WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY.
E. A. BIRGE, Director. W. O. HOTCHKISS, State Geologist
A. R. WHITSON, In Charge, Division of Soils
SOIL SURVEY IN COOPERATION WITH COLLEGE OF AGRICULTURE
H. L. RUSSELL, DEAN

BULLETIN NO. XXIV. SOIL SERIES NO. 1

RECONNOISSANCE

SOIL SURVEY

OF

MARINETTE COUNTY

BY
SAMUEL WEIDMAN
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY
AND
PERCY O. WOOD
UNITED STATES DEPARTMENT OF AGRICULTURE

SURVEY CONDUCTED IN COOPERATION WITH THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF SOILS, MILTON WHITNEY, CHIEF.

MADISON, WIS.
PUBLISHED BY THE STATE
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TABLE OF CONTENTS

ILLUSTRATIONS

PLATES.

FIGURE.

MAP.

PREFACE

The Wisconsin Geological and Natural History Survey is carrying on a soil survey of Wisconsin in cooperation with the U. S. Department of Agriculture and the College of Agriculture of the University of Wisconsin. The primary object of this survey is to make an inventory of the soils of the state; to secure knowledge of the kinds of soil, their physical and chemical qualities, and the area and distribution of each kind. In the reports of the soil survey, therefore, the soils are described, classified, and mapped, as is done in the present report of the survey of Marinette County.

In the northern and more sparsely settled portions of the state the survey is of a rapid and general character, and is termed a "reconnoissance survey." In those portions of the state where substantially all of the land is in farms, the survey is carried on with much greater detail.

In the course of the reports on the soils of different areas general statements are made regarding the use and treatment of types of soil. These statements are carefully considered and are correct in the light of present knowledge. But it is plain that they cannot be based on careful study and experiment on the particular soils with which the report deals. Such an investigation must be carried on by the College of Agriculture after the survey has been completed and a general knowledge of the soils has been obtained. It will take much time and many experiments to determine in detail the proper methods of maintaining and increasing the fertility of soils, and the crops to which they are best adapted. Meanwhile, the statements made in the reports give general advice which will be of service to the farmer. It must be remembered, however, that the main purpose of the report is to describe and map the soils of the county, or other area with which the report deals. Those who receive the reports should preserve them; to be used for reference in connection with bulletins which the College of Agriculture may issue later, and which will be specifically directed to the practical use of the soils.

RECONNOISSANCE SOIL SURVEY OF MARINETTE COUNTY, WISCONSIN.

By S. Weidman,
Of the Wisconsin Geological and Natural History Survey,
and
Percy O. Wood
Of the United States Department of Agriculture.

DESCRIPTION OF THE AREA.

Marinette County is situated in the northeastern part of the State of Wisconsin, lying adjacent to the southern end of the Upper Peninsula of Michigan, and separated from it by the Menominee River. It is bounded on the east and northeast by the Menominee River, on the north by Florence County, on the west by Forest and Oconto Counties, on the south by Oconto County, and on the southeast has about 15 miles of shore line on Green Bay, an arm of Lake Michigan. The county lies approximately between parallels 45° and 45° 45′ north latitude, and meridians 87° 35′ and 88° 25′ west longitude. Its greatest length is 58 miles from north to south and its width varies from 24 to 32 miles. It is the third largest county in the State, containing 1,413 square miles, or 904,320 acres.

The elevation of Marinette County above sea level ranges from 580 feet on the shore of Green Bay to probably over 1,500 or 1,600 feet in the northwestern part of the county. The Menominee River at the head of Big Quinnesec Falls, in the northern part of the county, has an altitude of 1,020 feet and descends to 580 feet at the harbor in Marinette. The Peshtigo River at the head of Taylors Rapids, in the west central part, has an elevation of 1,227 feet, and falls to 580

feet at Peshtigo Harbor. The altitude of the railroad station at Marinette is 600 feet, Peshtigo 602, Coleman 706, Pound 714, Beaver 662, Ellis Junction 675, Wausaukee 736, Amberg 889 and Pembine 968.

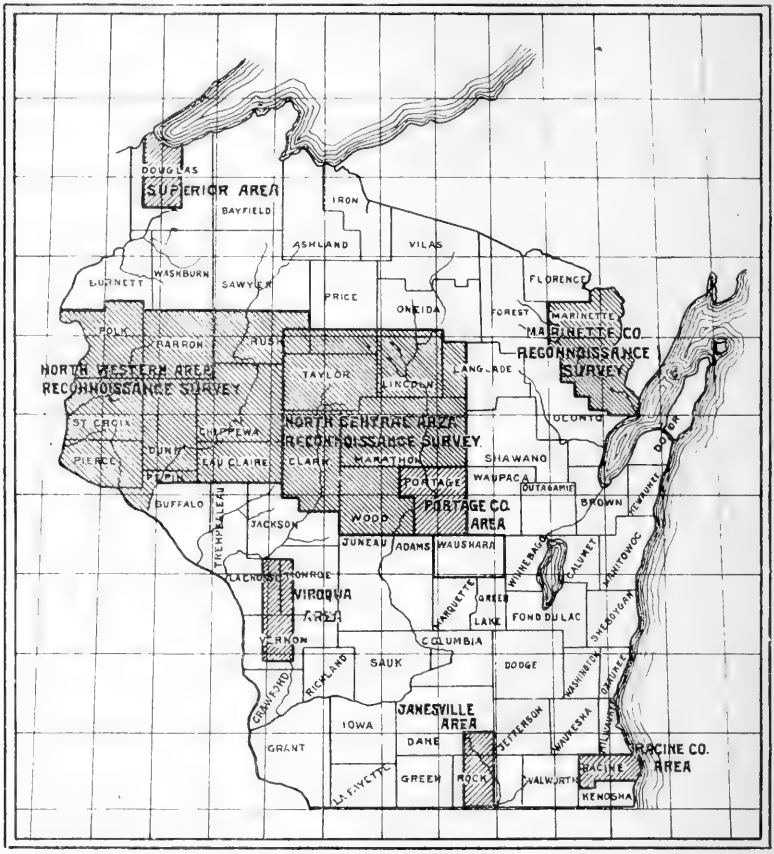

FIG. 1. Sketch map showing location of Marinette County reconnoissance survey, and other soil surveys of Wisconsin.

The topography of the county varies from level plains to gently undulating and rolling areas. The areas of level plains

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The surveys of Marinette Co., of the North Western area, and of the North Central area, including Portage Co., may be obtained on application to the Wisconsin Geol. & Nat. Hist. Survey, Madison, Wis. The surveys of Marinette Co., Portage Co., Racine Co., and the Janesville, Viroqua, and Superior areas may be obtained on application to the U. S. Dept. of Agriculture, Washington, D. C., or from the local Congressman or U. S. Senator.

and rolling lands alternate, their main direction being northeast and southwest. The streams, on the other hand, flow in a southeast direction, at right angles to the trend of the prevailing land features. In conformity with the general trend of the more prominent topographic divisions the small swamps and ridges have their longest direction northeast and southwest.

The most prominent hills in the county are Silver Mountain and Thunder Mountain, both of which reach 400 to 500 feet above the surrounding country. Both these elevations are in the western part of the county, Silver Mountain being in T. 34, R. 17, and Thunder Mountain in T. 32, R. 18.

The drainage of the entire country is toward the southeast. The tributaries of the Menominee River, which forms the northern and eastern boundary of the county, drain about three-fifths of the county, and the Peshtigo River and its tributaries drain about two-fifths. The principal tributaries of the Menominee are the Pike and the Peme Bon Won. The principal tributaries of the Peshtigo are the various streams draining into Lake Noeque Bay and the Little Peshtigo River. There are many small lakes in the county, the most prominent of which are Lake Noeque Bay, having an area of 4 or 5 square miles, and Coleman Lake, with an area of less than 1 square mile.

The stream valleys are relatively broad and shallow; in only a few places are they deep and narrow. Rapids and waterfalls are common. In the western part of the county the Peshtigo River, from Taylor Falls to the Lower Sandstone rapids, falls about 550 feet in about 43 miles. This part of the river is characterized by numerous rapids from 10 to 40 feet in height. Between the rapids the descent is relatively slight. The Menominee and Pike Rivers also contain numerous rapids. These numerous falls and rapids, which are almost entirely found in the area of crystalline rocks, make possible the development of a large amount of electrical power. A $1,000,000 plant has recently been constructed at High Falls on the Peshtigo River for the purpose of supplying power to the city of Green Bay and the intervening country. One of

the largest wood-pulp mills in the country is located at Niagara, in the northern part of the county on the Menominee River, where a fall in the river is utilized for power. The water-power possibilities of northern Wisconsin are becoming more and more important and Marinette County will have no small share in this development.

Marinette County lies in the great timbered area of northern Wisconsin, and agriculture is secondary to lumbering and the manufacturing of timber products. The original growth of white pine has been quite generally removed, as it was long considered the only timber worth cutting. Beginning about 15 years ago, Norway pine, hemlock, and the various kinds of hardwoods, of which there are many in the county, such as basswood, poplar, birch, and jack pine, have been utilized.

There still remain a few tracts of excellent pine owned by lumber companies in the northeast part of the area, and on the Coloma loam there is much fine hardwood, but aside from these areas the valuable timber has very largely been cut. Some poplar and hemlock is used by the paper mills at Marinette, Menominee, and Niagara.

As the process of removing the magnificent forest covering has gone on, few settlers have entered upon agriculture, with the result that the county contains scattered settlements over the large areas of cut-over lands, awaiting the arrival of other settlers to turn the unoccupied areas into prosperous farming sections. In addition to these cut-over areas, which at present are developing a growth of scrubby oak, poplar, and birch, there exist many cedar and tamarack swamps which some day will also be made to contribute to the agricultural resources of the State.

The earliest white settler in the region now comprised in Marinette County was an agent of the American Fur Co., Louis Chappieux, who located on the present site of Marinette in 1796. He retained the monopoly of the fur trade until 1822, on the arrival of William Farnsworth and Charles R. Brush.

Marinette County was organized from the eastern and southeastern portions of Oconto County in March, 1879. The

county when first formed extended up the Menominee River to include township 38, and thus contained what is now the eastern half of Florence County. Florence County was detached from Marinette and Forest Counties in 1884.

The lumber business attracted the first permanent settlers to the county. The first sawmill in Marinette was erected in 1832. The second mill, located at Twin Island, was built in 1841. About 1854 to 1856 several mills were erected in Marinette and Menekaunee, a suburb of Marinette. The original plat of Marinette was laid out and recorded in April, 1858. The first school was organized in 1857 and the first schoolhouse erected in 1858. John G. Kittson, a clerk of the fur company in 1826, was the first man to break ground for a farm in the county. His farm and trading post were located at Wausaukee Bend on the Menominee River.

Agriculture in the county was unimportant until within the eighties. The great tracts of pine land along the Peshtigo and Menominee Rivers, owned by the lumber companies of Marinette, Menominee, and Peshtigo, developed a highly productive business, which gave employment to all the early settlers of the region. The earliest farming in the county was begun about 1870 in the settlements of the Upper, Middle and Lower Sugar Bushes, in the southern part of the county, in what is now the town of Grover.

The Peshtigo fire of October 1, 1871, in which about 1,000 people lost their lives, was a decided blow to the development of the county. The fire followed a long period of especially dry weather and is a memorable day in the history of Marinette County. At that time about 300 families lived in the three Sugar Bush settlements. Only eight houses remained after the fire. The village of Peshtigo was the center of great devastation. The great tracts of thickly forested lands burned over in various parts of the county gave added impetus to clearing the land for farming in the next few years.

In 1860 the population of the towns of Marinette and Peshtigo before the county was set off from Oconto County was 1,044 and in 1875 it was 5,057. Since its organization the county, according to the State census, has reported the follow-

ing population: In 1885, 13,494; in 1895, 19,417; and in 1905, 33,730. The population in 1910, United States census, was 33,812. About one-half the population since 1885 has been in the city of Marinette. Of the entire population since 1885 about two-thirds has been urban and about one-third rural.

Nearly one-half of the early settlers were native-born Americans. The most important foreign-born element was from Canada, of English and French extraction, in about equal proportion. Most of the French Canadians settled in the village of Peshtigo, and on farms about the village of Coleman. The important sources of immigration from Europe before 1885 were Germany, Sweden and Norway, Great Britain, and Ireland. Later the Polish became an important element. Bohemia, Austria, France, and Holland are also represented. In 1905 the number and nationality of the important foreign-born elements were as follows: Canadians, 2,288; Germans, 2,257; Swedes, 1,667; Norwegians, 737; Poles, 757; Danes, 315.

Before the advent of public roads communication in the undeveloped country was very difficult. The Menominee and Peshtigo Rivers were the natural highways for the fur traders and the lumbermen. The supply roads of the lumber companies leading out from Marinette, Peshtigo, and Oconto were an important aid to early communication. For years after the railroads were built into the county the floating of logs down the rivers to Marinette and Peshtigo was the principal method of bringing the timber to the sawmills, and this is still an important means of transportation.

From the time of earliest settlement in the county outside communication has been carried on by vessels on Green Bay and the Great Lakes. The first railroad reached Marinette from Green Bay in 1871. The next year this road, the Chicago & Northwestern Railway, was built from Menominee to Escanaba, Mich. The Peshtigo Lumber Co. at an early date built a railroad from Peshtigo to Peshtigo Harbor, where it connects with a line of barges on the lakes. This railroad later developed into the Wisconsin & Michigan Railway, extending through the northern part of the county. In 1881 the Milwau-

kee Northern Railroad, now the Chicago, Milwaukee & St. Paul, was built through Coleman, Wausaukee, etc., to connect with Ontonagon, Mich. It practically bisects the county in a north and south direction, and has the greatest mileage of any of the roads in the area. In addition to these lines, the Minneapolis, St. Paul & Sault Ste. Marie Railroad traverses the northern part of the county from east to west. The city of Marinette, the county seat of Marinette County, in addition to having three railroads, is so situated as to participate in the Great Lakes traffic, although the principal wharves are in Menominee, Mich., which is about the same size as Marinette, and is situated on the opposite bank of the Menominee River.

Marinette, population 14,610, is the principal town in the area, and is a thriving and prosperous little city, which owes its origin and growth to the lumber industry, still the most important business. Peshtigo, a town of about 2,500, is also a lumber town, and Wausaukee, the next in size, with about 1,200 population, has a large sawmill as its most important feature. Aside from these local markets, together with Menominee, Mich., the iron and copper country of upper Michigan furnishes a most excellent market for all kinds of farm products. Not only can Chicago prices be obtained in the copper country markets, but freight charges are paid in addition, so that the various vegetables and small fruits, grown at present on a very limited scale, as well as potatoes, hay, field peas, and the like, are readily disposed of.

A county agricultural school, established in 1905, is located at Marinette. The school is maintained jointly by the State and county and is doing excellent work in agricultural education. The general science of agriculture is taught and practical demonstrations in farm work in its various phases are given.

A substation of the State experiment station was established in 1909 at Crivitz (Ellis Junction railroad station). The station is devoted to experimental work on crops best adapted to the sand soils and the general management of sandy soils. The results of the investigations will be announced as soon as completed.

CLIMATE.

Northern Wisconsin is famous for its ideal autumn weather. The summers, while warm during the day, almost uniformly have cool nights. The winters are long and usually dry and cold, snow often being on the ground from December to April. The following tables, compiled from the records of the Weather Bureau Station at Florence, Crandon, and Menominee, show the normal monthly and annual temperature and precipitation. Florence is about 15 miles north of the north central part of Marinette County, and Crandon is 18 miles west of the northwestern part of Marinette County. The observations for Menominee, Mich., are taken only a half mile from the city of Marinette, and are thus applicable to southeastern Marinette County.

The climate of Marinette County, like that of most of Wisconsin, is characterized by considerable range in temperature. The ameliorating influence of Green Bay and Lake Michigan on the southeast border of the county is important only from 5 to 10 miles from the shore line. Sometimes a temperature as low as—35° F. is reached in winter, while the mercury sometimes passes the 100° F. mark in summer, giving a range of 135°. The coldest weather usually occurs during the latter part of January and the first of February, and the warmest weather in July and August.

The normal temperature for the winter months ranges from 14.5° F., at Florence and Crandon to 18.6° F., at Menominee. The normal for the spring is approximately the same for the three stations, ranging from 38° to 40.7° F. The normal temperature for the summer ranges from 63.6 F. at Florence to 64.9° F. at Crandon and 65.3° F. at Menominee. The normal for the fall is 43.5° at Florence and 43.3° at Crandon, while at Menominee it is much higher, being 48.3°.

Normal and mean maximum and minimum temperature at Florence, Crandon, and Menominee.

	Florence.			Crandon.	Menominee.		
	Mean temperature, 1893–1907.	Mean of maxima, 1893–1907.	Mean of minima, 1893–1907.	Mean temperature 8 years, including 1907.	Mean temperature, 9 years.	Mean of maxima 3 years, 1906–1908.	Mean of minima, 3 years, 1906–1908.
December	18.3	25	10	16.7	23.2	31.8	16.6
January	13.3	23	5	11.1	18.1	28.8	13.2
February	11.9	23	3	15.7	14.6	28.6	10.5
Winter	14.5	.....	.....	14.5	18.6	.....	.....
March	24.0	35	14	26.3	28.2	36.9	19.0
April	39.0	53	29	43.1	39.7	48.9	30.1
May	51.1	66	40	52.7	50.4	57.9	39.6
Spring	38.0	.....	.....	40.7	39.4	.....	.....
June	61.8	75	48	64.7	61.7	73.0	52.5
July	65.6	80	53	66.8	68.0	77.7	58.3
August	63.3	76	51	63.1	66.8	76.6	56.7
Summer	63.6	.....	.....	64.9	65.3	.....	.....
September	56.5	67	44	56.8	59.6	71.8	53.2
October	44.3	55	35	45.3	49.5	57.1	39.1
November	29.6	37	21	27.8	35.8	42.9	28.4
Autumn	43.5	.....	.....	43.3	48.3	.....	.....
Annual	39.9	.....	.....	40.9	43.0	.....	.....

Normal precipitation and prevailing direction of winds at Florence, Crandon and Menominee.

	Normal precipitation.			Direction of prevailing wind, 1908		
	Florence.	Crandon.	Menominee.	Florence.	Crandon.	Menominee.
December	1.54	1.12	0.52	W.	SW.	SW.
January	1.16	1.46	.76	NW.	N.	SW.
February	1.10	1.08	1.05	NW.	N.	NW.
Winter	3.80	3.66	2.33			
March	2.00	1.48	1.84	NW.	W.	SW.
April	2.44	1.48	1.73	NW.		N.
May	3.89	2.38	3.39	NW.	N.	NE.
Spring	8.33	5.34	6.96			
June	4.15	2.62	3.63	SW.	S.	SW.
July	3.86	3.15	4.36	NW.	W.	SW.
August	3.35	2.70	2.68	NW.	W.	NW.
Summer	11.36	8.47	10.67			
September	3.61	3.76	3.27	NW.	S.	NW.
October	2.86	2.65	1.63	NW.	S.	SW.
November	2.05	2.26	1.18	NW.	W.	
Fall	8.52	8.67	6.08			
Annual	32.80	26.14	26.04			

In summer the temperature of Marinette County is practically the same as at Crandon, which is warmer than Florence, while in winter the temperature of Marinette County is the same as that of Florence, which is warmer than Crandon. The north half of Marinette County is 1 degree warmer for the year than either Crandon or Florence, and the southern half of Marinette County is 1 degree warmer for the year than the northern half of the county. In other words, Marinette County has a more equable temperature than either Florence County to the north or Forest County to the west, due to the ameliorating influence of Green Bay and Lake Michigan.

The annual rainfall of Marinette County averages from 26 to 33 inches for the major part of the area. The amount of precipitation is fairly constant for the winter, and a portion of the fall and spring months, but varies considerably in the summer months. Exceptionally dry periods occur once in 50 years, dry periods once in 25 years, and moderately dry periods once in

10 years. The last exceptionally dry period occurred in the years 1894 and 1896.

The greatest rainfall occurs during the growing season, the table showing 19.06 inches for the period from April to September, inclusive, at the Menominee station, against 6.98 inches for the period from October to March, inclusive. At Florence there are 21.3 inches rainfall in the spring and summer months, and 11.5 inches during the fall and winter.

The data of last and first killing frosts, in the accompanying table indicate the period in which immunity from killing frost can be expected to range from 105 days in the northern part of the county to 140 days in the southern part near Green Bay. As shown by the table, frosts are likely to be late in the spring but are not generally earlier in the autumn than for the southern part of the State. From the table it may be seen that one can not reasonably expect immunity from frost, for most parts of the county, before about the first part of June or after the middle of September.

Dates of killing frosts at Florence, Crandon, and Menominee.

Year.	Florence.		Crandon.		Menominee.	
	Last in spring.	First in fall.	Last in spring.	First in fall.	Last in spring.	First in fall.
1895	May 27	Sept. 27	May 26	Sept. 30	.....	.....
1896	May 26	Aug. 19	Apr. 10	Sept. 2	.....	.....
1897	June 8	Sept. 17	June 8	.....	.....	.....
1898	May 16	Sept. 10	.....	.....	.....	.....
1899	May 25	Sept. 13	.....	.....	.....	.....
1900	June 9	Sept. 8	.....	.....	.....	.....
1901	June 9	Oct. 4	.....	.....	May 12	Oct. 1
1902	June 5	Sept. 12	.....	.....	May 21	Oct. 14
1903	June 12	Sept. 6	.....	.....	May 3	Sept. 24
1904	May 30	Aug. 21	.....	.....	May 16	Sept. 20
1905	May 26	Sept. 13	.....	.....	May 9	Oct. 12
1906	June 13	Sept. 29	.....	.....	May 9	Oct. 9
1907	May 28	Sept. 22	May 28	Sept. 22	May 27	Sept. 30
1908	June 15	Sept. 28	June 15	Sept. 29	May 13	Sept. 29
1909	June 18	Sept. 7	May 18	Sept. 7	May 10	Sept. 27
Average	June 3	Sept. 14	June 1	Sept. 13	May 14	Oct. 2

The following table shows the comparative temperatures and rainfalls of Marinette County, southern Wisconsin, northern Illinois, Iowa, and the Lower Peninsula of Michigan:

Mean, seasonal and annual temperature and precipitation.

	Winter.		Spring.		Summer.		Fall.		Annual.	
	Precipitation.	Temperature.	Precipitation.	Temperature.	Precipitation.	Temperature.	Precipitation.	Temperature.	Precipitation.	Temperature.
	Inches	° *F.*	*Inches*	° *F.*	*Inches*	° *F.*	*Inches*	° *F.*	*Inches*	° F.
Marinette County....	3.26	15.7	6.84	39.5	10.16	64.6	7.75	45.1	28.01	41.2
Southern Wisconsin..	4.66	19.8	9.18	45.3	11.17	67.6	8.56	47.0	33.57	44.9
Northern Illinois.....	5.74	25.0	9.89	48.0	11.07	71.8	7.64	51.4	34.34	49.0
Iowa	3.33	21.5	9.50	47.0	12.46	71.5	6.88	50.6	32.17	47.8
Michigan, Lower Peninsula.....	6.29	21.6	7.65	42.7	8.49	67.3	7.54	48.5	30.31	.....

AGRICULTURE.

The principal industry of Marinette County, as already stated, is lumbering and related manufacturing enterprises, with agriculture second in importance. About two-thirds of the population is in the cities and villages and one-third on the farms. This condition is not unusual, but is characteristic of most of the counties in the northern half of Wisconsin, as well as of many counties of the southern half.

The proportion of farm population to village and city population has remained approximately constant since 1875, the total population showing the rapid increase from 5,057 in 1875 to 33,812 in 1910 already cited. The state census of 1905, however, shows a slightly greater increase in the rural population as compared with that of the city, and this trend will very probably continue in the future, as the lumber industry has already passed its greatest development, while agriculture is still in its formative stage.

The total area of the county is 904,320 acres, of which only about 6.7 per cent in 1905 was under cultivation. The acreage of improved land in the county has about doubled for each ten

year period from 1885 to 1905, the cash value of farm lands also doubling for each similar period. A fair estimate of the percentage of land in the county that will finally be improved is probably 70 to 80 per cent of the total area, and hence it is evident that there is ample room for the future development of agriculture in the county. The statistics for 1910 are also included in the table.

Improved and unimproved acres in farms and cash value of farm land, including buildings.

Year.	Improved.	Unimproved.	Value including buildings.
	Acres.	*Acres.*	*Dollars.*
1885	16,989	34,050	908,335
1895	29,302	123,982	2,177,875
1905	60,257	104,141	4,040,736
1910 U. S. Census	79,474	140,089	6,899,590

In describing the agriculture of the county, therefore, we are concerned with possibilities of future development as well as with the status the industry has already attained. At present the agriculture of the county is practically confined to the south central and southeastern parts of the county, on the Coloma fine sandy loam, Miami fine sandy loam, and Dunkirk fine sand. While there are farms scattered over the other types, there are few localities which are at all thickly settled or which present the appearance of an agricultural community.

The present valuation and selling price of the farm lands in Marinette County is determined largely by the character of the soil. In the older counties of the State, where the agricultural lands are almost all occupied, this factor wholly determines the valuation and selling price, but in the new counties other elements, such as location and density of settlement, may enter into the generally accepted basis of valuations.

The range in prices of farms per acre varies widely, as is usually the case in other northern counties. Farms on the lighter sandy soils in the thinly settled central and northern parts of the county will average between $5 to $15 an acre for

uncleared land and $20 to $45 for cleared lands, including buildings. The prevailing prices of farms on the loam soils in the southeastern half of the county and also on the fine sandy soil between Peshtigo and Marinette generally range between $15 and $25 an acre for unimproved land and from $50 to $90 an acre for improved land. The average prices, though stated between wide ranges, are subject to a gradual change tending toward higher prices for each year, as is usually the case where unimproved lands are opening up to agricultural settlement.

In the southeastern part of the county about Coleman, Peshtigo, and Marinette, where settlements were first made, from 1870 to 1880 the staple crops were wheat, oats, corn, and potatoes. Wheat was the principal money crop. Live stock was raised mainly for home consumption. Many of the earliest settlers depended upon game, mainly deer, for meat. An important market of the early settlers was the lumber camps.

The acreage in wheat was very probably larger in 1875 than that of any other crop. In 1885 (see table) the acreage of wheat was second to that of oats. Since 1885, despite the much larger acreage of improved land, the acreage of wheat remains about stationary. On the other hand, the acreage of oats from 1885 to 1905 has increased about five times, of corn ten times, of barley four times, of rye ten times, of potatoes three times, and of hay five times. The apple crop is increasing in importance, the yield in 1885 being 1,630 bushels, while in 1905 14,563 bushels were reported.

The crop statistics, compiled by the U. S. Census of 1910, are also included and shows a notable increase in all crops excepting that of wheat.

Acreage and yield of more important crops.

Crop.	1885.		1895.		1905.		1910.[2] U. S. census.	
	Acres.	Bush.	Acres.	Bush.	Acres.	Bush.	Acres.	Bush.
Wheat	1,499	27,790	706	12,701	1,556	21,164	885	14,927
Barley	114	2,088	108	2,495	415	9,210	1,409	32,019
Oats	2,070	66,647	5,072	135,256	11,407	299,100	13,029	405,503
Rye	161	2,549	423	7,158	1,200	17,574	2,478	43,989
Corn	112	6,552	818	29,132	1,171	34,101	3,597	94,913
Buckwheat	12	324	79	1,013	363	5,779	430	5,672
Potatoes	754	75,012	1,499	127,611	2,153	253,484	3,689	439,958
Beans and peas.	369	6,674	657	8,951	1,873	34,505	.....	.....
Root crops	246	39,284	59	11,483	238	21,245	.....	.....
Apples	.....	1,630	.....	653	.....	14,563	.....	.....
Sugar beets	.....	.....	.....	.....	.....	[1]4,354	.....	.....
Hay	.....	[1]5,115	.....	[1]10,596	17,914	[1]25,031	23,690	31,988

[1]Tons.

[2]Complete statistics of U. S. Census, 1910, for this and other tables not available.

The Miami fine sandy loam of the southeastern half of the county is especially favorable to apple culture. Such varieties as the Duchess, Hibernal, Patten Greening, Charlamoff, Longfield, and Wealthy are well adapted to the local soil and climatic conditions.

The data relating to acreage and production of beans and peas mainly or entirely relate to field peas. Peas do exceptionally well on the new sandy loams and loam soils, the average yield in 1905 being over 18 bushels per acre. The bean is grown very little in Marinette County. It should be grown more extensively on the sanly soils as an important export crop.

Sugar beets are sold to the sugar factory at Menominee, Mich. While the usual yield per acre is not large, the sugar content of the beets is relatively high.

The development of the live-stock and dairy industry has been as rapid as the development of this industry in other northern Wisconsin counties. The value of cattle and calves sold from 1885 to 1905 increased about six times, of hogs about three times. The number of sheep sold has increased considerably during the past few years.

Number and value of live stock on hand and sold or consumed in Marinette County.

Year.	Horses and mules.		Cattle and calves.			
			On hand.		Sold or consumed.	
	Number.	Value.	Number.	Value.	Number.	Value.
		Dollars.		*Dollars.*		*Dollars.*
1885	1,011	100,655	3,032	69,301	346	8,822
1895	2,104	89,378	5,019	56,064	803	8,969
1905	5,168	391,612	13,316	208,335	3,109	49,850
1910	4,439	462,437	15,678	309,918	.....	.....

Year.	Sheep.				Hogs.			
	On hand.		Sold or consumed.		On hand.		Sold or consumed.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
		Dollars.		*Dollars.*		*Dollars.*		*Dollars.*
1885	956	2,557	379	1,169	1,458	8,714	829	13,276
1895	1,019	1,671	257	532	1,890	9,090	1,749	17,281
1905	1,461	4,287	570	1,674	4,806	23,290	4,202	37,540
1910	3,569	12,152	.....	.....	7,917	50,804	.....	.....

Dairying has increased in importance with other phases of agriculture. Complete statistics are not available for 1885, but in the decade between 1895 and 1905 the number of milch cows more than doubled, the output of butter from the farms increased about three times, and the production of cheese from the factories increased about four times. In 1895 there was one creamery and two cheese factories in the county. In 1905 no creameries were reported, but seven cheese factories were in operation.

TYPICAL DAIRY FARM ON MIAMI SANDY LOAM. SEC. 10, T. 31, R. 22 E.

A CHARACTERISTIC HOME OF A NEW SETTLER ON THE COLOMA FINE SANDY LOAM, T. 31, R 20 E. A SMALL ORCHARD AND CLOVER FIELD IN THE FOREGROUND.

Dairy products of Marinette County.

Year.	Milch cows.		Milk.		Butter.	
	Number.	Value.	Pounds.	Value.	Pounds.	Value.
		Dollars.		*Dollars.*		*Dollars.*
1895	.....	.....	.....	.....	97,383	22,981
1895	2,977	53,744	.....	.....	179,170	32,325
1905	7,176	178,663	296,205	43,897	454,992	91,020
1910	8,335	.....	.....	.....	.....	.....

While the dairying industry has more than doubled during the last decade, its development has not been quite as rapid as that of grain and potato growing. One of the principal reasons for the relatively slow development of dairying is probably due to the low grade of the dairy stock. So far as known, there are no herds of pure-blooded stock of the generally recognized dairy or general utility breeds in the county. There are, however, a few bulls of pure blood, mainly of the Guernsey breed, in the southern part of the county. While many farmers keep a good number of cows, the yield of milk per cow is not large nor especially rich; hence the best results from dairying are not obtainable. It is a well-known fact that it requires as much feed to keep a low-grade cow as it does to keep one of high grade. The yield of milk per cow ought to be increased at least twofold over the present yield to obtain the best results developed in other dairy sections of the State. And to obtain this result, better dairy stock should be developed as rapidly as possible.

A system of farming, with dairying as a principal industry, will not only be profitable, but will develop conditions favorable to the maintenance of the fertility of the soil. The general use of manure and fertilizers should be practiced in any scheme of permanent agriculture. Where the forage crop is not fed on the farm and the manure returned to the soil, the continuous production of grain and hay crops brings about conditions in the soil that result in diminished yields. The selling of hay or other forage crops should not be practiced, unless pur-

chases are made from such sales of concentrated feeds with which to balance the feeding ration. The growing of alfalfa on all soils on which it will succeed should be extended, and also the growing of more clover and other legumes, in order to increase the supply of organic matter in the soils and to add the nitrogen which such plants gather from the air.

A chemical examination of much of the surface soil (0 to 8 inches) of the important types has been made, showing, as usual, a high content of potassium and a variable and, in some cases, quite a low content of phosphorus and nitrogen. Only a general statement in regard to the chemical composition and its relation to the fertility of the soil and the application of particular fertilizers can be submitted at this time.

Chemical analyses of samples representative of the soils of the area have been made by Prof. A. R. Whitson, of the College of Agriculture, at Madison, Wis., the results of which are given in the following table:

Chemical Analyses of soils of Marinette County.

Soil type.	No.	Total P^2O^5.	Total K^2O.	Total N.	CO^2	Organic matter.	Lime requirement per acre.	Litmus test.
Coloma loam	92A	0.15	2.52	0.131	0.073	2.83	5,000	Very acid.
Do	102A	.06	2.22	.130	.136	3.82	5,000	Do.
Superior fine sandy loam	93A	.05	2.41	.062	.017	1.17	2,000	Slightly acid.
Coloma fine sandy loam	94A	.15	2.60	.089	.069	1.45	2,000	Acid.
Plainfield sand	199A	.07	1.92	.067	.034	1.08	5,000	Do.
Coloma fine sand	200A	.09	2.27	.077	.042	1.66	5,000	Do.
Miami fine sandy loam, light phase	201A	.08	2.66	.107	.046	1.98	2,000	Very acid.
Miami fine sandy loam	202A	.12	2.59	.182	.082	3.42	500	Not acid.
Dunkirk fine sand	203A	.05	2.12	.130	.049	3.06	5,000	Slightly acid.

These analyses show a fairly high content of potassium in all the soils.

The chemical analyses of these soils is essentially like that of other soils of Wisconsin or the Northwest.

The supply of nitrogen is fairly good for the heavier loam soils, but quite low in the lighter sandy soils. The supply of nitrogen can be maintained and increased by growing clover, alfalfa and other legume crops. An especially good crop for nitrogen on the light sandy soils, which are very low in both nitrogen and organic material, is mammoth clover.

The supply of phosphorus is fairly good in the heavier loams, but quite low in the sandy soils. The analyses show that the phosphorus in the sandy soils is low, and phosphatic fertilizers on these soils are desirable, especially for crops other than the small grains. Application of barnyard manure, where available, would help these soils, but it will probably be found desirable to apply ground rock phosphate, at the rate of about 1,000 pounds per acre to begin with, and lighter applications of 250 pounds per acre thereafter.

Nearly all the soils, of the area would be benefited by lime. The first requisite is to make applications of ground limestone at the rate of 1 to 2 tons per acre. The cost of this would be about $3 per ton, depending on freightage, and the application of these amounts will last for some time, four or five years at least. Where ground limestone is not available, slaked lime can be used, but in smaller quantity. Clover often fails to get a start on light sandy soil. It is usually advisable therefore to add ground limestone when the field is ready for planting to oats or rye with the clover.

Before going to the expense of applying lime to correct acidity of the soils, or phosphate as fertilizer, it is suggested that the local agricultural school at Marinette or the State experiment station at Madison be consulted.

That system of agriculture is best which allows a rational and comprehensive adaptation of soils to crops under the climatic conditions of the area. While it is not intended to outline such a comprehensive system under the present undeveloped conditions of agriculture, certain suggestions are offered which may be of value to prospective settlers, as well as to those already located on the farms.

The loam soil provisionally named the Miami fine sandy loam and Coloma loam, and locally referred to as "clay" soil, are adapted to all those crops usually grown in the northern States

under a system of general farming. Proper varieties of corn should be selected which will ripen within the average period of immunity from frost. The Early Yellow Dent (Wisconsin No. 8), and Golden Glow (Wisconsin No. 12) should be selected. Common flint is probably best for the wet lands on account of maturing earlier. While wheat can be grown and fair yields produced, the crop tends to decline rapidly in yield, and hence it is not grown extensively. Buckwheat should be sown not later than June. The apple, when established varieties are selected and properly cared for, can be grown successfully for home consumption.

The lighter loam soils, the Coloma loam and the small areas of Superior fine sandy loam, are probably not well adapted to wheat and barley, but to most other grains and root crops suitable to the climate. Peas, with yields of 18 bushels per acre, are grown on the Coloma fine sandy loam. On these types from 100 to 150 bushels of potatoes per acre are commonly secured, and oats, rye, and corn give good average yields. The addition of lime to correct acidity of the soil, and also phosphorous as a fertilizer in some cases would be beneficial.

The sandy soils, the Plainfield sand (the jack pine plain type), the Coloma fine sand (the hilly pine-land type), and the Dunkirk fine sand (the low sand-plain type), are adapted to more specialized crops. Barley and wheat should ordinarily not be attempted. These light sandy soils should be worked with special care in order to maintain and increase their fertility. An ideal rotation[1] of crops for the sandy soil is first year oats or rye, seeding with cdover; clover two years; then a cultivated crop of potatoes, corn, or soy beans. Sufficient dairy and other stock should be raised to maintain the upkeep of the farms.

The light sandy soils are typical truck soils, but under the present conditions of development of the region, general farming with selected grains and root crops and the development of the dairying industry is probably the best system to adopt. Dairying, in fact, should be developed on all the soil, not only for the money profit to be derived but also as an important means in

[1] For management of "Sand soils," see Bulletin 204, Wis. Exp. Sta., Madison, Wis.

conjunction with proper crop rotation and use of commercial fertilizers in developing a system of permanent agriculture.

SOILS.

The soils of Marinette County are predominantly sandy, ranging from light sand to a moderately heavy loam. The upland soils are very commonly grayish or brownish at the surface, and are generally well drained throughout.

The soils of the county are formed mainly from glacial and alluvial deposits overlying granite, sandstone, and limestone. The glacial deposits are very largely composed of the ground-up material of the underlying bed rock, and hence these soils in the area of the limestone are very largely of limestone debris, and in the areas of sandstone and granite are largely of sandstone and granitic material, respectively. On the other hand, the soils of the alluvial deposits consist largely of sand and gravel without regard to the underlying rock, and are of very similar composition over the entire area.

The granite and other crystalline rock of the northwestern part of the county are the oldest formations and are of pre-Cambrian age. The first formation next overlying the crystalline rock is the Potsdam sandstone, of Middle Cambrian age, whose area of outcrop lies in a belt or zone from 6 to 10 miles wide extending northeast and southwest and reaching in a general way from the vicinity of Wausaukee to Lake Nocque Bay. The next formation above the Potsdam sandstone is the Lower Magnesian limestone, forming a zone 5 to 6 miles wide, lying southeast of the vicinity of Beaver and Left Foot Lake. The next overlying formation is the St. Peter sandstone, extending in a narrow belt about one-fourth to 1 mile wide along the east margin of the Lower Magnesian. The next formation, the uppermost in the county, is the Trenton limestone, forming a zone from 10 to 15 miles wide in the southeast part of the county, extending from the vicinity west of Porterfield to Marinette and the Green Bay shore. Overlying the bed-rock formation are the surface deposits of glacial drift and the alluvial sands and gravel.

In the northern and northwestern part of the county are belts of terminal moraine, characterized by billowy drift hills and

swamps. These belts were formed at the margin of the ice sheets in their retreat across the county, and trend in a northeast-southwest direction. The soils of the terminal moraines generally contain numerous bowlders, these being commonly granite.

A common feature of the southeastern one-third of the county are hogback ridges of gravel or sand "eskers," which were formed by streams flowing in ice tunnels beneath the glaciers. Most of these eskers run in a northeast-southwest direction and usually extend along or through swamps.

The level plains of sandy soil, generally containing more or less gravel in the subsoil, are stratified deposits and were formed in water, which may or may not have been connected with the ice sheets. The sand plains are quite variable in area and have their greatest length in a northeast-southwest direction.

In the northwestern part of the county in the vicinity north and south of Dunbar are small patches of red calcareous clay evidently old lacustrine deposits like those occurring along the shores of Lake Superior and Lake Michigan and in the Fox River Valley.

In this connection may be mentioned the old shore line of Green Bay which extends across the southeastern part of the county and forms the approximate border of the level tract of sand and peat soil lying between Peshtigo and Marinette. This abandoned shore line, 40 feet above the present level of Green Bay and Lake Michigan, was the border of the lake at the Algonquin stage of the Great Lakes. This shore line may be seen near Wilcox Station, also about 2 miles west of Peshtigo, and about 2 miles south of Bagley Junction, whence it turns to the northeast passing through the county 3 or 4 miles north of Marinette and Menominee. It marks a much later stage in the history of the Great Lakes than the one during which the red calcareous clays about Dunbar were deposited.

Considering the geological derivation and process of formation of the various soils, all the principal soils are formed either by weathering of glacial till overlying the bed-rock formation, or by weathering of water-deposited sands in old stream or old lake bottoms. The Miami fine sandy loam is derived from glacial till over the Trenton limestone and the

subsoil consists almost wholly of limestone dèbris, varying from fine powder to large fragments and bowlders, the bed rock being generally from 5 to 20 feet below the surface.

A light phase of the Miami fine sandy loam is derived from glacial till overlying Lower Magnesian limestone, St. Peter sandstone, and the Potsdam sandstone, the subsoil consisting mainly of limestone dèbris and sand. The Coloma loam is derived from glacial deposits overlying the crystalline formations, and consists wholly of dèbris of granitic rocks. The Coloma fine sandy loam and the Coloma fine sand are derived from glacial material within the general area of the sandstone and granitic formations, and are largely of terminal moraine deposits. The Superior fine sandy loam is derived from alluvial sand associated with and overlying red lacustrine clay.

The Plainfield sand is derived from the weathering of alluvial sand and gravel overlying various rock formations. The Dunkirk fine sand is derived from the weathering of delta or estuarine sands deposited in former Lake Algonquin, whose shore lines are about 40 feet above the present level of Green Bay.

Of the unclassified soils Peat consists of decomposed humus and marsh vegetation; Muck consists of a mixture of humus with sand and clay; and Rock outcrop consists of areas of abundant rock exposures, mainly of granitic character, in the northern parts of the county.

With relation to the native forest growth developed on the various soils, the nature of which was used as a general index of the character of the soil, the Miami fine sandy loam and the Coloma loam are characterized by relatively dense growths of hardwoods and hemlock, with large white pine in local areas. The Coloma fine sandy loam and the Superior fine sandy loam support a mixture of hardwoods and pine, the pine predominating. The Coloma fine sand is characterized by a growth of pine including white, Norway, and some jack pine. The Plainfield sand is characterized typically by a growth of jack pine and some Norway pine. The Dunkirk fine sand, relatively low sandy land, is characterized by a rather dense growth of white and yellow poplar, soft maple, scrub oak,

white birch, jack pine, some Norway pine, and in low wet places mixed tamarack and cedar.

Below is given a table stating the actual and percentage area of the various soils of the county as shown on the accompanying soil map.

Areas of different soils.

Soil.	Acres.	Per cent	Soil.	Acres.	Per cent
Coloma fine sand	199,872	22.1	Coloma loam	58,176	6.4
Coloma fine sandy loam	163,008	18.0	Dunkirk fine sand	29,952	3.3
Miami fine sandy loam	43,776	17.4	Peat	21,312	2.4
Light phase	114,048		Superior fine sandy loam	1,728	.2
Plainfield sand	151,488	16.8			
Muck	120,960	13.4	Total	904,320	

MIAMI FINE SANDY LOAM.

The Miami fine sandy loam consists of a gray sandy to silty loam containing some small stone to a depth of 8 or 10 inches, underlain with silty loam containing somewhat larger rock fragments and extending to a depth of 24 to 30 inches. Below 24 to 30 inches stones and bowlders are generally abundant. The bed rock of limestone is struck at depths of 3 to 15 feet of the surface over large portions of the area. The loose stone is almost wholly of limestone material from the underlying formation. Stone piles are a characteristic feature over much of the cultivated parts of this type.

The soil type occurs mainly in the town of Grover and in the southern part of Porterfield. It is derived from the weathering of glacial drifts over limestone, and like most soils of glacial origin is somewhat variable in composition from place to place.

The surface varies from gently sloping and undulating to nearly level. The type quite generally occupies upland areas and slopes above the stream beds and swampy tracts. The slopes are so gentle that such objectionable features as rapid soil erosion and gullying are not likely to be developed. They are nowhere too steep for cultivation. Occasionally fields of

this soil type are so level that the use of tile drainage would be beneficial. In general, however, the loose texture of the soil, as well as the undulating surface, gives such good natural drainage that underdrainage is unnecessary. A typical farm on this soil is shown in Plate I.

This soil was originally heavily timbered with hard woods and white pine. The pine has been cut for years, but in many places the hardwoods still remain. The latter consist mainly of sugar maple, birch, and beech, with a variable amount of hemlock, oak, elm, ash, basswood and poplar. Three of the earliest agricultural settlements in the county were established upon this type of soil in the town of Grover. They were locally known as the Lower, Middle, and Upper Sugar Bushes, on account of the abundant growth of sugar maples in the settlements.

The forest growth of white pine and hard woods was not uniformly distributed over this soil. Over considerable areas dense hardwood forests predominated, but in some places, usually in areas of small extent, the white pine grew in great abundance even to the exclusion of the hard woods. Where the pine greatly predominated the surface soil generally contains more sand than elsewhere, but the subsoil conditions are much the same as in areas covered with hard woods.

The groundwater level in this soil is generally from 10 to 30 feet below the surface. Sufficient water for domestic purposes, therefore, can be obtained generally in the drift overlying the limestone or a few feet in the limestone. Occasionally, however, wells are drilled from 50 to 100 feet into the limestone before a sufficient supply can be obtained. Much of the soil is underlain by a clayey subsoil which tends to hold the moisture sufficiently near the surface to be available for the growing of crops.

The Miami fine sandy loam is the most fertile soil in the county, and all the staple farm crops are successfully grown upon it. Oats is the principal grain crop, the acreage greatly exceeding that of all other grains combined. The yield varies from 25 to 40 bushels per acre, the average yield being about 30 bushels. Corn is the next most important crop, the yield per acre being about the same as that of oats. In growing corn on this soil, as well as on other soils in the county, the average length of the period

of immunity from frost should be taken into consideration, and only such varieties selected as will ripen within this period. The Early Yellow Dent (Wis. No. 8) and Golden Glow (Wis. No. 12) as well as flint corn, will ripen within the average period of freedom from frost. Wheat and barley are grown to a slight extent, the usual yield of wheat being 15 bushels and of barley about 20 bushels per acre. Some rye is grown, the average yield being about 16 bushels per acre. The yield of potatoes ranges from 125 to 150 bushels. Pease do exceptionally well, the yield being 15 to 20 bushels per acre. Apples and the various kinds of berries can be readily grown. Sugar beets are successfully grown on many farms.

This loamy soil is especially well adapted to apples. The climatic conditions, due to the moderating influence of Green Bay and Lake Michigan, as well as the character of the soil, with its high content of limestone material, are very favorable to their culture. Most of the apples grown in the county are on this soil type. By properly spraying and otherwise caring for the trees, there are good prospects for the successful raising of such varieties of apples as the Dutchess, Hibernal, Patten Greening, Charlamoff, Longfield, and Wealthy for the home as well as for the market.

Dairying is important on this soil, although only a relatively small number of farmers have silos. The principal feed of cows is mixed hay. Hay is an important crop, averaging about 1 and one half tons per acre. Clover is grown to some extent, but not extensively. Millet and some small grains and corn are occasionally grown for forage. The soil is well adapted to dairying and this industry should be developed. Alfalfa has been successfully grown on this soil, and it should be more widely raised.

Because of its adaptation to all the ordinary crops and because of its location this type constitutes the highest priced land in the county, the prices usually ranging from $50 to $90 an acre.

Light phase.—There is a light phase of the Miami fine sandy loam which is of extensive occurrance. It is found in the southeastern half of the county. The main area lies in a belt trending northeast-southwest through the town of Pound, eastern

Beaver Lake, and northern Porterfield. Isolated areas lie farther west in the western half of Beaver and in Wausaukee. The surface soil consists of a grayish medium to fine sandy loam, with depth of 6 to 10 inches, resting usually on a brownish fine sandy loam, which extends to a depth of 24 to 36 inches. The character of the subsoil is somewhat variable, ranging from fine sandy loam to a sandy clay mixed with some stones. Below 24 to 36 inches there is generally a mixture of sand, gravel, and bowlders. This phase of the Miami fine sandy loam contains more sand and less stone than the other phase of this soil. Usually the more clayey phases of the soil are the most stony.

The surface is usually very gently sloping, though in places it is undulating to hilly. The more undulating areas are in the vicinity south of the village of Wausaukee and in the western part of the town of Beaver. Even in the most uneven areas, however, the slopes are not too steep for cultivation. Over most of the areas in the towns of Pound and eastern Beaver Lake the surface rises gently from 10 to 40 feet above the adjacent low tracts and swampy areas along the stream beds.

The soil has its origin in the weathering of glacial drift over a sandy limestone and sandstone. Being derived from glacial drift, it is somewhat heterogeneous in character and the texture and composition of the subsoil lacks uniformity. The lower Magnesian limestone formation which underlies the main area of this soil contains considerable sand, and the weathering of the glacial dèbris worked up from this formation has resulted in a soil consisting of sand and limestone material varying in fineness from flour and small fragments up to large bowlders of lime rock. Mixed with the local limestone are a few bowlders of crystalline rock derived from more distant sources. Along the streams, especially the larger ones, such as Beaver Creek, Little Peshtigo River, and Peshtigo River, these are sandy tracts due to the action of these streams. In the areas of this soil are some gravel and sand ridges, locally known as "hogbacks," which owe their origin to glacial streams flowing in tunnels beneath the glacial ice sheets. Most of the important sandy tracts along the streams and the sand and gravel ridges of subglacial origin are shown on the soil map.

Probably about one-third of this light phase of the type is

under cultivation. Originally it was covered with dense hardwood and white-pine forests. In some areas the pine greatly predominated, in others the hardwoods. The principal hardwoods are beech, maple, and birch, with a variable amount of hemlock, oak, elm, and basswood.

The level of ground water is quite generally from 10 to 40 feet below the surface. Abundant water for all domestic purposes can usually be obtained from the surface formation overlying the bed rock. In some places the wells penetrate the underlying formation of limestone.

About the same crops are grown on this light phase as on other parts of the Miami fine sandy loam. Oats constitute the principal grain crop with wheat next in importance. Potatoes are also an important crop. The yield of oats per acre varies from 30 to 40 bushels and potatoes from 125 to 195 bushels per acre. Barley is grown to some extent, yielding between 20 and 30 bushels per acre. Peas do exceptionally well, yields of 25 to 35 bushels per acre being often reported. Hay is a good crop, mixed clover and timothy usually yielding 2 to 3 tons per acre.

Dairying and stock raising are not as important as they should be. While there are two or three cheese factories within the area of this soil, the average amount of milk obtained from the cows is small, as compared with average conditions over the State. The breed of milch cows should be improved and more attention paid to care and feed of the herds.

The farm values usually vary between $50 and $85 an acre for improved land and about $15 to $20 for unimproved land.

The following table gives the average results of mechanical analyses of the soil and subsoil of the Miami fine sandy loam:

Mechanical analysis of Miami fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
22753, 22755	Soil	0.9	5.9	9.4	24.6	18.5	33.1	7.4
22754, 22756, 22759	Subsoil	1.7	7.0	8.4	24.5	19.5	27.5	11.1
Light phase:								
22745, 22747, 22751	Soil	0.7	6.2	12.5	29.4	14.8	29.9	6.3
22746, 22748, 22752	Subsoil	1.3	7.3	13.3	28.7	16.5	22.7	10.2

COLOMA FINE SAND.

The Coloma fine sand, to a depth of 8 to 12 inches, consists of yellowish-brown fine sand. The subsoil, to 36 inches, is a yellow fine sand, which becomes slightly coarser in the lower depths. In the lower subsoil rock fragments and bowlders are sometimes found, and to some extent these are scattered over the surface. This type owes its origin to the last ice sheet and is largely cleared from terminal moraine. In some places it does not differ materially from the Plainfield sand, except in topography, which in the case of the fine sand is rolling to moderately hilly. Natural drainage is good; in fact there is more likelihood of excessive drainage than of lack of drainage.

The fine sand is preeminently the pine soil of the area, it having been originally covered with a heavy growth of white pine, with some Norway. At present, the timber growth consists largely of scattered white pine, considerable Norway pine, and in some local areas jack pine and small oak. Like the Colmoa fine sandy laam, the fine sand occurs in northeast-southwest belts, with alternating areas of Plainfield sand, the latter mainly representing an older soil covering of the region on which the fine sand was deposited by thelatest ice sheets.

Also like the Plainfield sand and Coloma fine sandy loam, the Coloma fine sand is in a practically undeveloped state. Nearly all these types, together with the Coloma loam, Superior fine sandy loam, Muck, and Peat, are in their virgin state, except that the timber is largely removed. On the surface of much of the upland areas is found a layer from one-half inch to 2 inches in thickness, of dark or black material, representing accumulations of organic material.

The Coloma fine sand, like the Plainfield sand, is probably best adapted to a system of general farming restricted to certain grain crops and to dairying. It is a typical truck soil, but under the present condition of agricultural development and settlement of the region, location of markets, etc., it can not be utilized to advantage for the growing of truck. It is a soil which needs "body" added to it in the shape of manure and green crops plowed under. Early maturing crops, such as green corn, peas for canning, tomatoes, cucumbers, etc.,

should do well on this type. At present it gives moderate yields of excellent potatoes, and fair yields of rye, mixed hay, oats, and corn.

By proper management the farms on this soil can be made to yield good returns, many thrifty farms having already been developed upon it. Legume crops, to add nitrogen to the soil, should be included in the crop rotation. Following clover, good crops of peas and beans can probably be grown.

Average yield on the Coloma fine sand are about as follows: Corn, 20 to 35 bushels; oats, 25 to 35 bushels; peas, 12 to 18 bushels; potatoes, 100 to 150 bushels; and rye, 12 to 18 bushels. Practically no barley or wheat is grown.

Unimproved or wild land is held at about the same price as the Plainfield sand, viz., $5 to $20 an acre. Improved farms are sold at $30 to $50 an acre.

The following table gives the average results of mechanical analyses of the soil and subsoil of this type.

Mechanical analysis of Coloma fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per ct.	*Per ct.*	*Per cent.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
22,733, 22737.....	Soil.....	0.1	5.5	14.6	35.4	23.4	15.2	5.2
22,734, 22738.....	Subsoil...	1	4.6	13.6	41.9	29.9	7.1	2.4

COLOMA FINE SANDY LOAM.

The Coloma fine sandy loam has a top soil, 10 to 12 inches deep, of yellowish-brown, smooth, mellow, fine, to medium sandy loam. The subsoil to a depth of about 24 inches is a light-colored sandy loam, while from 24 to 36 inches is found a light yellow medium sand. The type is by no means uniform, being of glacial origin, and varies from neary pure sand to a heavy sandy loam. The major portion, however, is as described above.

The Coloma fine sandy loam is a terminal morainic type, and has a rolling to hilly topography. It is naturally well drained, but is rarely too hilly to be easily cultivated. Stones and bowlders are more or less plentiful, but seldom occur in

such quantities as to interfere with cultivation. This soil, like most of the important types in Marinette County, lies in northeasterly-southwesterly belts, that being the general distribution of the formations left by the last sheet of ice.

The timber growth is mixed pine and hardwood, being largely white and Norway pine, white birch and red oak. Hemlock, basswood, maple, and elm do not thrive as they do on the heavier Miami fine sandy loam and the Coloma loam.

Very little of the Coloma fine sandy loam is under cultivation, as is true of all the types in Marinette County, with the exception of the Miami fine sandy loam and the Dunkirk fine sand. The home of a new settler on this type is shown in Plate II. However the few farmers located on the type are well satisfied with it and report fair yields, as follows: Oats, 20 to 40 bushels; potatoes, 100 to 200 bushels; pease, 15 to 20 bushels; and hay, 1 ton to 1½ tons. This soil, like practically all the other sandy soils in the county, is low in organic matter, and after the first few years of cultivation should be liberally manured. Potatoes are the crop probably best suited to this type, and rye, buckwheat, and bush fruits should be profitable crops. The incorporation of organic matter should not be neglected, as is so often the case in newly settled districts, because of the scarcity of stock. Crops of rye, vetch, and clover, plowed under, preferably in the fall, would greatly benefit and build up such soils. One or more legumes should be included in the rotation, and all manure carefully saved and used. By judicious management the soil can be made to increase instead of decrease in productiveness and value. At present the Coloma fine sandy loam can be bought for $10 to $20 an acre in an uncleared state. The improved lands sell from $40 to $60 an acre.

The following table gives the average results of mechanical analyses of the soil and subsoil of this type:

Mechanical analyses of Coloma fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
22741, 22749.....	Soil.....	0.6	6.5	10.8	20.4	20.6	34.0	6.8
22742, 22750.....	Subsoil.	1.4	7.6	8.8	17.6	24.0	32.9	7.2

PLAINFIELD SAND.

The Plainfield sand to a depth of 6 to 8 inches, consists of yellow medium to coarse sand, sometimes slightly loamy. From 8 to 36 inches the material is a yellow medium to coarse sand, growing lighter in color and coarser in texture with depth. Some pebbles and fine gravel are found in the lower subsoil.

As a whole, the soil is free from stones and bowlders, although outcrops of rock are sometimes found within the general soil area, and also an occasional erratic or glacial bowlder. The material composing this type was deposited by streams, and probably antedates the soils in the area which were formed as a result of the latest glacial action.

The soil is locally known as "sandy land," "jack-pine land," "sand plains," etc. The typical timber growth consists of jack pine and scrub oak, with occasionally some Norway and a very few white pines. The surface of the ground is usually covered with brake, sweet fern, blueberry bushes, and wild oat grass. Jack pine is characteristic of the type. The jack pine occurs sometimes on other soils, but only to a limited extent, the medium to coarse sand being its natural habitat.

The topography is level to gently rolling, being usually nearly level, as its alluvial origin would indicate (Pl. III, fig. 1). In some localities, however, as in the area southeast of High Falls, windformed dunes occur in such numbers as to give the type a rolling surface. These dunes are often of slightly finer texture than the soil of more level areas, consisting of clean, loose sand, and are considered less valuable than the main type. Other and larger sand hills occur less frequently, being eskers, or deposits formed by glacial water under ice.

The Plainfield sand is an extensive type, covering an area of 151,488 acres, or 16.8 per cent of the county. Although the surface is level to undulating, the porous character of the soil and the depth and coarseness of the subsoil give good natural drainage. The level character of the land and the comparative ease of clearing often impress newcomers, especially those from the prairie States, so favorably that they purchase farms on this type in preference to those supporting hardwood, although the prices may be nearly the same. Satisfactory yields

FIG. 1. TYPICAL VIEW OF PLAINFIELD SAND, UNDEVELOPED. JACK PINE PLAINS. SEC. 4, T. 36, R. 20 E.

FIG. 2. VIEW OF FARM DEVELOPED ON THE PLAINFIELD SAND. SEC. 5, T. 34, R. 20 E.

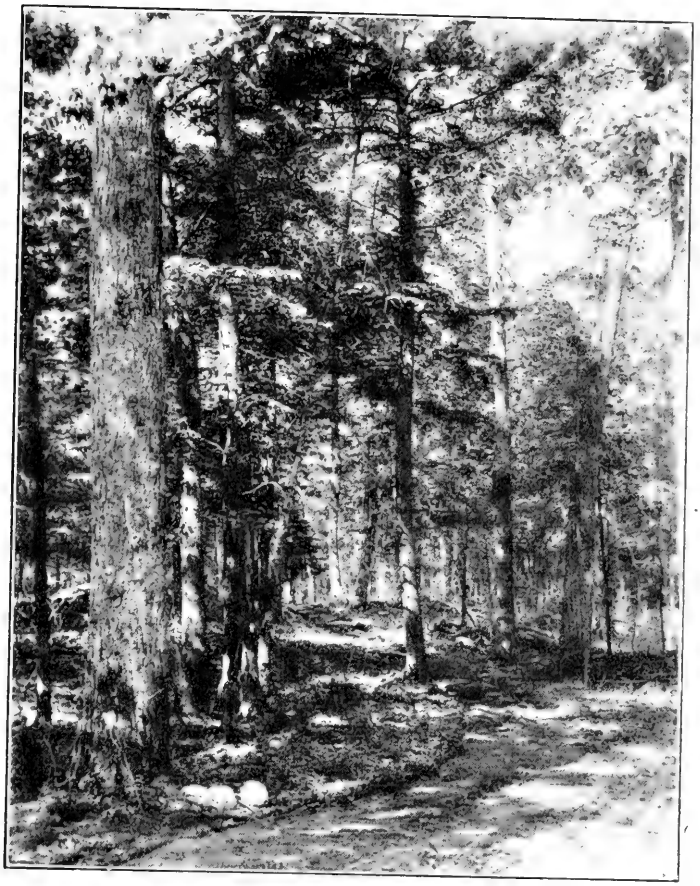

FIG. 1. VIEW OF COLOMA LOAM SHOWING TYPICAL DENSE HARDWOOD FOREST NEAR GOODMAN.

FIG. 2. VIEW OF NEWLY CLEARED FIELD ON COLOMA LOAM AT GOODMAN.

can be produced on the Plainfield sand only with heavy applications of manure. Green manures, especially legumes, are highly beneficial and should be more generally used. A common mistake is to grow several crops of oats or other grains upon newly cleared land, thus reducing the productiveness to a low stage before a system of building up the soil by growing clover and other legumes is begun. By proper farm management good stands of clover can be produced. Clover can be followed by a money crop which will do well. The bean crop, though rarely grown on this soil in Marinette County, is well adapted to sandy soils of this character and could be grown with profit.

While a good living can be obtained by farmers on this soil, it should be emphasized that the type is not especially productive and that care should be taken at the outset not only to maintain the original productiveness of the land but to practice some system of farming that will tend to increase this productiveness from year to year. That prosperous farms can be developed on the Plainfield sand, when rightly managed, is shown by the presence of some thrifty farms in a number of places. (Pl III, fig. 2.) At the same time there are some abandoned farms on the type which may be expected with poor management.

The type seems best adapted, when operated along general lines, to potatoes, rye, and clover. Fair crops of potatoes are readily grown, the tubers being of excellent quality. More satisfactory yields of buckwheat and rye are secured under the prevailing farm management than of oats or corn. The type is entirely too light for either wheat or barley or sugar beets, although what few beets are grown on the light soils in the area have the compensating factor of a higher sugar content.

But little corn is grown on this type, and much of the product is used for fodder. Twenty to 30 bushels per acre is a good yield. Other crops yield as follows: Oats 20 to 30 bushels; rye, 10 to 15 bushels; buckwheat, 12 to 15 bushels; peas, 10 to 15 bushels, hay, three-fourths ton to 1½ tons; and potatoes, 75 to 150 bushels per acre. A rotation quite commonly followed is corn or potatoes, oats, and hay, the mowing lands being left as long as they are considered profitable. Pure usu-

ally is put on the new fields, followed by corn or potatoes. A rotation better adapted to this type would be potatoes, field peas, and mixed hay, leaving the sod not longer than two or three years. The peas could be sold at a good price, the oats or other concentrates purchased. As more land is broken up and more stock kept, fodder corn could be grown in the same place in the rotation as potatoes. This rotation is only tentative; more satisfactory ones may be suggested by practice. There is no question, however, that better rotations than of corn, oats, and grass, leaving the grass down for a long period, can be worked out and used on this soil.

At present prices for the Plainfield sand range from $5 to $18 an acre for "wild" or unimproved land, depending on the location, and $30 to $50 for cleared land.

The following table gives the average results of mechanical analyses of the soil and subsoil of this type:

Mechanical analyses of Plainfield sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
22727, 22729, 22731, 22739.	Soil.....	0.5	17.8	30.9	33.9	5.8	6.5	4.5
22728, 22730, 22732, 22740.	Subsoil.	.5	17.2	31.1	38.8	6.5	2.7	3.0

DUNKIRK FINE SAND.

The soil of the Dunkirk fine sand consists of a gray to dark brownish-gray fine sand to fine sandy loam, with a depth of 8 to 10 inches. From this depth to about 18 inches occurs a pale yellow fine sand and from 18 to 36 inches a brighter yellow, fine sand, sometimes slightly mottled.

The topography is level to gently undulating, although in some local areas sand dunes and eskers are so numerous as to give a hummocky surface. The type seems to be a delta deposited in glacial Lake Michigan or Lake Algonquin by streams from the ice sheet to the north and west. There is only one area of this character in Marinette County. It extends from a few miles north of Marinette south along Green Bay to the county

line and is about 6 miles wide. Beyond the county limits it reaches south along the shore nearly to the city of Oconto, retaining practically the same width as in Marinette County. The western edge of this area is somewhat more loamy than the rest, being influenced by the Miami sandy loam. The old beach line of Lake Algonquin constitutes the boundary and is sharply defined in only a few places, being about 40 feet above the present level of Lake Michigan, while the average elevation of the Dunkirk fine sand is probably about 10 to 20 feet above the lake.

In its primitive state this type was covered with a thick growth of jack pine, red oak, and white birch, white and yellow poplar, and some white and Norway pine, and in the wet places with tamarack and cedar. Many scattered areas of Peat, slightly lower than those of the surrounding soil, occur. These, when cleared, or where not forested, are used for hay, of which from three-fourths ton to 1½ tons per acre of rather coarse quality is secured. Where forested, peat supports tamarack, cedar, alder, and a little elm, birch, and ash. The Dunkirk fine sand, as a whole, has a very flat surface. The water level is only 5 to 10 feet below the surface, and in many minor depressions the soil shows grayish white mottling, due to imperfect drainage. In wet seasons the higher lying fields give much the better results, while in dry seasons the reverse is true.

This soil is a typical truck soil, but it is used at the present time mainly for general farming. Rye, hay, and potatoes are the leading crops; oats and little corn practically complete the list, The average yield of rye is 15 to 18 bushels; of hay 1 to 2 tons, and of potatoes from 100 to 125 bushels per acre. Oats do not yield especially well, ordinarily 20 to 30 bushels per acre. Corn yields from 25 to 40 bushels, depending largely on the season.

Owing to its proximity to the towns of Marinette, Menominee, Mich. and Peshtigo, to its productiveness under judicious management and ease of cultivation, the Dunkirk fine sand is held at rather high prices—from $50 to $75 an acre. It is a type which responds readily to manure, and this fact, together with its nearness to market, makes the keeping of cattle especially profitable. Dairying, mainly for the production of butter, is prominent on this type. A few are starting in the truck business on a small scale and doubtless in a short time the adapt-

ability of this soil to the trucking industry will be more clearly recognized, and an important business will be developed, with the cities of Marinette and Menominee as the primary markets. Chicago and North Western Railway traverses the type, and this fact, together with direct water transportation to Milwaukee, Chicago, and other large Lake cities, will have an important bearing on the development of the soil in the production of the less perishable kinds of truck crops.

The following table gives the average results of mechanical analyses of the soil and subsoil of this type:

Mechanical analyses of Dunkirk fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
22717, 22719, 22721.....	Soil.....	0.1	0.6	2.9	59.8	18.5	11.8	6.0
22718, 22720, 22722.....	Subsoil.	.0	.2	5.4	73.6	16.3	2.5	1.8

SUPERIOR FINE SANDY LOAM.

The soil of the Superior fine sandy loam consists of 6 to 8 inches of gray to reddish medium textured sand. Underlying the sand, and rather sharply separated from it, occurs a stiff, tenacious, very impervious red clay, the red color having a peculiar pinkish red or light chocolate tinge. The clay subsoil is lacustrine in origin, having doubtless been laid down at the same time as the Superior clay near Green Bay, Duluth, and Superior. The sandy topsoil is of later glacial origin, having been deposited on the clay by subsequent glacial action. This covering of sand is of varying thickness; in some places the clay subsoil lies practically at the surface, while in others the sand is 2 feet deep.

This type is found only in limited areas in Marinette County. The different isolated patches, north and south of Dunbar, evidently lie in an old drainage basin or depression. In general the topography is level to gently undulating, but the soil is nevertheless fairly well drained, as is indicated by the original timber growth of white pine.

The Superior fine sandy loam is a very good general farming soil. Its areal extent in Marinette County is so limited

as to make it comparatively unimportant, but it is known to be well adapted to clover and timothy for hay and pasture, to potatoes, and root crops. It is especially suited to strawberries and raspberries and other bush fruits. Some such special industry will doubtless be developed on it in time, as the mining country to the north furnishes an excellent market for the fancy as well as the staple farm products.

The following table gives the results of mechanical analyses of the soil and subsoil of this type:

Mechanical analyses of Superior fine sandy loam

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
22757	Soil	0.3	5.5	14.7	52.3	13.6	11.1	3.2
22758	Subsoil.	.0	0.4	1.0	3.3	4.0	53.6	37.7

COLOMA LOAM.

The soil of the Coloma loam is a brownish fine sandy to silty loam, with a depth of 6 to 8 inches. The surface 2 or 3 inches often has a grayish color. From 8 to 18 inches the subsoil consists of brown sandy loam to loam. Below 18 inches there occurs an increase in the content of sand, and the subsoil as a whole is generally lighter and more sandy than the surface soil. Throughout the soil and subsoil are found many stones and bowlders.

This stony loam soil, which is known locally as heavy hardwood land, lies in the northwestern part of the county. It is derived from the weathering of glacial drift overlying granitic rocks of various kinds. The surface is very gently undulating. There is a difference of 10 to 50 feet between the elevation of the lower lands along the streams and the adjacent higher land, but the gentle slope as well as the character of the soil tends to prevent damaging erosin.

This soil covered with dense forests of hardwoods and hemlock (Pl. IV fig. 1), has a wide extent over Forest County and the adjacent region to the west. In Marinette County it is undeveloped agriculturally, and is still heavily timbered with hard-

woods and hemlocks, mainly the latter-named tree. Prominent among the hardwood species are sugar maple, birch, elm, oak, and some basswood. Inroads upon the forest are now being rapidly made by the lumber companies at Goodman and Wausaukee. There are one or two farms upon the type in the vicinity of the village of Goodman. (Pl. IV, fig. 2.)

The level of ground water in this soil is probably from 10 to 50 feet from the surface, and sufficient well water for domestic purposes can very generally be obtained from the drift overlying the hard crystalline rock. The water is excellent, being typical soft water.

The Coloma loam, as just stated is still a virgin soil, unopened to agriculture. The dense stand of hardwoods found upon it, however, is a good indicator of considerable natural fertility. The excessive quantity of stone in places is an objectional feature. On almost every section are areas too stony for successful cultivation, but such stony areas are generally small and can be conveniently devoted to wood lots or pasture lands, and most of the type is sufficiently free from stone to be used for farming.

All the general farm crops can be grown on this soil, but it is probably best adapted to potatoes, oats, rye, peas, clover, and grasses. It is a favorable type for dairying, and a system of agriculture built about dairying as a leading industry is probably the most promising. Corn for ensilage and also other forage crops can be grown successfully. By developing dairying as a leading industry, and giving some attention to sheep raising, the productiveness of the farms can be maintained or increased.

The hardier varieties of apples can undoubtedly be grown for home use, and all kinds of garden berries and vegetables can be produced.

No values can be given for cleared farm lands on this type. Unimproved cut-over lands containing little or no merchantable timber, are held at $5 to $15 an acre.

The following table gives the average results of mechanical analyses of the soil and subsoil of this type:

Mechanical analyses of Coloma loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
22723, 22725.....	Soil.....	0.4	3.5	5.5	9.4	19.9	52.2	8.6
22724, 22726.....	Subsoil.....	1.1	5.1	7.6	12.8	24.6	40.1	7.8

MUCK.

Muck consists of a mixture of organic matter with a relatively small though varying proportion of mineral materials. It has been formed in areas of deficient drainage where a rank vegetation flourished. The organic part of the soil represents the accumulated decaying remains of plants and the mineral portion the more or less finely comminuted rock particles carried into the depressions by streams or by the wind. The deposits are often many feet in depth.

The Muck is generally in a swampy condition. There are many such areas in Marinette County. They usually lie along the smaller streams, but occasionally form interstream areas of considerable extent.

Some of the wet lands along the streams are treeless and called "hay marshes" while other, generally overflow land, support a growth of swamp maple, alder, white birch, and water elm. Much of the marsh and swamp areas comprise soils ranging texturally from Muck to sandy loam, the determining factor in separating this type being lack of drainage rather than texture. When drained some of the areas of swamp will be practically the same as the surrounding type, while others will be more like true alluvial soil. Some of the overflow lands are very fertile and when cleared and drained will constitute the best soils on many farms. A few areas were cleared and used for wild hay.

In addition to the swamps along the rivers and small streams, there are numerous swamps of greatly varying size, over interstream areas, pactically all of which are covered with a more or less valuable growth of cedar, tamarack, or both. The largest of these forested swamps does not exceed 4 square miles in area,

and most of them could be drained, adding a large area to the valuable agricultural land and taxable resources of the county.

None of the heavy black Muck in the county is under cultivation, but when drained this type is valuable for truck crops, such as celery, onions, spinach, lettuce, and peppermint.

PEAT.

Most of the Peat in Marinette County is situated in the southeast corner adjacent to, or surrounded by, the Dunkirk fine sand. Locally the areas are called "peat bogs" or "hay marsh," to distinguish it from the swamps in which cedar or tamarack is always found. The true Peat is a level, usually treeless expanse, very wet in the spring and early summer, and supporting a rank growth of marsh grass, cat-tails, mosses, and other water-loving plants and shrubs.

The soil in these areas consists of organic matter in various stages of decomposition, and of varying depth, underlain by a medium to coarse grayish-white sand. The average depth of the organic material is about 2 feet. In places this covering has largely the character of Muck, but for the most part it is more accurately described as Peat, being a brownish or dark brown mass of partially rotted moss, leaves, and other vegetable remains of a spongy, coarse consistency.

Much greater progress has been made in developing this type than in the case of Muck, owing to the proximity of the former to the cities of Marinette and Peshtigo. About 2 miles west of Marinette a number of progressive farmers have formed a drainage district and have successfully drained a large area of Peat by digging a deep canal through it. Considerable difficulty has been experienced during the last year, however, owing to filling in of the ditches by sand, brought in by seepage waters from the sides. Diking or riprapping may have to be resorted to.

The State experiment station has had a cooperative station located on the Peat west of Marinette. Various experiments have been conducted there by the resident farmer, under direction of the station.

Where farmers have both the Peat and the sandy soils it is best to reserve the manure to be used on the sandy soil and ap-

ply wood ashes and phosphate fertilizers to the Peat, because the sandy soils are benefited by all the constituents, especially the nitrogen contained in the manure, while the Peat, rich in nitrogen, responds to the potash, phosphate, and lime contained in the ashes. The ashes can be obtained in considerable quantities from the mills in Marinette and Menominee.

ROCK OUTCROP.

There are a few local areas in Marinette County in which ledges of the underlying rock outcrop in sufficient number to make such areas practically worthless for agricultural purposes. These have been shown on the map by symbols but are included in the areas of other soil types. The principal areas of this character occur in Tp. 37, R. 21, Tp. 38, Rs. 20 and 21, and Tp. 37, R. 18, although there are several smaller areas in other townships in the northern part of the county. The material composing these outcrops is mostly red and gray granite, and to some extent greenstone.

In the areas mentioned above, the rock does not appear at the surface over the entire area, but does appear so frequently and is often so near the surface in the spaces between the actual outcrops, that little can ever be done with the land agriculturally. The only practical use is for forestry or pasturage. Outcropping ledges are by no means uncommon all over the area underlain by crystalline formations, which embrace approximately the northern three-fifths of the county, but except where indicated on the map, are so infrequent as to be practically negligible.

SUMMARY.

Marinette County is located in the northeastern part of Wisconsin, and has an area of 1,413 square miles.

The surface varies from nearly level plains to low undulating hills. The altitude adjacent to Green Bay is 580 feet, and in the northwestern part of the county about 1,500 to 1,600 feet. The drainage is through the Menominee and Peshtigo rivers.

The climate is rigorous in winter and warm in summer, the mean winter temperature being 15.7° F., and the mean

summer temperature 64.6° F. The average annual precipitation is 28 inches, about 20 inches for the growing season and 8 inches for the non-growing season.

The first settlement in Marinette County was made by the fur traders in 1791. The first farm was started in 1826. Agriculture, however, only began to be important in the period between 1870 and 1880.

The county was originally heavily forested with pine, hardwoods, and hemlock. Practically all the pine has been cut, but heavy stands of hardwoods and hemlock still remain in the northwestern part. A large part of the county is cut-over land.

In 1905 about 20 per cent of the county was laid out in farms, and 6.7 per cent of the county was improved land. In 1910, U. S. census, 24.2 per cent of the county was in farms, and 8.7 per cent of the land area of the county was improved. It is estimated that the land that will finally be improved is 70 to 75 per cent of the county. Agriculture, therefore, is still in its formative stage.

Up to very recently the manufacture of lumber products has been more important than agriculture. At present, however, agriculture is as important as manufacturing, and will probably be more important than manufacturing in the future.

The population of the county increased from 5,057 in 1875 to 33,810 in 1910. About one-half the population is on the farms and one-half in the villages and cities. Most of the population is native born. The foreign born are mainly from Canada, Germany, Sweden, Norway, Poland and Denmark.

The improved land increased from 16,989 acres in 1885 to 79,474 acres in 1910. The value of the farms in 1885 was less than $1,000,000 and in 1910 $6,489,590.

The county is well supplied with railroads and local markets. The city of Marinette, population 14,610 U. S. Census, 1910, is the county seat. A county agricultural school is maintained at Marinette. A State experimental farm, on sandy soil, is established at Crivitz.

The soils are of glacial and alluvial origin, derived from limestone, sandstone, and granite debris. Seven types of soil,

exclusive of Muck, Peat, and Rock outcrop or stony land, were mapped.

The Miami fine sandy loam is undulating land, and supported generally a strong growth of heavy hardwood and pine, most of which has been cut. It is the best soil in the county and suitable to all farm crops.

The Coloma loam, undulating and often stony land, is still forested with dense growth of hardwoods and hemlocks. Though practically undeveloped, it is a fertile soil, as indicted by its dense growth of timber.

The Coloma fine sandy loam is generally undulating to hilly land, and originally supported a mixed growth of pine and hard woods, mainly oaks. This type is especially well adapted to potatoes, corn, oats, rye, peas, and clover.

The Superior fine sand loam is relatively unimportant in extent, and consists of sand over a subsoil of red clay on level areas. It has about the same crop adaptations as the Coloma fine sandy loam.

The Dunkirk fine said is low, level sandy land, associated with Peat land within the area of the former Algonquin Lake between Marinette and Peshtigo.

The Coloma fine sand is hilly and undulating land, originally forested mainly with white and Norway pine, and some jack pine, while the Plainfield sand is level, and is known as the jack pine plain type.

The sandy soils—Dunkirk fine sand, Coloma fine sand, and Plainfield sand—are typical truck soils, but under present conditions should be devoted to general farming with oats, rye, corn, potatoes, and the soy bean as principal crops. Mammoth clover should be grown extensively in order to supply nitrogen and organic material to these sandy soils.

The Muck areas have not yet been brought under cultivation. The Peat west of Marinette has been cropped successfully where properly drained and fertilization by manure or wood ashes has been applied.

The rough land of the area, that which is too stony to be cultivated, should be devoted to forestry or to sheep raising.

All the soils of the area are given applications of barnyard

manure, but very little commercial fertilizer is used. Many of the soils, especially the sandy types, appear to be in an acid condition, and would be benefited by applications of lime.

Fruit growing, especially small fruits and bush fruits, might well be extended. Apples, adapted to the climate, do well on the hardwood types of soils, and with proper care have proven to be a profitable crop. Sugar beets are grown successfully on the Miami fine sandy loam.

Dairying and stock raising are important industries in the county on all soil types, and should be increased, not only for the money profit to be derived, but also as an important means in conjunction with proper crop rotation, including the plentiful growing of clover and the use of fertilizers, in developing a system of permanent agriculture.

SOIL MAP

WISCONSIN

MARINETTE COUNTY SHEET

U.S. DEPT. OF AGRICULTURE
BUREAU OF SOILS
MILTON WHITNEY, CHIEF

STATE OF WISCONSIN
GEOLOGICAL AND NATURAL HISTORY SURVEY
E.A. BIRGE, DIRECTOR
IN COOPERATION WITH THE U.S. DEPARTMENT OF AGRICULTURE, BUREAU OF SOILS
H.L. RUSSELL, CHIEF OF DIVISION
S. WEIDMAN, IN CHARGE

SOIL PROFILE

(3 feet deep)

Coloma fine sand
Fs
Fs

Coloma fine sandy loam
Sl
Sl

Coloma loam
Sil
L
Sl

Miami fine sandy loam
Fsl
L
L

Fsl
Sl
Light phase

Plainfield sand
S
S

Dunkirk fine sand
Fs
Fs

Superior fine sandy loam
Fsl
C

LEGEND

Fs = Fine Sand
Sl = Sandy loam
Sil = Silt loam
L = Loam
Fsl = Fine sandy loam
S = Sand
C = Clay

LEGEND

Coloma fine sand — Cs
Coloma fine sandy loam — Cf
Coloma loam — Cl
Miami fine sandy loam — Ms
Ms — Light phase
Plainfield sand — Ps
Dunkirk fine sand — Df
Superior fine sandy loam — Sl
Peat — P
Muck — M
Rock outcrop

Soil surveyed by
S. Weidman of the Wisconsin Geological and Natural History Survey and Percy O. Wood of the U.S. Dept. of Agriculture assisted by E. B. Hall and E. B. Spraker of the Wisconsin Geological and Natural History Survey
1909

Scale 1 inch = 3 miles

3 2 1 0 3 6 9 12 Miles

The Kroger Lithographing Company, Washington, D. C.

Field Operations
Bureau of Soils
1909