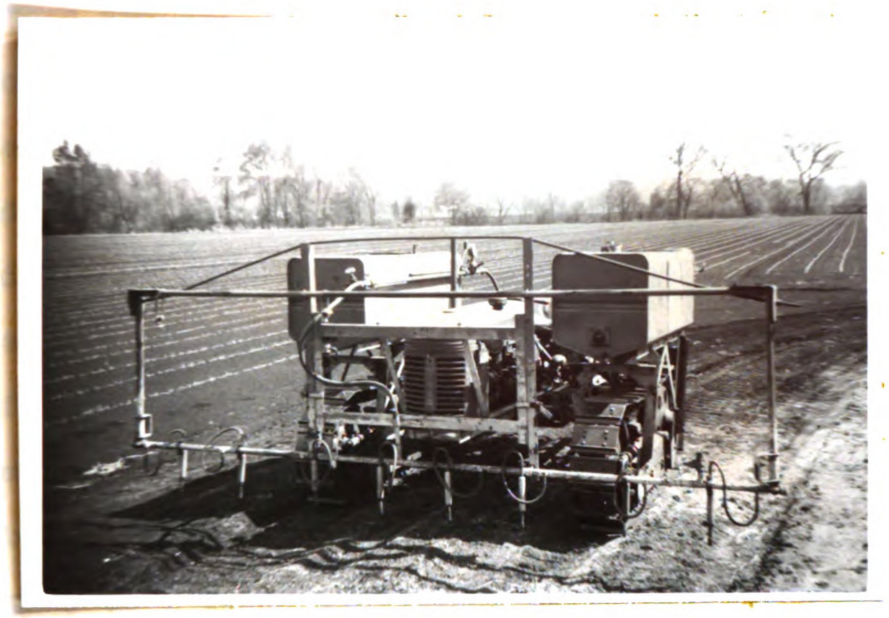

Figure 38. Muck soil spray rig. Onions are planted in the field in the background.

Figure 39. Planting rig used on the muck soils.

farm operators are obligated to provide lodging for these seasonal workers. All types of lodgings are available (Figs. 63 and 64). Tents are set up, and local houses, shacks, and shanties, most of which appear to be woefully dilapidated, are available. The homes of the farm operators are of considerably better quality (Fig. 62).

The farmsteads of the muck soil farms differ considerably from those of the small grain and dairy farms (Fig. 15). The basic farm plant include: the operator's farm house; as many as a dozen additional buildings which are used to house seasonal workers; and sheds for the storage of equipment and produce. The farm houses are usually smaller than those of the small grain and dairy farms. Equipment sheds are scattered around the property of the muck farm owners, rather than being concentrated within the farmstead lot.

In the past, with a concentration on onions and mint, there were more operators present in the area than there are today. A consolidation of land holdings is taking place. As the muck soils continue to lose their ability to satisfactorily produce superior yields of onions to compete with the products of other muck soil areas in Michigan, Wisconsin, and elsewhere, this consolidation may be accelerated. At present the operators of the twenty and forty acre plots of muck land cannot support themselves from the receipts of the corn harvest. Income from the sale of field corn cannot favorably compare with the income produced from the

sale of such specialty crops as mint or onions.

In summarizing the land use of the organic soils area, it may be noted that in the past the dominate crop on the muck has been onions. This practice has given way to the planting of potatoes and field corn. Such crops as carrots, sweet corn, and celery are grown, but they are limited in total area. There is a significant onion growing operation still present, and this cultivation is located in two areas: one in the northern portion of the muck soils, and situated within two miles of Gun Lake; the other located at the southern end of the muck soils. It has been estimated that the muck soil will support onion cultivation for approximately twenty-five more years, and that as time goes on more onion land will be planted to other crops.[1] Signs of much exhaustion due to wind erosion, decomposition, and continual cropping are present in the form of shallow, sandy, muck land. Such land has been abandoned to brush and pasturage.

Following this general description of the organic soil agricultural land use, an examination of a specific farm operation would seem to be of value. The Boysen-Gregerson farm is not representative of the average size muck soil farm in the plain, for in contrast to the twenty and forty acre holdings, the Boysen-Gregerson interests own over 500 acres of muck land. However, the Boysen-Gregerson farm does produce the three main muck soil crops: corn, potatoes, and onions. Therefore the operations of this farm can be

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[1]Fact obtained from the county agricultural agent.

considered representative of activity in the muck soil area except that it is on a larger scale, includes larger storage facilities, and is more diversified than the average small farm.

The Boysen-Gregerson Muck Farm

The Boysen-Gregerson farm was founded in the early 1900s, during the period when crops were being planted on Gun Marsh for the first time. The major concentration of muck land owned by this farm borders the Gun River in the southeastern end of the outwash plain. Other acreage is scattered about the muck area. Last year approximately ninety acres of onions, 120 acres of potatoes, and a large acreage of corn were raised. These crops are grown for the wholesale market.

Onions are planted during the period, April 20th to May 5th, and are harvested beginning in the first week of August. The crop is shipped out beginning in the harvest season and on into the spring. Onions are sold to various buyers, who generally arrange for customers to come directly to the farm to pick up the produce. Prices are determined by the demand and condition of the market, which is critically effected by weather conditions in other onion growing sections of the United States. A one hundred pound bag of onions, which brought $2.00 in early harvest, was worth $5--$6.00 in the early months of 1958, after adverse weather had damaged the Texas onion crop.[1]

[1]Information from a conversation with H. Boysen.

Certified seed potatoes are obtained from growers in Prince Edward Island, Canada. The potatoes are planted about May 15th, and are harvested beginning late in September. The potatoes are trucked to Chicago, where they are utilized by a food processing company for the production of potato chips.

The Boysen-Gregerson employees plant corn and tend it during the growing season. At harvest buyers come directly into the fields to harvest the crop. This eliminates the need for the farm to maintain such equipment and releases the labor force to harvest the other crops.

Generally a three crop rotation is utilized. The most common rotation is potatoes, onions, and corn. The dredging of the Gun River, completed in 1952, enabled the Boysens to add to cultivation an additional sixty acres of land previously unusable because of a high water table.

During the planting and harvest season the twelve full-time employees are augmented by the addition of local school children and migrant laborers. Peak employment has totaled seventy during the harvest season. Tents are set up, and some seasonal housing is available for the use of the migrants. Many of these migrants are Mexican Nationals.

A conservative estimate of the value of the field equipment maintained on the muck farm is $75,000. Three platform trucks, a pickup truck, seven tractors, including three caterpillars, a field lift tractor (for picking up

Figure 40. Inactive mint still.

Figure 41. The Boysen-Gregerson Warehouse. Potatoes and onions are stored, graded, and bagged in this building. Other structures are equipment sheds.

crates and placing them on the platform trucks in the field), three spraying rigs, and a potato harvestor are included among the equipment.

The muck soil farm plant is composed of a combination office-house, a number of equipment sheds, a large storage and grading barn, and a number of houses which are scattered about the property, and which are seasonal in occupance. The storage and grading barn is especially interesting (Fig. 41). This building is designed to accommodate 26,000 bushels of onions in forty bushel crates in the south end of the building, which is divided into two equal parts by an interior wall. The northern half is designed to store 28,000 bushels of potatoes in similar forty bushel crates. Grading and packing rooms are arranged along the eastern side of the building.

The forty bushel crates are loaded in the field and are then moved to the storage rooms in the barn. The potato storage room is equipped with an air conditioning unit. Automatic controls maintain a temperature of fifty degrees. The potatoes give off warmth when stored, which makes unnecessary the use of a furnace. The air conditioning unit prevents the temperature of the room from becoming too warm. In addition the potatoes are sprayed with a growth inhibiting solution.

There are four main steps in the processing operations of potatoes in the grading rooms. These are selecting, washing, picking, and bagging. A Clark lift picks up the

crate of potatoes and dumps the contents onto a conveyor belt. A selecting operation then sorts the potatoes. The potatoes then move by conveyor belt to the washing operation, and after washing, to the pickers, who remove rotten or otherwise unsuitable potatoes. The last stage is the bagging of the potatoes into 100 pound sacks. These bagged potatoes are then kept in a smaller storage room at a temprature of sixty-five degrees until they are shipped to Chicago. Onion processing is much simpler. It involves only sorting and bagging.

Summary

The study of muck soil farming and small grain and dairy farming, the two distinctive types of farming activity in the Gun Lake outwash plain, has revealed interesting contrasts in land use. Small grain and dairy farming is extensive in nature, occupies approximately seventy per cent of the surface of the outwash plain, and is operated on gently rolling land mantled with non-organic soils. Standard equipment is maintained, and the farm structures are concentrated in the farmstead. The average farm is over eighty acres in size. The standard crops are corn, wheat, oats, rye, and hay. Milk is produced, and some farmers also raise hogs, chickens, sheep, and beef cattle to supplement income.

Muck soil farming is intensive in nature, requiring much hand work, utilizes approximately ten per cent of the

outwash plain surface, and is operated on the flat surface of Gun Marsh. Specially rebuilt equipment is necessary for tending onions. Farm structures are scattered about the farm holdings. Many of the farms are small, twenty to forty acres in size, but the more successful farms, such as Boysen-Gregerson operation, are much larger. The main crops are onions, potatoes, and corn which since 1940 has been greatly increased in acreage. The expectancy that the muck soil will support the growth of specialty crops for only twenty-five more years, the change to the production of field corn instead of onions, and the consolidation of muck soil land which has resulted partially because of these reasons, may cause the smaller farm holdings to eventually vanish.

CHAPTER IV

RECREATIONAL LAND USE

Recreational land use is confined to areas in the east-central and northeastern Gun Lake outwash plain. This land, devoted to recreational activity, is owned by private interests and by the State of Michigan. The private holdings of recreational land and facilities consist of the cottages and associated land which occupy space on the shores of Payne, Cobb, and Barlow Lakes, and the resorts, cottages, and associated land holdings which encircle Gun Lake. The recreational land and facilities owned by the State of Michigan are administered by the Michigan State Department of Conservation; they consist of the Barry County State Game Area and the Yankee Springs State Recreational Area. This study of recreational land use will describe the origin and present development of these recreational facilities.

Privately Developed Recreational Land

Development of private recreational facilities on the lakes in the east-central and northeastern Gun Lake outwash plain occurred first at Gun Lake. Minor development followed later at Barlow, Payne, and Cobb Lakes. These lakes, however, are small in size when compared in size to Gun Lake, and

development has been restricted to the construction of a few cottages on the land frontage of each lake (Fig. 44). There has been a rather large development on the shore of Gun Lake, which will now be analyzed.

Gun Lake

The beautiful 2680 acre Gun Lake has been the locale of recreational activity for approximately a century. A History of Allegan and Barry Counties, published in 1880, contains information about the lake in a description of Yankee Springs Township:

> This lake is a somewhat noted resort for anglers, picnic-parties, and other pleasure seekers, and on its western shore, in Smith's grove, the Spiritualists of Barry and adjoining counties gather each summer in considerable numbers for camp-meeting exercises, which last generally about a week, and attract crowds of curious people.[1]

The area on the north shore of the lake, known for many years as Streeter's Landing and now the location of a commercial resort development and a portion of the Yankee Springs State Recreational Area, was long a favorite gathering place for gala holiday celebrations. Huge farmers' picnics drew an estimated three to four thousand people to enjoy a carnival-like atmosphere.

The first recreational structures built on the shore of Gun Lake were club houses designed for the use of fishing

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[1]David Schwartz, "Yankee Springs," A History of Allegan and Barry Counties, Michigan (Philadelphia: D. W. Ensign Company, 1880), p. 514.

Figure 42. Cottages and shore facilities along the western shore of Gun Lake.

Figure 43. Newly dredged lagoon on the shore of Gun Lake. This lagoon furnishes access to the lake and provides water frontage for newly constructed cottages.

clubs from Hastings, Wayland, Allegan, Plainwell, and Kalamazoo. Some of these were in use as early as the 1870s, and during the season club members and their families would come to the lake for a week or two of fishing or duck hunting.

The first cottage was built about 1900, by a man from Hastings. Today there are about 1200 cottages occupying land around the lake. Construction of cottages both for summer residence by their owners, and for the purpose of rental, slowly gained momentum following 1900 and reached a pre-World War II peak in the 1920s (Fig. 42). Since the end of World War II, a considerable number of cottages were constructed, many of which are equipped for year-round residence and therefore are of greater valuation than the older seasonal cottages. As the building has continued the most desirable building lots have been utilized. At the same time lake frontage has become increasingly expensive, and at the present time some choice 100 foot sections are worth $7500. Land in the southern and southeastern areas of shore, formerly utilized for muck farming purposes, have been acquired for building sites. Lagoons have been dredged in other areas to provide water access for some of the new cottage developments. The most recent of these lagoons was dug during 1957, and extends west from the extreme northwestern tip of Gun Lake for a distance of about a quarter mile (Fig. 43). Lots are now being sold on this lagoon by a Grand Rapids realty firm, and several cottages have already been constructed on its banks.

Figure 44. Recent cottage development on Cobb Lake. Kalamazoo moraine in the distance.

Figure 45. West Gun Lake store. This serves the resorters at Gun and the other nearby Lakes.

People from nearby towns and cities in Michigan, as well as from Canton, Ohio; Chicago, Illinois; and other towns and cities in these and other states come to Gun Lake for their summer vacations. In the early days of the century resorters came from many of the southern states, especially Kentucky and Tennessee.

The present resorts vary in quality and number of accommodations. Groups of ten or more cottages are maintained by seven resorts, and there are others which have from one to five cabins available for rental. Most of these resorts are located on the northern and western shores of the Lake and are interspersed between private cottages. In 1957, a new trailer park was opened on the northwestern shore. Service facilities available at the Lake include several gasoline stations, four grocery stores, several boat liveries, some bait shops, a marine supply shop, and a laundrymat (Fig. 45). The resort season lasts from May 30h to Labor day, but some of the resorts remain open until the first of November.

Boating, swimming, and fishing are the favorite summer activities. The available fish include blue gills, pike, muskies, and bass. Old timers mourn the increasing use of the motor boats which, they say, have spoiled the fun of fishing on the lake, especially on weekends.

This description of private recreational land use in the Gun Lake outwash plain has revealed several interesting

Figure 46. Dredged lagoon in the Yankee Springs Area. This lagoon opens onto Gun Lake. Picnic facilities line its shores.

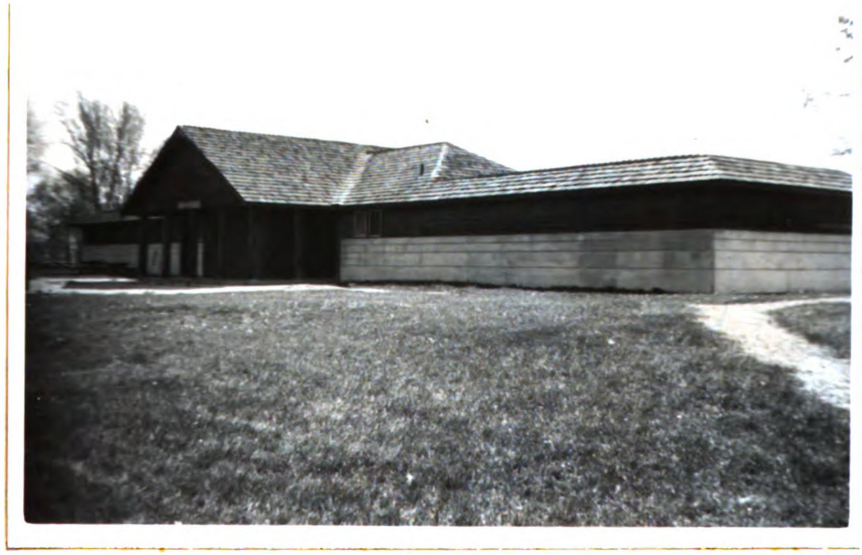

Figure 47. Yankee Springs Bathhouse. This provides facilities for swimmers at the State Recreational Area.

facts. Primary development has occurred at Gun Lake, which has been utilized for recreation for almost a century. Development at Gun Lake has been in the form of cottages and small resorts. Recent addition of facilities at Gun Lake has included: the construction of lagoons to provide additional water frontage; the building of homes designed for year-round living; and the development of former muck farming land for cottage building sites. Private recreational land use development at Cobb, Barlow, and Payne Lakes has been limited to the construction, since World War II, of a few cottages on each lake.

State-Owned Recreational Land

Still another form of recreational land use is the development of recreational land by the State of Michigan. The Barry County State Game Area and the Yankee Springs State Recreational Area are recent in origin, and together account for a large portion of land in the northeastern outwash plain.

The Yankee Springs State Recreational Area

The name for this area comes from the name of a former tavern which existed in the area in the middle nineteenth century (Fig. 48). On Jaunary 1, 1943, the United States Government, by an Act of Congress, deeded the Yankee Springs Recreational Area to the State of Michigan. Since that date the Michigan State Department of Conservation's Park and

Recreation Division has administered the 4,255 acre property. The history of the development of the Area, which occupies frontage on Gun Lake and extends north of the lake, began in the early 1930s. Part of the land was purchased in 1932 and other purchases followed. Most of this land is covered with the Coloma-Hillsdale-Bellefontaine and Plainfield soil associations. This area of sandy soils was the location of farming operations which the Federal Government considered as submarginal. In an attempt to bring better conservation practices to the area, the Government purchased this land and developed it into recreational land use.

During the period of Federal ownership, many of the facilities now existing on the property were constructed. These include the manager's home, the area headquarters, and the group camps. The purpose of the Federal Parks Division in establishing the group camps, which are located on Long and Chief Noonday Lakes, was to provide underprivi-ledged children with a place for outdoor camping activity. These group camps, now maintained by the State as a part of the Recreational Area, provide facilities at nominal fees for 200 hundred overnight campers and 600 day-time visitors. There are bathing beaches, housing, a central lodge, hiking paths, and athletic fields at each group camp.

That part of the Recreational Area bordering the north shore of Gun Lake has over three miles of lake frontage. Additional land had been added in this section of the Area

Figure 48. Historical Marker at Yankee Springs. It was placed in the Area by the Michigan Historical Commission.

Figure 49. A portion of the Barry County State Game Area. The area has been reforested with pine.

by dredging activity; this resulted in a lagoon, and increased the total acreage of that part of the Area which extends out into Gun Lake. Along the shore of the lagoon are many picnic facilities (Fig. 46). A large bathhouse which provides accommodations for swimmers has been constructed near the lagoon (Fig. 47).

The Yankee Springs Recreational Area is visited by an estimated 250,000 to 350,000 people a year. The Department of Conservation listed 1956 attendance at 276,050.

The Barry County State Game Area

The Barry County State Game Area was established in 1938, for the purpose of providing state sportsmen with a State-owned area for fishing and hunting. The land has been purchased from private land owners; it is considered to be of poor agriculture value. Most of the Area is mantled with the Coloma-Hillsdale-Bellefontaine soil associations, which are sandy and droughty, and upon which most farming activities were definitely submarginal. Since 1938, the State has continued to purchase acreage. The total area of the State Game Area is now approximately 14,000 acres (Fig. 19).

Hunting is especially heavy during the deer season; seventy-five deer being taken in 1957. Pheasants, rabbits, and squirrel are also sought. Pike, trout, walleyes, bass, et cetera, are the object of the fishing enthusiasts.

The Conservation Department has planted fields with corn to provide feed for the animals and fowl of the Area.

In 1957, due to the lack of sufficient State funds to facilitate satisfactory corn acreage for this purpose, the State Game Area, through the State Conservation Department, entered into share crop agreements with nearby farmers. Under the terms of these contracts, the farmers planted 300 acres with corn and at harvest removed fifty per cent of the planted corn. The remaining corn was left in the fields by agreement to provide the necessary fodder for the animals and birds. The Game Area management also planted 125 acres, thus providing a total of about 275 acres of corn.

The state has also exercised conservation practices in its utilization of the land. These practices have been undertaken with the double purpose of providing a better fishing and hunting environment and improving the condition of the soil. Fields have been planted with various grasses including birdsfoot trefoil, sweet clover, alfalfa, and rye, Large plantations of pine have been made, and other trees and bushes have been planted (Fig. 49).

Summary

The Barry County State Game Area and the Yankee Springs State Recreational Area represent the State-owned recreational land use in the Gun Lake outwash plain. Most of this recreational land was created through the purchase of submarginal farm land. Since this sandy droughty soil was unable to practically support farming activities, andbecause continued use of this land for agricultural purposes probably

would have resulted in further deterioration of the soil, the removal of this land from agricultural activity can be deemed a good practice. Since the State's utilization of this land has combined an attempt to improve soil and surface conditions as well as providing adequate recreational facilities, this change in land use can be considered quite acceptable. The popularity of the recreational facilities can be attested to by the fact that upwards of 400,000 persons use the combined facilities of the Game Area and the Recreational Area.

CHAPTER V

SETTLEMENT AND TRANSPORTATION

This chapter contains a description of the composition, function, and location of the villages, rural settlement, and transportation facilities of the plain. These cultural phenomena are of small size in terms of utilization of total surface area but are exceedingly important in terms of service function.

The Villages

There are five villages located in the Gun Lake outwash plain. Of these only the village of Martin is incorporated.[1] The unincorporated villages are Moline, Shelbyville, Orangeville, and Hooper. These villages are similar in respect to small size but vary considerably in function (Fig. 50).

The village of Martin is located in the southwestern outwash plain and is situated on U. S. Route 131, a north-south state trunk line highway, and the Pennsylvania Railroad. Michigan 118, an east-west segment of the Michigan

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[1]Under provisions of the 1908 Michigan Constitution, a village, after it has framed a charter of government, can incorporate.

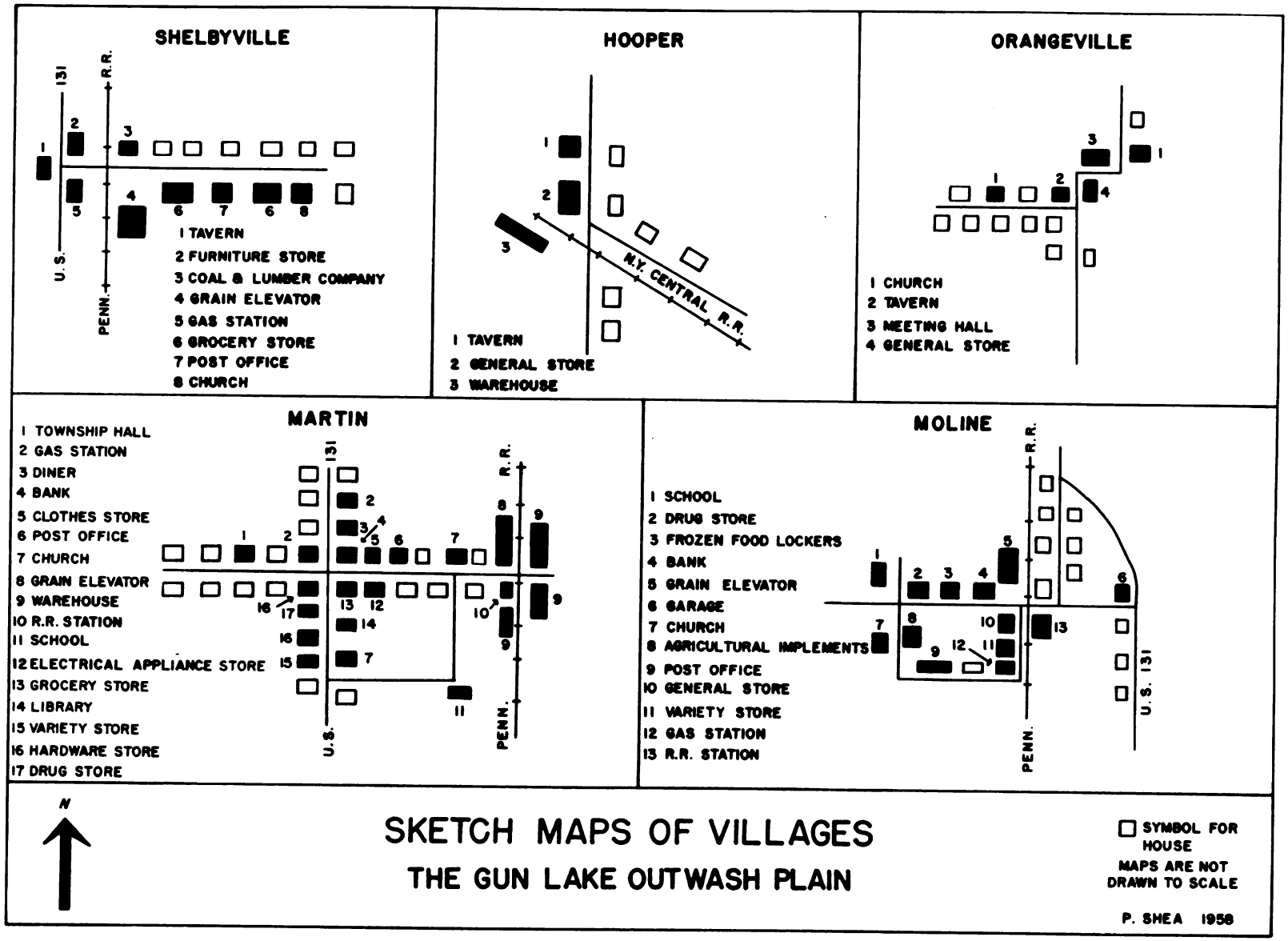

Figure 50. Sketch map of the villages in the Gun Lake outwash plain.

highway system, extends westward from the center of the village. In the Census of 1950, Martin had a population of 407.

The orientation of business establishments in Martin is along U. S. 131, and Michigan 118 (Fig. 51). This arrangement enables the businessmen of the community to serve both their local customers and the potential customers who pass through town on the two main highways. The business establishments situated on U. S. 131 include four gasoline service stations, a diner, a variety store, two hardware stores, a grocery store, and a bank. The Martin Public Library, a church, and a number of residences are also situated along Route 131. A small clothing store, an electrical appliance store, the United States Post Office, a church, an auto repair garage, a doctor's office, several warehouses, the Martin Grain Elevator Company, and a number of residences comprise the buildings situated along Michigan 118 and its extension, a county road, to the east. A school is also within the village limits.

The Martin Grain Elevator Company is, perhaps, the principal grain elevator for the outwash plain (Fig. 54). The elevator at Shelbyville is considerably smaller, while the Moline elevator's customers are mainly farmers who do not operate in the plain. Almost all the farmers transacting business with the Martin elevator live within a three mile raidus of the elevator. Almost no business is

Figure 51. Looking north along U. S. 131. The business section of Martin.

Figure 52. Celery packaging plant. Operated in Martin by a Kalamazoo firm.

developed with the muck soil farmers who carry on business with firms outside the outwash plain. Approximately 200 farmers buy such goods as fertilizer, coal, commercial seed, lumber, weed killer, fencing, and veterinary supplies from the Martin Elevator. In turn, some 150 farmers sell their crops of corn, wheat, barley, and soybeans, to the elevator. In round figures this amounts to 30,000 bushels of wheat, 7,500 bushels of corn, 4,000 bushels of oats, and 1,000 bushels of barley. These crops are shipped out by rail and truck. All the feed, fertilizer, and coal is brought in by rail. Most of the other products are transported to the elevator by truck transportation. The tracks of the Pennsylvania Railroad, whose freight transportation facilities are utilized by the grain elevator and some of the other business establishments in Martin, run in a north-south route through the eastern side of the village.

Three cold storage warehouses are located in Martin. In 1957, these warehouses served the following purposes: one was used for the storage of pears, apples, and other fruit purchased from fruit growers near Lake Michigan by a nationally known food products company (Fig. 53); the second functioned as a packing plant, where employees of a Kalamazoo firm packaged celery for shipment to restaurants and hotels (Fig. 52); the third warehouse, located like the other in close proximity to the tracks of the Pennsylvania Railroad, was used for storage by the elevator company.

Figure 53. Cold storage warehouse in Martin. Operated by a food product company for storage of fruit purchased from fruit growers near Lake Michigan.

Figure 54. The Martin Grain Elevator. This is the principal grain elevator in the outwash plain. The elevator is served by the Pennsylvania Railroad.

Figure 55. A portion of the Moline business section

Figure 56. The Moline grain elevator. In the foreground are several freight cars of the Pennsylvania Railroad.

The village of Moline is located in the center of the protrusion of outwash in the northwest. The village is served by the Pennsylvania Railroad and U. S. 131, which passes through the village limits but to the east of the business center of the village. As the business center of Moline is therefore, not as accessible to through traffic trade as is the business center of Martin, considerably less of this type of trade is transacted. The village serves the farmers of the surrounding area. However, because of the location of the village in the outwash plain most of the customers of the business establishments are from outside the plain (Fig. 1).

The 1950 Census credited Moline with a population of 403, thus making it similar in size to Martin. Local residents live and work in the village and a few commute daily to Grand Rapids. Among the business establishments situated in the village are a bank, a grain elevator, a drug store, a general store, a farm implement dealer, an auto repair garage, and several gasoline service stations (Figs. 55 and 56). The remaining structures are the United States Post Office, several churches, a school, and the homes of village residents.

Shelbyville has a population of 115. It is located on the western edge of the outwash plain, four miles north of Martin. Route 131 passes by the village on the west, and three of the village's business establishments, a furniture store, a tavern, and a gasoline service station, are

Figure 57. Main street, looking westward, in Shelbyville.

Figure 58. The Shelbyville grain elevator.

located beside that highway. The main business center is located east of U. S. 131, on 124th Avenue, which runs at right angles to the state highway. The Pennsylvania Railroad also passes through the business center. The structures of this small village include a few houses, a coal and lumber company, a church, a small grain elevator, and the United States Post Office (Figs. 57 and 58).

Orangeville is situated two miles south of Gun Lake on the southeastern edge of the outwash plain. The 1950 Census listed a count of fifty-three persons. Two churches, a tavern, a general store, and about a dozen houses comprise the village. The churches, tavern, and store are patronized by the village residents, resorters, and nearby farmers (Fig. 59).

A tavern, a grocery store, a co-op muck soil growers warehouse, several homes, and the buildings of the Boysen-Gregerson farm identify the place known as Hooper (Fig. 60). Situated in the edge of the outwash plain, about three miles southwest of Orangeville, Hooper is the terminus of a spur of the New York Central Railroad Company. The grocery store serves the families which live on the muck soil farms, while the tavern is a favorite leisure hour gathering place for the men who toil on the muck soil farms.

The Rural Settlement Pattern

Except for the muck soil area, the clusters of resort cottages around the lakes, and the homes of the commuters

Figure 59. The Orangeville tavern. This establishment and the general store comprise the business establishments of the village.

Figure 60. Co-op warehouse in Hooper. In the foreground are the tracks of the spur of the N. Y. Central Railroad.

along U. S. 131, most of the rural residences are farm houses which usually vary in occurrence throughout the outwash plain from one to four per mile of section line county road. As may be expected, the quality of these farm houses varies considerably. A few are large, well maintained, newly painted, and exhibit fine expansive lawns; some are small, unpainted, dilapidated, and have no lawn; but the majority are unpretentious two story white rectangular shaped dwellings, containing eight rooms, and have well-kept lawns (Fig. 61). Many of these houses seem to be about seventy-five years old.

The rural residences in the muck soil area require special study. Occurrence of the permanent housing units varies from one to a dozen per mile of county road. Concentration of these dwellings is in the northern and central muck soil area. These houses may be divided into two groups: the first is composed of the homes of the muck farm operators; the second, the homes of the employees who work on the farms. Although there are exceptions, the homes of the muck farm operators as usually of better construction, design, and maintenance than the homes of the employees which vary from some woefully dilapidated shacks provided seasonal workers to the generally well-kept homes of the permanent employees (Figures 62, 63, and 64).

It should be noted here that it is necessary for the muck farm operators to provide housing for the migrant laborers who are imported to harvest the crops. During the

Figure 61. Small grain and dairy farm house.

Figure 62. Muck soil farm operator's house.

Figure 63. Migrant labor housing. Dilapidated shack used to house migrant labor during the harvest in the muck soils area.

Figure 64. Another migrant labor housing facility.

harvest season the operators utilize buildings, some of which must be classified as substandard, and tents to house the migrants. As it is expensive to provide more substantial living quarters, it is to be expected that some of these operators attempt to solve this housing problem as cheaply and as simply as possible, and therefore this diversity of housing units is present in the muck soil area.

Transportation Facilities

County and State Highways and the Pennsylvania and New York Central Railroads occupy land in the Gun Lake outwash plain. These facilities furnish service for the people who live and/or work in the plain. A description of the location and function of these facilities follows.

The Occurrence and Function of the Highways

A well-developed system of approximately 260 miles of highways is available to serve the people who live and/or work in the Gun Lake outwash plain. These highways include county roads, U. S. 131, Michigan 37, and 118.

Approximately 240 miles of county roads, almost all of which are metal or bituminous surfaced, are available for travel.[1] County roads are mainly laid out along township section or half-section lines, although some run diagonally, and others are established to conform to local

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[1]Metal surfaced and bituminous surfaced are terms used by the Michigan State Highway Department to describe the surface of certain county roads.

terrain conditions. The well-designed checkerboard pattern which has resulted provides excellent land access routes for farmers, fluid milk collection trucks, mail carriers, resorters, and the numerous other traffic which requires need of such facilities.

U. S. 131, a heavily traveled, all weather, two lane concrete surfaced state trunk line provides a north-south route through the villages of Martin, Shelbyville, and Moline on the western side of the outwash plain. As this is the main route between Kalamazoo and Grand Rapids, it is quite important to the farmers, other residents, and other business establishment operators of the outwash plain. Buses whichserve the towns in the outwash plain travel along this route.

Michigan 37 penetrates the extreme northeastern fringe of the outwash plain, and provides residents in that area with an adequate route to Grand Rapids and other nearby villages and cities. This highway passes through the Barry County State Game Area, and motorists leaving the route in the Area have only a six or seven mile drive via county roads to the Yankee Springs State Recreational Area. Michigan 118 extends west out of the outwash plain from Martin.

The Deployment and Function of the Railroads

Railroad tracks are among the cultural land marks which have been constructed in the Gun Lake outwash plain. No regular passenger service is available, but freight

service is provided by the New York Central and Pennsylvania Railroads. These railroads furnish indirect service to the farmers in the outwash plain by providing their facilities for the use of the business establishments located in Moline, Shelbyville, Martin, and Hooper.

A rail spur of the New York Central Railroad enters the outwash plain in the southeast and penetrates the plain for less than a mile, terminating at Hooper. Except for occasional carloads of fence posts, fertilizer,and other farming supplies which are freighted in, and an occasional carload of farm produce which is freighted out, very little traffic occurs on this spur.

The tracks of the Plainwell to Grand Rapids section of the Pennsylvania Railroad penetrate the outwash plain in two places on the western side of the plain. In the southwestern portion of the plain the tracks parallel U. S. 131, which lies immediately to the west, pass through the village of Martin, and leave the plain after proceeding through the village of Shelbyville. The tracks enter the plain again in the northwestern protrusion of outwash. This time the tracks lie west of U. S. 131, parallel that route, and pass through the village of Moline.

The most important users of the rail facilities are the grain elevators and the farm supply establishments. All the feed, fertilizer, coal, agricultural implements, and some of the lumber are received by rail and sold to the

farmers and village residents. In addition approximately thirty-three and one-third per cent of the grain, including wheat, oats, barley, and corn purchased by the grain elevator companies from the farmers is shipped out by rail.

Summary

This chapter has described the villages, rural settlement, and existing transportation facilities in the Gun Lake outwash plain. The five villages of the plain are all small, with a population of 400 or less. These villages serve as residential areas for people who work in the villages or commute to work elsewhere. The villages also contain business establishments which serve villagers, farmers, and through traffic. Rural residences include the farm houses of the small grain and dairy area, the homes of the muck farm operators, and the buildings which house the permanent and seasonal workers of the muck soil area. Land access to the outwash plain is provided by U. S. 131, Michigan 118 and 37, and a checkerboard pattern of county roads. Rail freight service is provided by theNew York Central and the Pennsylvania Railroads.

CHAPTER VI

CONCLUSION

This thesis was undertaken to study the present land use in the Gun Lake outwash plain. Evidence gathered during this study indicates that there are three distinct types of land use in the outwash plain: agricultural, recreational, and that land utilized for settlement and transportation facilities. Description and analysis are designed to present the location, form, and function of these three types of land use.

Agricultural land use in the outwash plain is composed of two diverse operations. One is the extensive small grain and dairy farming of the non-organic soils area, the other the intensive specialty crop farming of the organic soil of Gun Marsh. Land use devoted to settlement and transportation includes the villages, which function as service centers for the agriculturalists, villagers, and those who pass through on the main highways; rural settlement development; the highways which provide land access to the plain; and the railroads, which provide freight service to the area. Recreational land use is classified under two categories. One is the private cottage development at Payne, Barlow, and Cobb Lakes, and the cottage and resort development at

Gun Lake; the other is the state-owned recreational land comprising the Yankee Springs State Recreational Area and the Barry County State Game Area.

In the course of description, numerous contrasts within and between these land use types has been noted. Some of these contrasts are the result of a direct relationship with elements of the physical environment, some are only the indirect result of this relationship, and others seem to be completely unconnected with the physical environment. Some of these contrasts will now be briefly summarized.

There are numerous diverse characteristics possessed by the two types of agricultural land use in the Gun Lake outwash plain. Small grain and dairy farming has been active in the outwash plain for over a century. This type of farming is extensive in operation, the farms averaging over eighty acres in size, covers a total of approximately seventy per cent of the outwash plain, and utilizes gently rolling terrain. The area on which these farms are situated is composed of five different soil associations. Each of these soil associations possesses particular qualities of drainage and fertility. Of these the Fox-Osthemo-Plainfield, and the Warsaw-Fox soil associations combine to include most of the westernoutwash plain and are the best non-organic soils of the plain. The area covered by the Plainfield and the Coloma-Hillsdale-Bellefontaine soil

associations is over-drained, generally lacking in adequate fertility, and has constituted a problem area where sub-marginal farming conditions exist. Farmstead lots are compact in shape; they contain the farm house, and the buildings which house the standard farm equipment and the facilities required for dairy farming. Milk, eggs, and grain are the standard products. Recent trends include the conversion of some small grain and dairy farms to chicken farms. This trend is said to be due to relatively low prices received for milk and the easier operations concerned with egg production.

In contrast, muck soil farming operations are intensive requiring much hand labor, and are developed on the flat, black muck land, which occupies ten per cent of the surface area of the outwash plain. Only the Carlisle-Ridle muck soils association is present compared to the five soil associations of the small grain and dairy area. However, these inadequately drained muck soils have provided expensive problems of drainage. In addition these farming operations have been developed for a period of fifty years, which is less than half the period of the history of the small grain and dairy operations in the plain. With the exception of several large and important establishments the farms are small, constituting farm holdings of twenty and forty acres. Specially designed and rebuilt equipment is required to farm the oinions, celery, and potatoes

grown on the muck soils. While the fields are generally smaller in size than those of the small grain and dairy area, the farmsteads also present a different appearance. The farm house is usually smaller, there are seasonal dwellings made available for the migrant labor force, and on the larger farms there are specially designed buildings used to grade and store the muck soil crops. Agricultural implement sheds are not always situated on the farmstead lot but are scattered on the periphery of the fields in which the implements are used. Recent trends in the muck soil area include the change from the growing of specialty crops to the growing of an extensive acreage of field corn, and the associated trends toward consolidation of the smaller farm holdings. A period of only twenty-five more years of agricultural use has been predicted by agriculturalists for the muck soils of Gun Marsh. This relatively short period remaining is due to many causes including decomposition, wind erosion, continual cropping of the land, and other factors contributing to the exhaustion of this muck soil.

The contrast present in the area of the outwash plain utilized for recreation is primarily focused upon the difference in ownership of this land. Private development of land for recreational purposes first occurred in the outwash plain at Gun Lake during the latter half of the nineteenth century. However, the construction of the cottages

and resorts which comprise the present recreational land development at Gun Lake has occurred since 1900. Recent trends include the construction of private cottages at Cobb, Barlow, and Payne Lakes, the dredging of lagoons at Gun Lake to provide water frontage and access to Gun Lake for new cottage developments, and the utilization of land formerly devoted to agricultural use for the construction of cottages. Governmental development of recreational land began in the 1930s and has continued since that time. State-owned recreational land includes the Yankee Springs State Recreational Area and the Barry County State Game Area. Much of the land which has been acquired by the state for these recreational facilities was formerly sub-marginal farm land. The state has instituted conservation practices designed to improve the soil and land as well as to improve the fishing and hunting environment.

Settlement and transportation exhibit other contrasts. Rural settlement presents a contrast between the small grain and dairy area and the muck soils area. In the former area the principal dwellings are farm houses while in the latter area there is a denser concentration of dwellings composed of the farm operator's homes, the homes of the permanent employees, and the seasonal dwellings provided for the migrant laborers. The villages present other contrasts. The business establishments of Shelbyville, Orangeville, and Hooper almost exclusively serve the residents of the

outwash plain. Martin because of its location functions as a service center for both the plain and for the through traffic of the highways. Moline serves only a small portion of the outwash plain because of its location in the northwest protrusion of the outwash plain.

Thus it has been shown that an outwash plain can exhibit diversity and contrast in both the physical and cultural aspects. It is hoped that this study by emphasizing these contrasts has contributed to the understanding of land use in the Gun Lake outwash plain and the geography of a portion of southwestern Michigan.

APPENDIX

TABLE 1

AVERAGE MONTHLY TEMPERATURE, ALLEGAN, MICHIGAN[1]

1927 - 1956

Year	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
1927	23.7	31.7	39.0	46.8	56.4	63.5	71.6	65.4	67.5	55.4	42.8	29.6
1928	26.8	28.0	34.3	43.8	57.6	60.9	71.8	69.8	58.2	52.4	39.4	29.6
1929	18.2	21.1	41.3	49.2	54.2	64.4	72.6	67.8	63.2	49.6	36.3	26.7
1930	21.2	34.2	33.6	47.5	59.2	68.0	72.5	71.2	64.4	50.6	41.6	25.4
1931	29.5	33.1	34.0	48.8	56.4	71.3	75.2	72.0	69.1	56.1	46.9	36.6
1932	35.1	32.0	28.4	45.1	58.1	69.7	71.9	70.4	60.7	52.4	35.4	28.6
1933	34.0	25.4	33.5	47.2	59.4	73.6	74.1	68.8	66.2	49.5	35.2	29.5
1934	31.4	16.0	28.6	44.2	61.8	72.8	76.0	69.1	63.6	51.9	43.6	26.2
1935	25.3	25.4	38.6	44.8	52.6	64.4	75.8	71.6	61.8	51.6	39.1	24.6
1936	21.0	15.8	37.6	42.8	62.1	65.7	75.4	72.0	65.4	49.7	53.7	32.1
1937	28.6	27.0	30.4	45.2	58.1	66.0	72.6	73.9	61.4	48.9	37.0	26.0
1938	24.0	31.5	42.1	48.0	57.9	65.7	72.4	72.8	61.6	54.2	41.8	30.0
1939	28.4	27.0	34.6	43.7	61.2	69.8	71.6	70.4	65.2	51.9	36.8	33.2
1940	18.8	25.2	28.4	43.6	54.6	67.8	72.0	70.1	61.8	52.9	37.1	32.4
1941	26.6	23.8	29.8	53.0	61.7	69.4	72.8	70.8	66.4	53.6	42.0	36.6
1942	25.6	22.6	37.5	52.8	60.4	68.7	71.9	69.8	61.6	52.7	41.8	26.6
1943	22.4	28.2	33.0	44.6	56.8	72.7	73.4	72.0	60.7	50.8	38.8	29.0
1944	31.1	29.2	31.4	44.4	63.4	71.6	72.0	73.0	64.0	50.8	42.2	24.6
1945	20.1	27.9	48.4	49.8	52.4	64.2	70.2	70.4	63.4	50.0	41.6	24.4
1946	27.7	26.9	47.2	49.2	56.3	67.0	71.8	67.8	64.8	56.8	44.0	32.2
1947	28.0	21.8	29.4	46.4	53.8	65.2	69.3	77.1	65.2	60.4	36.5	29.6
1948	19.0	24.6	35.3	52.2	55.4	66.8	72.7	71.9	66.0	49.3	44.3	31.2
1949	29.8	29.9	36.2	47.1	60.5	71.6	75.3	71.1	58.6	56.6	39.1	33.2
1950	32.0	26.4	31.7	42.0	60.1	67.6	68.9	69.1	62.2	56.2	36.5	24.6
1951	26.7	28.1	36.2	46.2	61.0	66.7	70.6	69.1	61.6	56.0	33.3	28.7
1952	28.9	31.2	34.4	50.0	57.5	72.0	74.3	70.5	64.2	56.9	42.0	33.7
1953	30.4	31.9	39.0	44.6	61.8	71.5	73.9	71.5	63.8	56.0	43.9	-
1954	26.3	35.1	33.7	52.1	54.9	70.8	71.2	69.5	65.2	53.4	41.2	30.4
1955	25.3	27.2	35.5	54.6	61.3	66.1	77.7	75.1	63.6	54.8	38.0	26.6
1956	26.1	27.1	32.3	46.0	58.3	70.2	70.4	70.7	62.5	57.6	41.2	33.5
Average	26.4	27.1	35.1	47.2	58.2	68.1	72.7	70.8	63.5	53.3	39.8	29.4

[1]Data: U. S. Weather Bureau

TABLE 2

AVERAGE MONTHLY TEMPERATURE, HASTINGS, MICHIGAN[1]

Year	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
1927	22.6	31.1	38.9	46.4	56.4	64.0	71.8	65.2	67.2	55.6	42.4	28.0
1928	25.4	26.9	-	-	57.2	62.3	71.8	70.6	58.0	53.5	40.8	30.7
1929	18.3	20.6	42.2	49.3	55.6	65.2	72.4	67.3	63.8	49.7	35.2	25.6
1930	20.8	33.2	33.6	47.6	59.4	69.6	73.6	71.2	65.3	49.8	41.3	28.0
1931	29.0	33.4	32.8	49.2	57.6	70.6	76.6	72.3	69.8	56.0	47.0	35.6
1932	34.4	32.1	29.0	44.6	59.8	70.4	72.8	71.4	62.4	52.4	36.1	29.0
1933	33.8	25.9	33.5	48.3	60.2	74.2	74.6	69.8	68.4	50.6	36.3	28.1
1934	31.6	17.4	30.9	44.8	62.0	75.1	76.7	70.2	66.1	52.6	44.0	26.0
1935	24.5	25.4	41.0	46.2	55.6	65.5	76.6	72.6	62.4	52.7	39.2	24.8
1936	21.4	16.4	39.0	43.8	64.2	68.1	76.2	74.6	66.2	50.0	35.0	31.0
1937	28.0	27.4	31.0	46.3	-	67.6	72.8	74.4	62.4	48.8	37.4	25.6
1938	23.8	31.6	42.8	49.0	59.6	66.4	72.6	73.5	61.3	55.1	42.0	28.6
1939	27.4	25.7	34.2	43.7	-	69.8	72.0	70.6	65.2	52.1	37.7	32.4
1940	17.4	25.9	27.9	43.8	56.8	68.7	73.0	70.3	61.8	52.0	-	30.8
1941	25.4	24.0	29.4	52.5	-	69.4	73.4	70.3	66.6	53.2	41.7	34.6
1942	23.8	20.8	37.0	52.8	60.8	68,4	71.4	69.4	61.6	52.2	40.1	24.4
1943	20.4	27.4	30.8	43.8	54.8	71.3	71.6	70.8	59.2	49.4	36.0	25.2
1944	29.1	27.6	29.8	42.7	62.8	70.7	71.4	72.0	63.6	49.8	41.0	23.1
1945	18.2	26.1	47.5	49.9	51.6	63.6	69.4	70.0	63.2	49.4	40.6	24.7
1946	27.6	26.8	47.4	49.6	56.8	67.8	73.2	68.4	66.0	57.6	43.8	30.4
1947	26.6	20.8	29.0	45.5	54.0	65.0	70.8	-	-	-	36.0	27.7
1948	17.9	24.5	35.0	52.6	56.2	67.4	73.6	71.2	67.2	50.0	44.5	31.1
1949	29.7	30.0	36.2	47.8	61.4	73.3	76.9	72.2	59.9	57.5	38.3	32.1
1950	31.7	25.7	31.2	42.0	60.4	68.8	69.6	69.3	62.3	55.3	35.1	23.3
1951	26.0	27.3	35.6	46.0	61.3	67.2	71.6	68.5	61.3	55.4	32.1	26.5
1952	27.6	29.3	33.3	48.5	57.1	71.7	74.8	70.4	64.0	46.1	40.5	32.7
1953	28.8	30.8	38.0	44.3	61.5	71.4	74.0	70.8	62.3	55.7	-	32.2
1954	24.7	33.6	32.6	51.5	54.4	71.1	70.5	68.7	63.8	52.3	39.8	27.9
1955	24.7	26.6	34.0	53.7	61.0	66.3	76.8	74.8	63.0	53.7	35.3	25.1
1956	23.6	25.0	30.3	44.0	56.2	70.1	70.1	70.0	61.5	57.2	40.1	32.6
Average	25.5	26.6	34.9	47.2	58.3	68.7	73.1	70.7	63.6	52.6	39.2	28.6

[1]Data: U. S. Weather Bureau

TABLE 3

AVERAGE MONTHLY PRECIPATION, ALLEGAN, MICHIGAN[1]
1927-1956

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1927	1.15	1.09	2.71	3.86	4.92	2.52	0.94	1.18	6.65	3.40	4.93	5.21
1928	2.73	1.11	1.50	3.09	2.95	4.76	1.27	1.86	3.56	4.21	5.44	2.64
1929	4.14	0.73	3.24	6.81	5.33	2.63	1.59	0.31	1.55	4.32	2.89	3.48
1930	2.96	1.86	3.06	2.08	2.93	2.06	1.21	0.77	1.31	1.49	2.78	1.13
1931	1.09	0.54	2.30	2.37	2.78	4.11	0.86	1.64	2.83	2.64	3.55	2.96
1932	3.66	1.94	3.58	1.17	4.87	3.75	3.19	2.10	0.93	4.89	1.40	2.83
1933	1.32	1.74	2.14	3.88	5.99	4.28	1.88	3.04	4.53	5.51	3.02	1.36
1934	1.62	1.42	1.54	2.25	1.88	0.90	1.05	3.96	6.58	2.39	4.35	2.41
1935	2.00	1.71	3.44	2.41	2.13	6.47	2.72	7.28	3.17	0.97	4.90	3.09
1936	3.38	1.68	0.46	2.24	1.18	2.51	0.65	4.57	8.32	2.70	1.15	2.99
1937	2.34	2.45	0.99	8.10	3.08	4.55	2.87	3.65	3.42	2.62	2.96	2.20
1938	2.08	4.06	3.07	1.03	3.59	3.82	3.03	2.91	3.32	0.53	1.15	1.87
1939	2.22	2.97	1.84	4.42	1.44	5.33	1.45	5.18	3.43	3.69	1.21	1.38
1940	3.59	0.73	2.32	2.25	5.06	3.78	1.41	5.48	1.61	3.12	2.63	1.96
1941	2.39	1.46	1.91	1.95	3.15	2.26	1.24	1.98	4.24	6.31	4.04	1.64
1942	3.41	0.88	.373	0.56	5.05	4.53	3.83	6.34	3.11	3.19	3.33	3.28
1943	2.66	1.92	3.18	2.60	5.91	2.88	3.07	2.68	3.84	1.05	1.93	0.70
1944	1.54	2.03	3.83	2.16	3.71	3.16	2.24	1.41	2.62	0.76	2.17	1.27
1945	0.98	1.52	1.66	4.03	6.52	3.32	1.94	1.95	5.02	2.40	3.22	2.12
1946	2.05	1.24	3.47	1.12	3.28	1.71	0.46	1.34	1.86	3.12	3.13	2.71
1947	2.27	1.39	1.85	8,60	4.26	2.32	1.89	1.62	5.68	0.78	2.95	1.84
1948	1.71	2.12	4.50	3.61	4.27	3.09	3.63	0.57	1.99	1.10	2.28	2.84
1949	3.08	2.67	2.53	1.82	2.97	4.71	4.36	2.05	2.71	2.20	1.65	5.55
1950	4.07	3.28	2.38	6.24	0.44	5.90	4.66	1.08	3.07	0.59	2.54	2.62
1951	2.51	1.76	2.03	4.07	2.18	3.35	2.08	3.68	3.97	3.18	3.34	4.07
1952	2.01	0.78	2.32	3.12	4.27	2.91	4.95	4.81	1.95	0.33	2.86	1.54
1953	1.00	1.89	2.14	2.36	1.89	4.02	3.57	4.93	1.22	1.12	1.37	1.93
1954	2.25	2.32	4.10	3.58	1.10	4.07	3.02	2.49	2.82	9.54	1.76	2.05
1955	1.96	1.75	2.51	2.17	2.50	2.00	2.39	4.79	1.20	5.43	3.42	1.35
1956	0.52	2.39	2.24	4.35	5.70	1.08	2.43	2.43	0.67	0.43	1.03	0.97
Average	2.29	1.78	2.52	3.28	3.61	3.43	2.33	3.24	3.24	2.80	2.79	2.39

[1]Data: U. S. Weather Bureau. Average Annual Precipitation 33.33 inches

TABLE 4

AVERAGE MONTHLY PRECIPITATION, HASTINGS, MICHIGAN[1]
1927-1956

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1927	1.03	1.36	2.04	3.30	3.80	2.28	1.43	1.47	5.19	3.03	4.63	3.19
1928	2.27	0.93	1.40	2.20	3.18	5.09	1.51	3.10	2.05	4.43	4.00	2.47
1929	3.40	0.63	.281	6.09	5.08	3.01	3.27	1.07	1.25	4.13	1.73	2.80
1930	2.25	1.63	1.23	1.47	4.02	2.80	0.43	0.54	3.11	0.96	1.47	0.67
1931	0.82	0.77	1.67	0.97	2.48	5.06	1.00	0.65	3.27	1.71	3.90	2.87
1932	3.72	2.11	2.11	1.56	4.99	1.73	4.96	3.78	2.79	5.03	2.15	2.74
1933	1.07	1.50	1.99	3.24	5.63	2.51	5.56	2.80	3.74	5.48	2.09	0.85
1934	1.08	0.43	1.51	2.11	2.67	1.89	1.32	2.28	4.48	2.01	3.53	1.06
1935	1.73	1.87	2.22	1.34	4.40	5.65	4.46	5.14	3.45	1.00	4.62	1.18
1936	1.41	2.99	0.24	1.94	0.71	.228	1.38	4.02	8.56	2.97	0.54	2.08
1937	1.83	1.30	0.91	6.23	2.79	4.09	4.19	2.61	2.66	2.42	1.73	1.71
1938	1.21	4.48	2.52	0.69	4.81	2.84	2.74	4.94	2.28	0.19	1.55	1.88
1939	1.58	2.40	1.47	4.17	-	9.56	1.07	8.77	1.59	3.09	0.91	.97
1940	1.54	0.65	1.35	1.26	4.84	5.24	1.21	9.17	1.11	3.40	1.65	2.49
1941	1.52	0.60	1.69	1.51	3.46	3.96	1.47	2.70	3.13	7.47	2.77	1.27
1942	1.73	0.76	3.83	0.69	5.85	5.13	5.78	4.25	5.58	3.94	3.00	2.17
1943	2.31	1.15	3.06	2.17	7.49	-	3.22	2.64	2.62	1.45	1.59	0.30
1944	1.15	1.79	3.57	2.21	4.01	2.98	1.49	3.81	3.37	1.26	1.73	0.94
1945	0.42	1.11	1.91	3.86	6.40	2.97	2.60	2.96	7.41	2.80	2.21	1.37
1946	1.67	1.47	3.24	1.00	4.16	3.68	0.53	1.00	3.57	3.06	2.30	2.74
1947	2.39	0.48	2.03	7.05	5.07	3.27	1.76	3.43	5.58	1.27	2.13	1.56
1948	1.12	1.26	4.90	1.86	4.32	4.21	3.79	1.52	2.40	0.90	2.30	2.44
1949	2.42	1.72	.208	1.91	3.22	4.63	3.55	2.98	2.21	2.13	1.46	5.42
1950	3.69	3.00	2.18	6.06	1.48	7.09	3.27	1.25	3.62	0.69	2.64	1.72
1951	2.20	0.95	2.25	4.21	2.86	4.17	2.45	3.45	5.18	4.70	2.70	3.15
1952	2.28	0.98	1.85	2.83	4.45	2.27	3.78	4.27	2.00	0.26	2.69	1.39
1953	1.41	1.49	2.07	3.39	2.33	2.26	1.24	2.64	1.74	1.89	1.14	1.34
1954	1.63	3.47	3.84	3.88	0.99	7.68	3.67	2.14	2.99	10.51	1.96	2.12
1955	1.29	1.61	2.56	2.54	3.02	1.53	2.08	3.68	1.42	4.17	3.30	0.46
1956	0.28	2.65	2.35	4.34	5.94	3.32	2.25	2.01	0.87	0.41	1.45	1.02
Average	1.75	1.59	2.24	2.86	3.96	3.98	2.58	3.17	3.32	2.89	2.33	1.88

[1]Data: U. S. Weather Bureau

Average Annual Precipitation 32.55 inches

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