

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY, E. A. BIRGE, DIRECTOR; COLLEGE OF AGRICULTURE, UNIVERSITY OF WISCONSIN, H. L. RUSSELL, DEAN; A. R. WHITSON, IN CHARGE SOIL SURVEY.

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SOIL SURVEY OF WOOD COUNTY,  
WISCONSIN.

BY

W. J. GEIB, OF THE U. S. DEPARTMENT OF AGRICULTURE, IN CHARGE, AND GUY CONREY, W. C. BOARDMAN, AND CLINTON B. POST, OF THE WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY.

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THOMAS D. RICE, INSPECTOR, NORTHERN DIVISION.

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[Advance Sheets—Field Operations of the Bureau of Soils, 1915.]



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1917.

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## LETTER OF TRANSMITTAL.

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U. S. DEPARTMENT OF AGRICULTURE,  
BUREAU OF SOILS,  
*Washington, D. C., December 14, 1916.*

SIR: The accompanying report and soil map cover the survey of Wood County, Wis., one of the projects undertaken by the bureau during the field season of 1915. This work was carried on in cooperation with the Wisconsin Geological and Natural History Survey, and the selection of this area was made after conference with State officials.

I recommend that the report and map covering this work be published as advance sheets of Field Operations of the Bureau of Soils for 1915, as provided by law.

Respectfully,

MILTON WHITNEY,  
*Chief of Bureau.*

Hon. D. F. HOUSTON,  
*Secretary of Agriculture.*

## CONTENTS.

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	Page
SOIL SURVEY OF WOOD COUNTY, WISCONSIN. By W. J. GELB, OF THE U. S. DEPARTMENT OF AGRICULTURE, IN CHARGE, and GUY CONREY, W. C. BOARDMAN, and CLINTON B. POST, OF THE WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY.....	5
Description of the area.....	5
Climate.....	7
Agriculture.....	9
Soils.....	14
Spencer silt loam.....	18
Vesper silt loam.....	23
Gloucester fine sandy loam, shallow phase.....	26
Gloucester silt loam, shallow phase.....	27
Gloucester silt loam, rolling phase.....	28
Whitman sand.....	30
Whitman fine sand.....	31
Whitman fine sandy loam.....	32
Whitman silt loam.....	33
Plainfield sand.....	35
Plainfield fine sand.....	37
Plainfield sandy loam.....	38
Plainfield fine sandy loam.....	38
Boone fine sand.....	39
Boone fine sandy loam.....	40
Genesee fine sandy loam.....	42
Genesee silt loam.....	43
Muck.....	44
Peat.....	44
Sands and Peat (undifferentiated).....	47
Summary.....	49

## ILLUSTRATIONS.

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FIGURE.	Page
<b>FIG. 1.</b> Sketch map showing location of the Wood County area, Wisconsin....	5

### MAP.

Soil map, Wood County sheet, Wisconsin.



## SOIL SURVEY OF WOOD COUNTY, WISCONSIN.<sup>1</sup>

By W. J. GEIB, of the U. S. Department of Agriculture, In Charge, and GUY CONREY, W. C. BOARDMAN, and CLINTON B. POST, of the Wisconsin Geological and Natural History Survey.—Area Inspected by THOMAS D. RICE.

### DESCRIPTION OF THE AREA.

Wood County is situated in the central part of Wisconsin. It is bounded on the north by Marathon County, on the east by Portage County, on the south by Adams and Juneau Counties, and on the west by Jackson and Clark Counties. It has a length north and south of 30 miles and a maximum width east and west of 30 miles. It comprises an area of 809 square miles, or 517,760 acres.

On the basis of topography the county falls naturally into two divisions, separated by a line running nearly parallel with, but somewhat to the north of, the Green Bay & Western Railroad, which crosses the county from east to west. The region to the north of this line, comprising considerably more than one-half the county, consists of an undulating or nearly level to rolling country, throughout which the soils are heavy and of good or excellent quality for agriculture. Many communities here are as well improved and as highly developed as the best farming districts of southern Wisconsin. The most conspicuous surface features are the Marshfield Moraine, south and southeast of Marshfield, and Powers Bluff, which is a large quartzite hill southwest of Arpin.



FIG. 1.—Sketch map showing location of the Wood County area, Wisconsin.

To the south of the dividing line the county consists of nearly level sand plains, rising gradually in elevation from south to north. Projecting through the floor of this plain and rising to elevations which range from 20 to over 100 feet are a few sandstone and quartzite hills, which form the most conspicuous features of the landscape. In a few places low dunes have been formed on the extensive sand flats, while in the southern and southwestern parts of the county large stretches of marsh occur, often dotted with innumerable small

<sup>1</sup> Wood County forms a part of the area known as north-central Wisconsin, of which a general soil survey was made by Dr. Samuel Weidman, of the Wisconsin Geological and Natural History Survey, and of which a soil map and report were published in 1906. The data collected in this early survey have been drawn upon in the preparation of the present report.

sand islands only 1 or 2 feet above the level of the lowlands. The fertility of the sands is low and agriculture is not well advanced. On the marshes hay is frequently grown, and cranberry production has been developed to considerable proportions. In many places large drainage projects have been constructed and efforts are under way to develop the region agriculturally.

In the northern two-thirds of the county, which is largely covered by drift from early ice sheets, the topography is much more mature than in those parts of the State covered by the late Wisconsin ice sheet. Most of the slopes are long and gentle. There are no lakes and comparatively few swamps. At Vesper the elevation above sea level is 1,090 feet, at Arpin 1,149 feet, at Marshfield 1,283 feet, and at Auburndale 1,213 feet. The highest parts of the Marshfield Moraine probably rise only 100 to 150 feet above the surrounding lowland. Powers Bluff reaches an estimated elevation of 300 to 400 feet above the surrounding country, and probably includes the highest point in the county. The general elevation of the southern part of the county is 200 to 300 feet lower than that of the northern division. The elevation at Port Edwards is 969 feet, at Nekoosa 959 feet, at Dexterville 994 feet, and at Babcock 977 feet.

The drainage of most of the county is into the Wisconsin River, which crosses the eastern part of the area. Nearly all the remainder of the county drains first into the Yellow River, which traverses the western part from north to south and joins the Wisconsin River at Necedah, in Juneau County, to the south. The East Fork of Black River receives drainage water from an area of about two townships in the west-central part of the county. This stream is directly tributary to the Mississippi River.

Lumbering along the Wisconsin River in this region began with the erection of a sawmill at the present site of Nekoosa in 1831. In 1836 a strip of country 3 miles in width on each side of the river, extending to a point 40 miles north of this site, was given over to the lumbermen by the Indians. In 1848 title to all lands was taken from the Indians and the country opened up for settlement. In 1856 Wood County was separated from Portage County. Grand Rapids was incorporated in 1869. Settlements were made in the southern part of the county earlier than in the northern, chiefly because pine was the predominant timber growth here, while in the northern part the pine was usually mixed in with hardwood. Lumbering was the chief industry for a long period after the first settlements were made. The present Minneapolis, St. Paul & Sault Ste. Marie Railway was built through the county to Marshfield in 1871 and the present Chicago, Milwaukee & St. Paul Railway was constructed in 1873.

Many of the early settlers came from the States of Illinois, Ohio, and New York, and from Canada. Later many foreigners, princi-

pally Germans, Norwegians, and Swedes, took up land. The southern part of the county is for the most part thinly settled and undeveloped agriculturally, while the northern part is well settled and much of the land is highly improved.

Grand Rapids, with a population in 1910 of about 6,500, is the county seat and largest city. It is a distributing and railroad center of importance. Extensive water power is developed here from the rapids in the Wisconsin River, one of the chief uses of which is in operating a large paper mill. Other extensive power developments and paper mills are situated at Nekoosa, Port Edwards, and Biron. Marshfield, the second city in importance, with a population of 5,783 in 1910, is in the center of a highly developed agricultural region. Nekoosa had a population in 1910 of 1,570. Other towns include Pittsville, Babcock, Dexterville, Auburndale, Milladore, Vesper, Arpin, and Rudolph. The total population of the county in 1910 was 30,583.

The county is well supplied with railroads. Lines of the Chicago, Milwaukee & St. Paul, Chicago & North Western, Minneapolis, St. Paul & Sault Ste. Marie, and Green Bay & Western reach practically every township and afford good means of communication with the Twin Cities, Duluth, Madison, Milwaukee, Chicago, and other large centers of population.

The numerous towns within the county furnish a market for considerable farm produce, but the greater proportion is shipped to outside points. A large part of the farm income is from the sale of dairy products, chiefly butter and cheese, much of which goes to Chicago and eastern and southern cities. Practically all the fat stock sold is shipped to Chicago. Hay is frequently shipped to Milwaukee.

The wagon roads throughout the southern one-third of the county are sandy. In places there are deposits of clay which could be utilized in improving the roads. This material is used in some instances. In the northern part of the county the soil is heavy and graded roads are generally good, but at times of continued rains and when the frost is coming out of the ground the roads are often heavy. Under a recent State-aid highway law many miles of improved road are built each year, and it is planned ultimately to have such roads in every community.

Rural mail routes reach all parts of the county, and the telephone is in common use in farm homes. Rural schools are maintained in every community.

#### CLIMATE.

The climatic conditions in Wood County are fairly uniform, but vary somewhat from place to place with difference in topography. In the southern part of the county there are extensive marshes and sand flats, while in the northern part the soils are heavier. the sur-

face is considerably higher, and the topography is undulating to rolling. The most pronounced variations in climate are in the occurrence of frosts. The relative liability to frost is of vital importance to the cranberry industry, which is quite extensively developed in the marshy region in the southern and southwestern parts of the county.

The only Weather Bureau station in Wood County with long records is at Grand Rapids, which is situated within the extensive sand-plain area bordering the Wisconsin River. This place is a number of miles from the larger marshy tracts, and the records, particularly those in regard to frost occurrence, do not apply to the extensive low, wet areas in the vicinity of Babcock, Cranmoor, and to the west, nor to the higher, more rolling country in the northern and western parts of the county. They do, however, apply to all the level sandy areas in Wood County east of the Wisconsin River and to the extensive sand terraces reaching back several miles from the river on the west. The following table gives climatic data collected at the Grand Rapids station and at Neillsville, which is the county seat of Clark County, adjoining Wood County on the west. Neillsville is situated in a somewhat rolling country, and the records of this station are more nearly applicable to northern Wood County than are those taken at Grand Rapids.

*Normal monthly, seasonal, and annual temperature and precipitation.*

Month.	Grand Rapids (elevation, 1,021 feet).		Neillsville (elevation 996 feet).	
	Temperature.	Precipitation.	Temperature.	Precipitation.
	° F.	Inches.	° F.	Inches.
December.....	20.4	1.51	19.5	1.63
January.....	12.3	1.22	12.2	1.09
February.....	14.8	.64	14.0	1.33
Winter.....	15.8	3.37	15.2	4.05
March.....	30.2	1.48	28.5	1.97
April.....	44.4	2.56	44.6	2.82
May.....	56.4	4.39	55.8	4.37
Spring.....	43.7	8.43	43.0	9.16
June.....	66.5	2.91	66.2	4.59
July.....	69.5	3.25	69.8	3.91
August.....	67.6	3.21	67.1	3.63
Summer.....	67.9	9.37	67.7	12.13
September.....	60.6	3.25	59.5	3.88
October.....	47.1	2.14	47.2	2.92
November.....	31.9	1.61	31.0	1.65
Fall.....	46.5	7.00	45.9	8.45
Year.....	43.5	28.17	43.0	33.79

The winters in Wood County are long and severe, but the summers are pleasant. The rainfall is normally well distributed throughout the growing season. The months of May, June, July, and August each have on an average approximately 3 inches of rain, but in any of these months, especially July and August, there may be periods during which crops suffer considerably from drought.

The average date of the last killing frost in the spring as recorded at Grand Rapids is May 23, and that of the first in the fall September 26. This gives an average growing season for the vicinity of the station of approximately 126 days. In the marshy region to the west and southwest the period free from frost is shorter, and summer frosts are not uncommon in the cranberry-growing districts.<sup>1</sup>

#### AGRICULTURE.

The earliest settlements in this territory were made in the fifties. The sandy regions were occupied first, as the tree growth here was almost entirely pine, which was the only timber handled by the early lumbermen. Hardwood at first was of little value, and where clearings were made in hardwood sections the timber was frequently burned. The first farms were small, and large areas of land remained in the cut-over stage for a considerable length of time before they were subdivided. Agricultural development has been much slower on the sandy soils than on the heavier lands in the northern two-thirds of the county. Agriculture is more highly developed in the section around Marshfield than in any other part of the county, although settlements were made in some of the sandy sections considerably earlier.

Practically all the general-farm crops now grown were produced in the early history of the county, but the relative importance of a number of crops has changed considerably. Hay and oats have always been the most important crops from the standpoint of acreage. The censuses of 1880, 1890, and 1900 indicate for those years an acreage of rye somewhat greater than that of corn, while at present the reverse is true. In 1879 the acreage of wheat was over five times as great as in 1909. Buckwheat, peas, and beans are apparently not as extensively grown as they were 10 or 15 years ago. The greatest development has taken place in dairying and in the production of crops associated with this industry. The dairy production in 1909 was approximately seven times as great as in 1899. This rapid growth still continues, as is indicated by the fact that from 1910 to 1913 the number of cheese factories and creameries increased about 25 per cent.

<sup>1</sup> For a full discussion of climatic conditions and their relation to the cranberry industry in Wisconsin see Bulletin T of the U. S. Weather Bureau and Bulletin 223 of the Wisconsin Experiment Station.

The agriculture of the county at present consists chiefly of general or mixed farming, with dairying as the most important branch. The chief crops grown, in order of acreage, according to the census of 1910, are hay, oats, corn, rye, potatoes, barley, buckwheat, wheat, and peas. All of these may be considered in part as cash crops, for some of the hay and corn and a considerable proportion of the small grain are sold directly from the farm. The greater part of the production, however, is used in feeding live stock and finally finds its way to market in the form of dairy products, beef or pork. A considerable quantity of grain and hay is used as feed for work stock. Potatoes and various garden vegetables are grown mainly as subsistence crops, but small quantities are placed upon the market.

Hay is grown more extensively than any other crop. The 1910 census reports 33,951 acres in all tame and wild grasses, with a production of 53,494 tons, or an average yield of over  $1\frac{1}{2}$  tons per acre. About 67 per cent of the hay consists of timothy and clover mixed and about 15 per cent of timothy alone. Little clover is grown alone. Minor hay crops consist of wild marsh grass, millet, small grains, and alfalfa. Tame hay is grown by far the most extensively on the Spencer silt loam. On account of the acid condition of the soils alsike clover is grown to a considerable extent. Red clover does well on land where the fertility has been kept up and thrives on new land in spite of the acidity, but on run-down fields it is not so successful.

Oats in 1909 occupied 14,664 acres and gave a production of 396,762 bushels. This crop is grown to only a small extent in the southern part of the county on the sandy soils, the greater part being produced on the Spencer and Vesper silt loams and the Gloucester silt loam, rolling phase, in the central and northern parts of the county.

The acreage of corn in 1909 was less than half that of oats. Corn, however, appears to be gradually increasing in acreage, owing partly to the rapid increase in dairying and partly to the recent introduction of varieties that can be matured nearly every year.

Rye was grown on 6,297 acres in 1909, with a total production of 78,206 bushels. This crop is grown most extensively on the sandy soils and does better on such land than any of the other small grains. It is grown with success on some of the drained marshlands in the southern part of the county. Barley in 1909 occupied only slightly more than half the acreage devoted to rye. It is grown mostly in the northern half of the county, where silt loam soils predominate. The present acreage of wheat is small, being little more than one-tenth of that in 1899. Buckwheat is quite a common crop on the reclaimed marshy lands in the southern part of the county, but its total acreage is small.

Potatoes are quite an important crop, occupying 4,610 acres in 1909. The sandy areas produce most of the crop grown for market. Potatoes are grown for home use in all parts of the county and on practically all the various types of soil.

Peas are not grown as extensively as in former years. In 1909 the production was 3,664 bushels, while in 1899 it was 15,365 bushels, and in 1889, 17,682 bushels. More peas are now canned than formerly, but the canning industry has not yet become very important.

Cabbage is an important crop, especially in the vicinity of Pitts-ville, where it is grown on a commercial scale. In nearly all parts of the county it is grown for home use. Tobacco is grown on a very small total area, mainly by settlers who have come from tobacco-growing regions. Such crops as beans, radishes, lettuce, onions, carrots, strawberries, and bushberries are grown on most farms.

Cranberry growing has been quite extensively developed in the southern part of the county, chiefly on peat lands. Wisconsin is the third State in the United States in cranberry production, and within the State Wood County ranks first. The Wisconsin Agricultural Experiment Station maintains a branch station near Cranmoor, where special attention is given to questions relative to cranberry growing.<sup>1</sup>

The following table, compiled from census reports, shows the acreage and production of the principal crops at the last four census years:

*Acreage and production of principal crops, census years 1880 to 1910.*

Crop.	1880		1890		1900		1910	
	<i>Acres.</i>	<i>Tons.</i>	<i>Acres.</i>	<i>Tons.</i>	<i>Acres.</i>	<i>Tons.</i>	<i>Acres.</i>	<i>Tons.</i>
Hay.....	7,945	9,543	23,842	23,501	28,880	38,275	38,306	57,846
		<i>Bushels.</i>		<i>Bushels.</i>		<i>Bushels.</i>		<i>Bushels.</i>
Oats.....	2,101	54,284	6,245	203,181	11,829	331,740	14,664	306,762
Corn.....	1,529	43,442	1,841	57,789	4,763	105,070	6,713	154,710
Rye.....	1,728	17,511	3,023	37,944	5,417	72,830	6,997	78,206
Barley.....	79	1,507	145	3,293	1,754	42,500	3,801	91,622
Wheat.....	1,323	11,906	901	15,428	2,289	34,240	244	2,784
Buckwheat.....	61	588	414	5,439	832	8,920	523	3,329
Potatoes.....		56,756	1,560	15,366	4,169	273,625	4,610	318,446
Peas.....		3,133		17,682	1,010	15,365	229	3,664
Beans.....		419		326	158	1,110	17	426

Fruit growing receives but little attention in Wood County. Much of its area is not especially well adapted to fruit production.

<sup>1</sup> For a full discussion of this industry attention is directed to Bulletins 119, 213, and 219 of the Wisconsin Experiment Station.

The level, rather poorly drained heavy soils are not suited to the growing of tree fruits. Apples are grown more extensively than any other tree fruit. They are produced mainly in the more rolling parts of the county.

The live-stock industry is an important branch of farming. The 1910 census reports 32,561 head of cattle in the county, of which 18,465 are dairy cows. In 1909 there were 9,343 calves sold or slaughtered, 7,148 other cattle, 9,326 hogs, and 2,459 sheep and goats. Dairying is the most important branch of live-stock farming. The principal dairy products are cheese and butter. A small quantity of milk is retailed in the towns. Holstein blood predominates in the dairy herds. The use of purebred sires is gradually improving the stock. There are numerous herds of purebred cattle. The tendency at the present time is to send milk to cheese factories rather than to creameries. The number of cheese factories is increasing quite rapidly, while creameries are decreasing in number. In 1910 there were 17 cheese factories and 27 creameries, while in 1913 there were 32 cheese factories and 22 creameries. The dairy products reported in 1909, exclusive of those used in the home, amounted in value to \$610,475. Some beef cattle are raised within the county, but the number is much smaller than that of dairy cows. Most of the calves sold are from dairy herds. Hog raising is an important source of revenue. This industry is carried on in connection with general farming and dairying.

The character of the soil and topography has an important influence upon crop production in this county. On the heavy soils of comparatively level surface, which are cold and backward in the spring, corn does not do nearly so well as on soils of the same texture having a more rolling topography. Fruit and truck crops are but little grown in the regions where heavy, nearly level soils predominate. In the southern and southeastern parts of the county, where sandy soils predominate, the topography is not so important a factor. Except on the lowest sandy areas the natural drainage is good and frequently excessive. It is generally recognized by the farmers that the heavy soils are especially well adapted to the production of hay. Drainage increases their adaptation to small grains and corn. The sandy soils are considered better adapted to rye than to other small grains, and a number of the sandy types are considered better for potato culture than the heavy soils. It is recognized that the northern part of the county, where heavy soils predominate, is better adapted to general farming and dairying than the southern part, where sandy soils and marshes abound.

The methods of farming followed are about the same as those practiced throughout the general farming and dairying districts of Wisconsin and adjoining States. The silo is in common use on dairy

farms, and a considerable part of the corn crop is handled as ensilage. Hay is stored in barns or stacks and used mainly as feed for stock, though large quantities are also sold. Considerable grazing is available on cut-over tracts, and cattle, sheep, and goats are used to advantage in clearing new land. A considerable area of cleared land deficient in drainage is used for pasture.

Throughout the northern half of the county, and including the greater part of the region where heavy soils predominate, most of the farms are well equipped. The farmhouses are generally well built and in good repair. Most of the barns are built upon a stone or concrete foundation, with a cement floor, and have storage room for hay and grain. Modern stable equipment is used in dairying. Silos are often built of concrete. Milking machines are in use on a number of farms. The farm machinery in use is modern. The work horses are mostly of the heavy breeds, such as Percheron and Belgian. The cattle are mostly of mixed breeding, with Holstein blood predominating. Purebred sires are common. Throughout the sandy parts of the county and in some sections of heavy soil where drainage is most deficient the farm improvements are as a rule below the average. On the lighter soils the work horses are lighter in weight, and modern machinery is not in as common use.

On the heavy, level or nearly level soils a rather conspicuous cultural feature is the practice of plowing fields in narrow lands, so that a dead furrow left at intervals of 2 to 4 rods will act as a ditch to help carry off the surface water. This practice greatly assists in promoting surface drainage and usually insures fair drainage without the use of tile. On some of the large tracts of reclaimed lowland in the southern part of the county traction plows are used.

On the heavy soils a rotation in quite common use consists of corn, small grain for one or two years, and timothy and clover, from which hay is usually cut for two years. The field may be pastured a year before being again plowed for corn. On the sandy soils a rotation frequently followed consists of small grain, clover, and potatoes. In no part of the county has the question of crop rotations best suited to the soils been given careful consideration by the majority of farmers. Barnyard manure is the only fertilizer used to any considerable extent.

Farm labor is not so difficult to obtain as in some sections of the United States. In many cases women and children assist with the farm work. Farm hands hired for the year or by the month are usually paid from \$25 to \$40 a month. Married men are usually given a house, fuel, and garden. During haying and harvesting seasons the wage for special help is about \$1.50 to \$2 a day.

The average size of the farms in Wood County is 105 acres. Land holdings range in size from a few acres to several thousand acres.

In the sandy and marshy region a considerable area is held in large tracts. Some cut-over land in other parts of the county is also in large holdings. In 1910 there were 2,706 farms in the county, occupying 54.8 per cent of its total area. Of the land in farms, 38 per cent is improved. The 1910 census reports 92.9 per cent of the farms operated by owners, 6.1 per cent by tenants, and 1 per cent by managers.

In 1900 the average value of farm land in the county was \$14.40 an acre, while in 1910 it was \$32.36, having increased 125 per cent. Prices depend upon the extent of improvement, location, quality of soil, and other factors, and are variable in all parts of the county. In the vicinity of Marshfield, where agriculture is the most highly developed, farms frequently sell for \$100 to \$125 or more an acre, while in the sandy regions partly improved farms sell for \$25 to \$50 an acre. Cut-over hardwood land in undeveloped parts of the county ranges in selling price from \$20 to \$30 an acre. The unimproved sandy and marshy soils in the southern part of the county are usually held at a figure considerably lower than this.

#### SOILS.<sup>1</sup>

Wood County, in common with a considerable area in central Wisconsin, owes the general character of its soil material to several distinct processes of formation, namely, glacial, residual, alluvial, and possibly loessial. To these may be added the accumulation of organic or peat soils in low places.

Old glacial formations cover approximately 55 per cent of the county. The glacial débris in this area was deposited at a much earlier date than that covering northern and eastern Wisconsin. Geologically it is called the pre-Wisconsin Drift, and it is recognized as comprising three periods of glaciation, two of which are encountered in Wood County. The glaciated region includes the greater part of the northern two-thirds of the county, with the exception of a narrow belt along the eastern border. The first or earliest drift covers the greater part of this section, but an area equivalent to about one township in the extreme northwestern corner of the county is covered by the second drift. Marshfield is situated on this area. Marking the southern border of the second drift is a prominent range of hills known as the Marshfield Moraine. The topography over the glaciated region varies from level to rolling and, in a few places, hilly. The surface is largely characterized by long, gentle slopes. The soil is comparatively free from stones and consists mainly of silt loam or clay loam. One of the most important characteristics of this old

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<sup>1</sup> For a full discussion of the geology of this region see Bul. XVI, Wis. Geol. and Nat. Hist. Survey, by Dr. Samuel Weidman, on the Geology of North-Central Wisconsin. The following geological discussion is largely based on this bulletin.

drift is the heavy, compact nature and the pronounced mottling of the subsoil. This material has weathered to a much greater degree than the late Wisconsin drift, the topography is much more mature, and there are no lakes and few peat marshes. With the exception of the Marshfield Moraine and a few other limited areas, the effects of glaciation in this region have been largely obliterated through erosion and weathering.

Along the eastern border of the county, in parts of Milladore, Sherry, Sigel, and Rudolph Towns, the soils are considered to be largely of residual origin. The material forming the surface soil and, more especially, the subsoil has been derived from the weathering of the underlying crystalline rocks. Angular rock fragments frequently are scattered over the surface and a few glacial boulders occur. It seems probable that parts of the region were traversed by an ice sheet, but in most instances this does not seem to have had any appreciable influence on the formation of the soil. The surface is in the main gently rolling, with long slopes and broad, rounded elevations. In the southern half of the county also there are a few areas in which the soil is residual, but here it has been derived from Potsdam sandstone instead of crystalline rocks.

The region of alluvial soils is confined to the southern third of the county, mainly to the south of Grand Rapids and the Green Bay & Western Railroad. The country consists of a series of sand flats, associated with which, west of the Wisconsin River, there are extensive marshes. Some of these marshes contain numerous small sand islands only 1 or 2 feet higher than the level of the marshland. The greater part of the material throughout this sandy region is of alluvial origin, having been deposited by enlarged streams during preglacial or interglacial times. In a few places the underlying Potsdam sandstone comes to the surface and gives rise to a residual sandy soil. Where a shaly phase appears with the sandstone the residual material is considerably heavier.

Over most of the county, except the southern sandy region, the surface shows a covering of extremely silty material which has the characteristics of loess, and it seems probable that much of the surface material making up the silt loam types was deposited by wind action.

Throughout most of the northern half of the county and over isolated areas in the southern part crystalline rocks, mainly granite, make up the surface formation. In the vicinity of Milladore, Pittsville, and Grand Rapids and in a few other places gneiss and schist appear as the surface rock. In the vicinity of Arpin and Powers Bluff conglomerate and quartzite occur. In Milladore and Sherry Towns and at a few other points diorite-gabbro constitutes the surface rock. The depth to bedrock usually varies from 4 or 5 to over

50 feet. Outcrops of these various formations occur frequently. Over most of the southern part of the county and along the western border Potsdam sandstone appears as the surface rock. In a few places the sandstone outcrops, though in most cases, especially near the Wisconsin River, it is deeply buried by deposits of alluvial sand.

All the rock formations have contributed to a greater or less extent in the formation of the soils. A much larger proportion of the soil material has come from the crystalline rocks than from the sandstone. Through transportation by glacial action, crystalline-rock debris overlies sandstone over considerable areas, especially in the western part of the county. Small patches of sandstone material occur over the crystalline rocks in the northern and northeastern parts.

The soils of Wood County are classed in seven series, in addition to which three miscellaneous types are mapped.

The Spencer series comprises light-colored, timbered upland soils, chiefly within the region of pre-Wisconsin glaciation. The surface soils are gray or grayish brown and are usually underlain by lighter brown or yellowish subsoils which are highly mottled with brown, rusty brown, gray, and yellow. The surface soil is also mottled in places. Some stones and boulders are present upon the surface, but they are not as abundant as on the Gloucester soils and are seldom sufficiently numerous to retard agricultural development. The material forming these soils consists of glacial debris derived from crystalline rocks, chiefly granite and gneiss. The determining factor in differentiating this series is the mottled condition of the subsoil, which is due to poor drainage conditions, resulting in retarded oxidation. No calcareous material is present in the drift, and both surface soil and subsoil show varying degrees of acidity. The topography ranges from nearly level to undulating and gently rolling. Natural surface drainage is often deficient and underdrainage is poor in nearly all cases. This is the most extensive series mapped. It predominates throughout the northern two-thirds of the county. It is represented by one type, the silt loam, with a rolling phase.

The characteristic features of the Vesper series are the heavy, brown to grayish-brown surface soils and the light-brown or brown and gray mottled subsoil, of heavier texture than the surface soil. At a depth of about 18 to 24 inches the subsoil becomes sandy and passes into the underlying material, usually sandstone. The surface of the Vesper soils is flat and the natural drainage is usually deficient. Both surface soil and subsoil show varying degrees of acidity. These soils differ from those of the Spencer series in their shallow depth and in the less compact and impervious nature of the upper subsoil. One type, the silt loam with a rolling phase, is mapped in this county.

The surface soils of the Gloucester series are brown or grayish brown. The subsoils are brown, yellowish brown or reddish brown. The material of this series has been weathered from glacial drift derived mainly from crystalline rocks, chiefly granite and gneiss. The topography varies from gently to rather sharply rolling. In Wood County the Gloucester fine sandy loam, shallow phase; silt loam, shallow phase; and silt loam, rolling phase, are mapped.

The Whitman series is characterized by dark-brown or black surface soils underlain by drab, bluish or yellowish subsoils, which are usually mottled. These soils occupy a position similar to that of the Clyde soils, but they differ from the Clyde in showing varying degrees of acidity and in having been derived from noncalcareous material, chiefly crystalline rocks. Because of their low position the natural drainage of these soils is deficient. They may occur as alluvial first-bottom land or in depressions in the upland where there has been an accumulation of organic matter. The types mapped in this survey are the sand, fine sand, fine sandy loam, and silt loam.

The surface soils of the Plainfield series range in color from brown to grayish yellow, while the subsoils are usually yellow to pale yellow. This series is developed in and bordering the deep drift-covered areas of Wisconsin, Michigan, and Minnesota, and comprises soils formed from sandy and gravelly glacial débris washed out from the fronts of the glaciers. It is also developed in deep, filled-in valleys along streams, such as the Manistee and Au Sable Rivers in Michigan and the Wisconsin River in Wisconsin. Areas of the first description occur as nearly level or gently sloping outwash aprons connected with terminal moraines; the others occur as filled-in valleys, often several miles wide, the material having been laid down during the glacial period. The greater part of the material has been much assorted and consists mainly of sand and gravel. The deposits are deep and the soils leachy and droughty. The types mapped in this survey are the sand, with an eroded phase, fine sand, sandy loam, and fine sandy loam. These soils are extensively developed in the southern third of the county, in the valleys of the Wisconsin and Yellow Rivers. They occur chiefly on terraces and are not subject to overflows.

The surface soils of the Boone series are brown or light brown and are underlain by yellow, grayish or brownish-yellow subsoils. The material has been derived largely from the weathering of the Potsdam sandstones, with which there is frequently associated a shaly phase. This shale on weathering gives rise to material high in silt and clay, while the pure sandstone on weathering gives rise to an extremely sandy soil. Where shale is abundant the land is usually level, but where it is lacking the surface is usually gently rolling.

Both surface soil and subsoil show varying degrees of acidity. The types mapped in Wood County are the Boone fine sand and fine sandy loam, the latter with a poorly drained phase.

The Genesee series comprises light to dark-brown surface soils and usually lighter colored subsoils. These soils occur as first-bottom land in recent and old glaciated regions and frequently extend into unglaciated regions along streams heading in glaciated areas. Practically all the land is subject to overflows. The types mapped in this county are the Genesee fine sandy loam and silt loam.

The miscellaneous types mapped as Peat and Muck consist of decaying vegetation with which there is incorporated varying proportions of mineral matter.

The type of Sands and Peat (undifferentiated) consists of marsh land and low, flat sand islands so intricately associated that separation of the material in mapping is impossible.

In the following table the extent of each soil type mapped is shown:

*Areas of different soils.*

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Spencer silt loam.....	109,440	25.9	Gloucester silt loam, shallow phase.....	8,000	1.7
Rolling phase.....	24,384		Gloucester silt loam, rolling phase.....	512	
Vesper silt loam.....	60,736	15.0	Whitman fine sandy loam.....	7,424	1.4
Rolling phase.....	16,640		Genesee fine sandy loam.....	7,040	
Peat.....	49,920	13.1	Gloucester fine sandy loam, shallow phase.....	6,208	1.2
Shallow phase.....	17,856		Genesee silt loam.....	5,312	
Plainfield sand.....	57,984	11.6	Whitman fine sand.....	3,840	.7
Eroded phase.....	2,240		Plainfield sandy loam.....	2,304	
Whitman silt loam.....	42,112	8.1	Plainfield fine sandy loam.....	1,216	.2
Sands and Peat (undifferentiated).....	28,736	5.6	Muck.....	960	.2
Boone fine sandy loam.....	8,896	3.4	Total.....	517,760	.....
Poorly drained phase.....	8,896				
Whitman sand.....	16,640	3.2			
Plainfield fine sand.....	15,936	3.1			
Boone fine sand.....	14,528	2.8			

SPENCER SILT LOAM.

The surface soil of the typical Spencer silt loam is a grayish-brown silt loam, 8 to 10 inches in depth, very smooth to the touch, and carrying little or no coarse material. When wet it is more yellowish brown in color and rather sticky, though it does not polish on the auger. A few bowlders occur scattered over the surface.

The subsoil is a mottled yellow, drab, brown, and blue silt loam, grading into a heavy, tenacious, sticky silty clay loam at depths of 15 to 18 inches. This mottled silty clay generally extends to a depth greater than 3 feet. The stiff, close character of the subsoil makes it

almost impervious to water, and this stratum is locally called "hardpan." The mottled color of the subsoil is characteristic of the type. It is not uncommon for the mottlings to come within 2 or 3 inches of the surface.

The type as a whole is remarkably uniform, but the lower subsoil is subject to some variation. In the vicinity of the Marshfield Moraine a layer of gravelly, gritty silty clay loam occurs at varying depths. At greater distances from the moraine, both east and west, the mottled silty material becomes deeper and in general extends to a depth greater than 3 feet. In the northern part of Richfield Town residual material from sandstone occurs at depths of 36 to 40 inches, while farther south, in the same town, the sandstone comes closer to the surface. Where the sandy material is within 20 inches of the surface the soil is separated as the Vesper silt loam. There is an increasing percentage of very fine sand in both surface soil and subsoil as the Vesper soils are approached, the texture being a silty loam in some places. The sandstone stratum does not extend as far north in the eastern part of the county as in the western, but there are occasional isolated outcrops within 3 or 4 miles of the north county line, as just south of the railroad tracks, a few rods from Auburndale, in the northeast quarter of section 27.

A variation in the type occurs in the northern two-thirds of Rudolph Town and in a small area north of Milladore. The surface soil here is a gray to yellowish-brown silt loam, 8 to 10 inches deep, friable in structure and smooth to the touch. The subsoil consists of a brownish-yellow silt loam grading at 18 to 20 inches into a mottled silty clay loam, very heavy, tenacious, and sticky. The mottlings are yellow, brown, and gray. The subsoil below the depth of 30 inches may contain considerable residual material, although the mottled subsoil quite commonly continues to a depth greater than 3 feet. The topography in general is gently undulating to undulating. Because of the heavy, tenacious character of the subsoil the land is nearly always poorly drained, especially in the more nearly level areas, and crop production is more often limited on this account than for any other reason.

The Spencer silt loam is the most extensive type mapped. It occupies a large part of the northern half of the county. It occurs here in areas unbroken except for an occasional hill or ridge occupied by the rolling phase and small, narrow areas of Whitman silt loam along stream courses. Within the Vesper soils the Spencer silt loam is mapped in a few areas where the depth to the sandy layer is so great as to warrant its separation.

The topography of the Spencer silt loam ranges from level to gently undulating. The region occupied by this type is characterized by long, gentle swells and broad, nearly flat areas. Because

of the level topography and impervious subsoil, the type as a whole is poorly drained. The drainage of the areas of Spencer silt loam is divided. In the northern part of the county it is toward the north, into the Little Eau Pleine River. In the central part of the county Mill Creek and its tributaries drain to the east into Portage County. In the western part the Yellow River drains to the southwest into Juneau County, cutting through the Marshfield Moraine in section 26, township 25 north, range 2 east. The line of the Minneapolis, St. Paul & Sault Ste. Marie Railway follows approximately the divide between the first two drainage systems, and the Chicago & North Western Railway the divide between the second and third. The most extensive unbroken areas of Spencer silt loam, with a typical level to very gently rolling topography, occupy these divides, as in sections 27, 32, 33, and 34, Milladore Town; sections 14, 15, and 16, Auburndale Town; section 17, Lincoln Town; and along the line between Marshfield and Richfield Towns. In some instances the surface is that of a long, gentle slope rather than strictly level. These areas occupy the same physiographic position as the broad prairies of southern Wisconsin. Adjacent to intermittent drainage courses and where the Whitman silt loam occurs the Spencer silt loam is commonly quite level and wet. Some of the wettest areas are indicated by marsh symbols.

The Spencer silt loam is confined to the region covered by the early periods of glaciation. The glacial material has come from crystalline rocks and has been weathered to a much greater extent than material from the late Wisconsin drift. The extremely silty surface soil appears to be part of the blanket of loesslike material which covers much of the State. In a few places the deep subsoil is residual from the underlying crystalline rocks. Both surface soil and subsoil show varying degrees of acidity. The material is often strongly acid.

The original timber growth on the Spencer silt loam consisted of mixed hardwoods, maple, oak, basswood, elm, birch, large white pine, and some hemlock. The second growth is poplar. Most of the merchantable timber has been cut, but a considerable acreage still supports some valuable timber.

Less than 25 per cent of this type is under cultivation. Adjacent to the railroads the land is fairly well cleared, but in many sections the more remote tracts are still in brush and timber. Away from the villages there are large areas that have not been cleared at all except in small patches near the roads. Before clearing the land seems very wet, but under cultivation the surface water is removed with more rapidity. Even then, however, the drainage is not adequate in many cases, because of the slow movement of water downward

through the soil. This causes the ground to remain very wet for some time after rains and crops do not make their best development. The soil is cold and backward in the spring. The nearly level and the very gently undulating areas have about equally good under-drainage, but the gently undulating land is the more desirable from the standpoint of surface-drainage possibilities.

Where fair drainage can be effected this soil gives good yields. It is especially well adapted to grasses, clover making a remarkably good growth. Oats, barley, rye, and other grains produce large yields, but have some tendency to lodge. Corn for ensilage does fairly well and the crop often matures. Root crops give heavy yields.

Selling values of improved land of the typical Spencer silt loam range from \$40 to \$75 an acre.

In the cultivation of this soil the fields should be plowed in narrow lands, so that the dead furrows will assist in carrying off the surface water. Practically all the land would be improved by tile drainage. Because of the impervious nature of the subsoil the lines of tile, to be most effective, must be placed closer together than on any other soils in Wisconsin. The type requires careful cultivation with heavy stock and tools. It should be worked only when moisture conditions are most favorable. A mellow seed bed can then be readily obtained. The plowing under of green manuring crops, preferably the legumes, improves the physical character of the soil and increases the supply of organic matter. As the soil is acid, and frequently strongly acid, the use of lime is necessary if alfalfa is to be grown. On new land red clover does very well in spite of the acidity, because of the high virgin productiveness, but on old fields the use of lime would be beneficial to red clover and also to general farm crops. Because of the rather high cost of correcting the acidity on this type it may be advisable to grow such legumes as alsike clover and soy beans, which do well on acid soils, in place of red clover and alfalfa.

*Spencer silt loam, rolling phase.*—The surface soil of the Spencer silt loam, rolling phase, is a gray to brown, friable silt loam, 8 to 10 inches deep, very smooth to the touch and comparatively low in organic matter. The virgin soil often has a dark-brown color in the surface one or two inches, due to an accumulation of organic matter. An occasional boulder occurs on the surface. The subsoil consists of a grayish-brown silt loam mottled below 12 inches with yellow, brown, and gray. Below 15 inches the subsoil becomes a strongly mottled, heavy silt loam or silty clay loam. It is very compact, tenacious, and impervious to water.

On the whole the surface material is remarkably uniform, but the lower subsoil is variable. Prevailingly a mottled silty clay loam

extends to a depth greater than 3 feet, but occasionally within 30 inches a gravelly clay loam of glacial origin occurs. Reddish, gritty clay loam or clay, of residual origin, is also encountered in places. In some of the more rolling areas there is very slight mottling and in some places almost none. In places here the soil resembles very much the Gloucester silt loam, rolling phase, except that the gravelly layer is lacking.

The rolling phase of the Spencer silt loam occurs in the northern half of the county in irregular areas associated with the typical Spencer silt loam. It has a more rolling surface. In a few areas mapped, such as those adjacent to Powers Bluff and Cary Mounds, the topography is very rolling and the phase much better drained than the typical soil. The rougher areas containing rock outcrops are indicated on the map by symbols.

The phase has a very gently rolling to rolling topography. In the more rolling situations some small areas are too steep for general agriculture, being better adapted to use as pasture. The natural surface drainage is in general good, but some of the more gentle slopes would doubtless be benefited by tile drainage. The rolling phase is separated chiefly to indicate those areas which have slope enough to insure good surface drainage. Only in the more rolling areas is erosion serious, although it demands some attention on the gently rolling to rolling tracts. The original timber growth on this soil consisted of mixed hardwoods, some hemlock, and large white pine. All of the pine and much of the best hardwood has been removed.

A large percentage of this phase is under cultivation. Owing to its better drainage it has in general been taken up before the more level soils. It is very productive. Grains, such as oats, rye, and barley do well and occupy a large proportion of the total cultivated area. Corn ripens on this soil better than on some of the other types. Some of the best corn observed in the fall of 1915 was on one of the more rolling areas of this soil, where air drainage had prevented early frosts. The phase makes an excellent general-farming and dairying soil, since it is especially well adapted to grasses and clover. Some of the most highly developed farming communities in the county are on this class of land.

The suggestions made for the improvement of the typical soil apply also to this phase, except in regard to the drainage conditions. Because of the better drainage the phase can be cultivated earlier in the spring. It is somewhat easier to handle and on the whole is more desirable soil.

Land values on the rolling phase of the Spencer silt loam range from \$50 to over \$100 an acre, depending upon the location, buildings, topography, and other factors

## VESPER SILT LOAM.

The surface soil of the Vesper silt loam, extending to a depth of 8 to 10 inches, is a gray to grayish-brown silty loam to silt loam, containing in some places a small amount of fine and very fine sand. It is not uncommon for the surface soil to show slight mottlings. Fragments of sandstone occur occasionally on the surface over areas of small extent, but most of the type is stone free. The subsoil to a depth of 20 to 24 inches is a very compact silt loam, mottled drab, yellow, and brown. It passes at a depth of about 2 feet either into a drab or yellow, fine or medium sand or into more or less decomposed sandstone. Above the sand or sandstone the subsoil for a few inches is a heavy sandy loam or gritty clay loam.

The character and depth of the subsoil material are variable. Their condition over a large part of this type is probably well shown in the clay pit at the brick and tile works at Vesper. Beneath a 2-foot layer of more or less mottled silt loam there occurs about two feet of decomposing sandstone and sand. This is underlain by a red clay which extends to a considerable depth, and is derived apparently from the weathering of underlying crystalline rocks. The sandstone varies in thickness; in places it is very thin indeed. This condition gives rise to considerable variation in the subsoil. Occasionally the red clay comes quite near the surface over a small area where the sandstone is lacking. In places the sandstone or sand may be within 18 to 20 inches of the surface, and the silty layer a little thinner than typical. The silt loam in other places may be deeper than typical. In general, where the mottled silt loam to silty clay loam layer has a depth greater than 30 inches the soil is separated as the Spencer silt loam, on the assumption that where the heavy subsoil is of this or a greater depth the drainage possibilities more nearly approximate those of the Spencer soil. This type very much resembles the Spencer silt loam, except in its sandy subsoil.

The Vesper silt loam occurs in broad areas in township 23 N., extending through ranges 2 to 5 E. In the western part of the county numerous areas are mapped in the townships both north and south of township 23 N. Throughout this region it is the predominating soil. The topography of most of the type is level. Some areas are gently undulating, but on the whole the surface is much more nearly level than in the case of the corresponding type in the Spencer series. The Vesper silt loam occurs in broad, level areas which often extend for several miles unbroken except for an occasional strip of marsh lying at only a slightly lower level. Because of the flat topography, the drainage of most of the type is naturally very poor.

The material forming the Vesper silt loam has been derived from several sources. The type occurs within the region covered by the pre-Wisconsin ice sheets, and part of the mantle over the rock is doubtless of glacial origin. The extremely silty material, however, is loesslike in texture and structure and may be in part of wind-laid origin. The deep subsoil in most cases is residual from sandstone. In a few instances where sandstone is lacking the underlying crystalline rocks are the source of the material. Both surface soil and subsoil show varying degrees of acidity.

This soil was originally timbered with mixed hardwoods, white and Norway pine, and some hemlock. Practically all the pine was logged off many years ago. Large areas have been burned over, as just west of Vesper and west of Pittsville, and are now covered with a second growth of poplar. Where the land has not been burned over the present timber growth is basswood, maple, elm, birch, and poplar.

Except in areas adjacent to the railroads this type is not highly developed. Large areas have not been cleared at all except in patches adjacent to the highways. The areas in Sigel Town probably are as well developed as any part of the type.

Surface drainage improves very much upon clearing of the land, but the level topography and dense, impervious nature of the upper subsoil cause drainage even then to be deficient. Shallow surface ditches help to remove the water, but often it is difficult to obtain an outlet low enough to empty these, and frequently water stands on the ground for several days after a rain, doing much damage to growing crops.

The principal crops grown are clover, timothy, rye, oats, and some barley. Corn is a rather uncertain crop because of the poor drainage and the danger from frosts in the low-lying, level areas. Corn for ensilage does fairly well. Grasses are especially well adapted to this soil. Crops such as cabbage, rutabagas, mangel-wurzels, and turnips produce heavy yields and the roots can be used to some extent to take the place of ensilage. When the price of cabbage is low this crop is often fed to cattle.

Improved farms on the Vesper silt loam range in value from \$35 to \$75 an acre, the price depending upon the acreage cleared, the farm buildings, location, drainage, and other considerations.

In improving this type the first need is the supplying of adequate drainage. Where there is sufficient fall, tile placed in the underlying sand or open ditches cut down into the sand will ordinarily provide sufficient drainage, though it is sometimes difficult to get a satisfactory outlet. The soil is low in organic matter and green-manure crops should be plowed under. Because of its poorly drained condition the soil is cold and backward in the spring and should be culti-

vated only when moisture conditions are most favorable. The type requires practically the same treatment as the Spencer silt loam.

*Vesper silt loam, rolling phase.*—The surface soil of the rolling phase of the Vesper silt loam to a depth of 7 to 9 inches is a grayish to grayish-brown silty loam to silt loam, containing a small amount of fine and very fine sand. It is underlain by a mottled brownish-yellow silt loam to silty clay loam which contains a very small percentage of fine sand. At 24 to 30 inches there is a very abrupt change to a yellowish or drab fine or medium sand or sandy loam or decomposing sandstone.

Considerable variation occurs in the subsoil, both in depth and character of the material. In some areas the mottled silty clay loam subsoil is undoubtedly deeper than typical, but in general where it extends to a depth greater than about 30 inches the soil is mapped as the Spencer silt loam. In places in some of the larger areas a gravelly sand occurs. This is probably of glacial origin. Associated with the sandstone are shaly layers which weather into a mottled gritty clay, with the result that occasional heavy layers are encountered in the subsoil. Fragments of sandstone occur frequently on the surface. Much of this rock is of a very indurated nature and has furnished little material to the surrounding silt loam soil. On slopes occasional rock outcrops occur. This phase resembles very much the rolling phase of the Spencer silt loam, but differs in containing sandy material in the subsoil.

The Vesper silt loam, rolling phase, occurs in the central part of the county, where it occupies the more rolling land in association with the typical Vesper silt loam. The phase occurs on slopes and hills. Throughout Sigel Town the phase occupies many short slopes, marking the boundary between one broad level area and another level area at a slightly higher elevation. Its most extensive development occurs northeast of Pittsville, where it covers several square miles.

The topography of the Vesper silt loam, rolling phase, is undulating to gently rolling. Most of the land is well drained. Only in the more rolling areas is the phase subject to erosion.

The material forming this soil is from several sources and has practically the same origin as that giving rise to the typical soil. The phase differs chiefly in being much better drained.

The native vegetation on this soil consisted of oak, basswood, maple, elm, and pine. At present much of the land is covered with poplar.

A rather large proportion of the phase is under cultivation. The area northeast of Pittsville is very highly developed. The phase is a very good general-farming soil, and is especially well adapted to grasses. Excellent yields of oats, rye, and barley are obtained. Potatoes yield quite heavily. In the vicinity of Pittsville an area of

about 100 acres devoted to cabbage is partly on this soil. Heavy yields of cabbage of excellent quality are obtained. Root crops make excellent growth and to some extent take the place of corn, although the phase is about as well suited to corn as any of the other heavy types of the county.

Many of the small areas of the phase within broad tracts of the typical Vesper silt loam make excellent building sites and are used to quite an extent for this purpose.

The phase can be cultivated under a wider range of moisture conditions than the typical soil, and is a better all-round type, since it warms up earlier, is better drained, and slightly lighter in texture. It is considered a first-class general-farming soil.

Improved farm land on this phase ranges in value from \$75 to \$100 an acre, the price depending upon the location, improvements, and other factors.

The organic content of this soil is low and should be increased.

#### GLoucester FINE SANDY LOAM, SHALLOW PHASE.

The surface 6 to 10 inches of the Gloucester fine sandy loam, shallow phase, is a grayish-brown to yellowish-brown fine sandy loam, with sufficient content of fine material to be slightly sticky. Small, angular crystalline-rock fragments occur frequently on the surface and through the surface soil and subsoil, and there is an occasional boulder. The subsoil is a yellowish-brown fine sandy loam, grading into a sticky sandy loam or fine sandy loam. Below 24 to 30 inches the subsoil becomes a sand and quite commonly contains many rock fragments. The subsoil varies to quite an extent, occasionally being a rather heavy fine sandy loam to loam. In sections 1 and 2, Milladore Town, there occurs below 30 inches a compact layer, derived probably from mica and chlorite schists. It contains a large percentage of fine mica flakes and has a smooth feel like soapstone. At 3 to 8 feet the rotten rock is reached.

Included with this type are some areas of fine sand which are too small to show as a separate type. In the northern tier of "forties" in section 25, Milladore Town, is a narrow strip of fine sand, known locally as the "sand ridge." Other small areas occur throughout the center and in the southwest corner of section 16, and in the northwest quarter of section 3. In these areas the soil consists of a yellowish-brown medium fine sand, 6 to 10 inches deep, underlain by a brownish-yellow fine sand which continues to considerable depths. The color grows lighter with depth. In cuts the sand is seen to reach depths of 8 or 10 feet. This fine sand variation contains very few rock fragments, and in places none are observed.

In one place the surface soil to a depth of 8 inches consists of a yellowish-brown fine sandy loam carrying a moderate amount of rounded gravel. This is underlain by a light yellowish brown fine sandy loam which becomes lighter in texture and color with depth. The rounded coarse material may be derived from a conglomerate or it may be of glacial origin, occurring, as it does, very near the boundary of the area of this soil.

The Gloucester fine sandy loam, shallow phase, is confined to the northeastern half of Milladore Town, where it is the prevailing upland soil. The topography is for the most part rolling and the natural drainage is very good, but some included areas are nearly level or gently undulating, and are not so well drained. When the land is cleared and channels become established, most of these level areas drain out quite readily.

The greater part of this soil is derived from the weathering of siliceous granites, mica schists, chlorite schists, and similar rocks. Evidences of glacial action, in the form of bowlders, occur in sections 5 and 13, and the soil material has very probably been reworked to some extent by the ice.

This land was originally heavily timbered with white and Norway pine, hemlock, and mixed hardwoods. The pine has practically all been cut for many years, and much of the other timber has been taken out more recently. At present a number of farms contain some merchantable timber. Much of the land has been burned over and has grown up to poplar. This growth, with the numerous stumps and old tree trunks towering up, gives the undeveloped areas a desolate appearance.

Much of this type is unused. Many settlers have recently come in and undertaken the work of clearing. Owing to its good drainage and medium texture this soil is warmer and earlier than the surrounding silt loams. It is well adapted to potatoes, small grains, and grasses. Corn will probably do much better on this soil than on the surrounding heavy types, since it warms up much earlier and is not so subject to frosts, owing to its rolling topography.

Uncleared land of this type has a selling value of \$15 to \$25 an acre.

#### GLOUCESTER SILT LOAM, SHALLOW PHASE.

The surface soil of the Gloucester silt loam, shallow phase, to a depth of 7 to 8 inches, is a brown to yellowish-brown silty loam or silt loam, carrying a small amount of very fine sand. Occasional rock fragments are common on the surface. The subsoil consists of a yellowish-brown silt loam grading into a silty clay loam of various colors—yellow, brown, and reddish brown. Yellowish brown pre-

dominates. This color variation does not occur as a mottling, but depends upon the character and degree of weathering of residual material in the subsoil. Below 2 to 3 feet the subsoil quite commonly is more or less gritty and contains fragments of crystalline rocks.

This soil does not have as prominent a gray cast as does the Spencer silt loam, and does not show the mottling characteristic of the Spencer soils.

Included areas in the north-central part of the county, near the county line in township 25 north, ranges 3 and 4 east, vary slightly from the typical Gloucester silt loam, rolling phase. The surface soil here is a grayish-brown to brown silt loam, 8 to 10 inches in depth, underlain by a yellowish-brown silty loam which grades into a silty clay loam. At 2 to 3 feet decomposed granite is encountered. Because of this more open subsoil the type has even better drainage than the Spencer silt loam, rolling phase.

The Gloucester silt loam, shallow phase, occurs in irregular areas of varying sizes. It is confined almost exclusively to the northern parts of the county and of Rudolph Town, where it occurs as extensions of large areas in Marathon and Portage Counties. The surface ranges from gently rolling to rolling. Drainage is everywhere very good. Some of the steeper slopes show evidences of erosion, and this is apt to become serious unless precautions are taken to minimize the effects.

This soil apparently is partly residual. In the western part of Rudolph Town the presence of numerous boulders would indicate that the residual material has been covered to a greater or less depth by glacial drift. The surface soil probably has originated from the weathering of the same silty covering from which the Spencer surface soils are derived.

The timber growth on this land is composed of mixed hardwoods, white pine, and scattered hemlock. A large proportion of the land is under cultivation. The soil is very productive. It is especially adapted to oats, barley, rye, grasses, and clover. Corn does very well for ensilage, and in the average year it ripens. The steeper slopes are not well suited to intertilled crops, because of the possibility of erosion. The tendency to erode is lessened by the presence of rock fragments on the surface and through the soil.

#### GLoucester SILT LOAM, ROLLING PHASE.

The surface soil of the Gloucester silt loam, rolling phase, is a smooth, yellowish-brown to brown silt loam 8 to 10 inches in depth. It is underlain by a light yellowish brown silt loam containing a small amount of very fine sand. At a depth of 15 inches this material gradually changes into a brownish-yellow silty clay loam. Very

slight mottling with brown iron stains sometimes occurs at a depth of about 20 inches. At 24 to 30 inches the subsoil becomes gritty and grades into a gravelly, sticky sand, which carries some cobbles. This coarse material is derived from crystalline rocks. Boulders occur frequently on the surface. The surface soil resembles the Spencer silt loam, rolling phase, but the subsoil does not show the mottling characteristic of the Spencer series and the gravel content is greater.

In some of the more rolling and broken areas of the Marshfield Moraine the soil varies from typical in being gravelly. It usually consists of somewhat gravelly loam or silt loam underlain by a very gravelly layer, but in places the surface material has been eroded away, leaving a gravelly sandy loam exposed. This variation covers a total area of less than 1 square mile, in secs. 26, 27, 28, 33, 34, and 35, T. 25 N., R. 2 E. It gives good yields of such crops as rye and oats, but when planted to such crops as corn the land tends to wash badly.

The Gloucester silt loam, rolling phase, occurs in the northwestern part of the county, occupying the area known geologically as the Marshfield Moraine. This enters the county in sec. 6, T. 24 N., R. 2 E., and extends continuously east and northeast through the southwestern part of T. 25 N., R. 2 E., leaving the county in secs. 5 and 6, T. 25 N., R. 3 E. It occupies a ridge rising 75 to 150 feet above the surrounding lowland to the south and southeast, which can be seen for a distance of 10 to 20 miles. The topography is rolling to very rolling, and natural drainage is good.

This soil has been formed very largely through the weathering of drift composed of ground-up granites. The Marshfield Moraine is the terminal moraine of one of the pre-Wisconsin ice sheets. The accumulation of drift which forms the ridge is of considerable depth, varying from about 86 feet at Marshfield to 156 feet at Bakerville and 160 feet north of Lindsey.

The native timber growth on this land consisted of mixed hardwoods, white pine, and hemlock. This soil is more highly developed than any other in the county. A very large proportion of it is under cultivation. It is an excellent small-grain soil, and corn does very well. There is less danger of damage from early fall frosts than on the Spencer silt loam. The soil is very well suited to grasses and clover. It is all devoted to general farming and dairying, for which branches of agriculture it is very well adapted. The farm buildings and other improvements on this land are the best in the county.

Land values on the better improved areas of the Gloucester silt loam, rolling phase, in the vicinity of Marshfield range from \$100 to \$150 an acre.

## WHITMAN SAND.

The soil of the Whitman sand to a depth of 5 to 12 inches consists of a dark-brown to black medium sand. Very commonly the virgin soil has a 2 to 4 inch surface covering of dark-brown peat containing a small proportion of sand. On cultivation this becomes mixed with the underlying sand and gives rise to a sandy peat or peaty sand, the texture depending on the relative proportions of the various constituents. The surface soil generally contains a considerable quantity of organic matter. Because of the coarse nature of the sand grains the organic matter stands out as separate particles, and gives the surface soil an apparently loamy texture.

The subsoil of this type consists of a light-yellow to gray, medium to coarse sand which becomes coarser with depth. With increasing depth the color partakes more of a gray or whitish cast and the material has a leached appearance. Occasional yellow iron stains or mottlings occur in the subsoil.

This type is associated with the Plainfield sand, occurring in the southeastern part of the county on both sides of the Wisconsin River. The largest continuous area is mapped in T. 22 N., R. 5 E. Here the sand gradually becomes darker as the water table approaches the surface with increasing distance from the Wisconsin River. On the eastern side of this area the surface soil is a dark-brown medium sand, only a little darker than the Plainfield sand. The two soils merge into each other with a gradual darkening in color. On the western side, where the peat marsh is approached, there is a shallow covering of peaty matter. This accumulation gradually increases in depth with distance from the river. Throughout this area of Whitman sand there are a few scattered "islands" of Plainfield sand, 2 to 5 acres in extent, which reach an elevation of 1 or 2 feet above the surrounding wet soil and afford good building sites. In T. 21 N., R. 4 E., the Whitman sand occurs associated with the Plainfield sand in the miscellaneous type mapped as Sands and Peat (undifferentiated).

The surface of the Whitman sand in general is level to very gently undulating, and the natural drainage is poor. Some large open ditches have been constructed, and along these the drainage conditions have been greatly improved.

A large proportion of the material forming this soil is of alluvial origin, having been deposited by running water when the Wisconsin River was at a much higher stage than at present, probably during glacial times or during the retreat of the ice sheet, when great volumes of water were escaping from beneath the ice. The parent material was largely Potsdam sandstone, and in a few instances the soil may be residual from this rock. The dark color is due to the

accumulation of decaying organic matter, the growth of which was favored by the moist conditions. The material is acid, differing in this respect from soils of the Clyde series, which are similar in many other ways.

The native vegetation consists chiefly of willow, poplar, and alder, with marsh grass and some moss. In many places the marshy land is open and coarse grass or moss constitutes most of the growth. In others there is quite a dense growth of brush.

Only a very small proportion of this soil has been cleared and placed under cultivation. Along open ditches crops can generally be grown, but back from the ditches the drainage is usually deficient. On undrained areas some marsh grass is cut for hay. Such crops as buckwheat, alsike clover, corn, and small grains can be grown in the most favorable situations, but yields are uncertain. The soil is deficient in potash and phosphorus and on the whole is of low agricultural value. When well drained it can doubtless be farmed profitably, but it will require very careful management.

#### WHITMAN FINE SAND.

The surface soil of the Whitman fine sand, extending to a depth of 6 to 12 inches, is a dark-brown fine sand carrying a fairly high percentage of organic matter. The virgin soil often has a surface mantle, 2 to 4 inches deep, of peaty material, and in some included areas this peaty accumulation has a depth as great as 6 inches. With drainage this material shrinks, and upon cultivation and mixing with the sand it gives rise to a peaty sand texture, which is quite characteristic of the type.

The subsoil consists of a pale-yellow to gray fine sand which becomes a gray or whitish fine sand at 15 to 18 inches. Where exposed, as along drainage ditches, the sand takes on an almost white appearance when dry. Small amounts of mineral grains other than quartz give a slightly grayish cast to the subsoil. Some variations in subsoil texture occur. Layers of very fine sand are common, and an occasional layer is of even finer material. Where this very fine material is of any considerable extent the subsoil undoubtedly has a greater water-holding capacity.

The Whitman fine sand occurs associated with the Plainfield fine sand along the Yellow River and Hemlock Creek, in much the same relationship as that in which the Whitman sand and Plainfield sand occur along the Wisconsin River. Fairly large tracts are under cultivation in secs. 29, 35, and 36, T. 21 N., R. 3 E., south and southwest of Babcock. Other large areas occur near Dexterville. At least a part of the area in sec. 27, T. 22 N., R. 3 E., consists of a badly burned peat marsh where only a small part of the peaty matter remains.

In the type of Sands and Peat (undifferentiated) throughout Remington and adjacent towns many small areas of Whitman fine sand occur between "islands" of Plainfield fine sand.

The surface of this soil is level. Along ditches the drainage is usually good, but some distance back from these it is usually deficient. The native vegetation consists of willow, alder, and poplar, with marsh grass and some moss.

The organic matter in this soil, as in the Whitman sand, is soon exhausted under cultivation, and after a few years the soil in many places is an unproductive, grayish-brown fine sand. The type is deficient in phosphorus and potash, and is of rather low agricultural value. The chief crops grown are rye and buckwheat, both of which give fair yields. Timothy and alsike clover can be grown. As the soil is acid, red clover does not do well without the use of lime.

With proper farming methods and fertilization this soil can doubtless be farmed profitably. Where it is not carefully managed, however, results are very uncertain.

#### WHITMAN FINE SANDY LOAM.

The surface soil of the Whitman fine sandy loam, extending to a depth of 6 to 10 inches, is a dark-brown to black fine sandy loam high in organic matter. It is underlain by a drab to yellowish-drab fine sandy loam, which becomes a sticky sand or very gritty clay loam below 18 to 24 inches. Yellow, red, blue, and drab mottling is quite common.

The surface soil is not very uniform. Considerable silt and clay is mixed with the sand in places, especially along drainage courses heading in areas of silt loam soils, in which case the soil is a loam rather than a fine sandy loam. On the other hand, small areas in which the texture approaches a fine sand are also included. Where the type occurs associated with peat soils, a 2 or 3 inch layer of peat is often encountered on the surface, as in the areas northeast of Dexterville.

The subsoil of this type also is quite variable. Within areas of sandy soils it consists of a gray to drab sticky fine sand or fine sandy loam. Occasionally layers of sandy or gritty clay loam of a drab mottled color occur where the soil is associated with the Boone fine sandy loam, poorly drained phase. In places the subsoil may be a fine to medium sand below the surface foot. Where the type is associated with the Boone soils layers of a mottled color, with red predominating, are seen where the subsoil has been derived to a considerable extent from shaly layers in the sandstone.

In some small included areas, associated with the Plainfield sand, the texture is coarser than typical. The soil here consists of a 6-inch layer of dark-brown to almost black sandy loam, with 1 or 2 inches

of well-decomposed peaty material over the surface. The subsoil consists of a gray sandy loam grading into a yellow medium to coarse sand.

In the northeast one-half of Milladore Town the Whitman fine sandy loam occupies depressions along drainage courses and areas along the borders of the large marshes. In the southern and southwestern parts of the county it is associated with other Whitman soils and with the Plainfield soils and Peat. The surface is level, the water table lies near the surface, and the natural drainage is poor. In some places large open ditches have been dug. Most of the land supports a heavy growth of alder and willow, with marsh grass in the broader open areas. At the head of the drainage courses the native timber consisted of ash, elm, birch, some hemlock, and pine. At present there is considerable poplar.

Practically none of this land is utilized at present, except that marsh hay is cut to a very small extent on some of the broader open areas. Most of the type occurs in an undeveloped part of the county and probably will not be utilized until more of the upland has been put under cultivation. When properly drained this type may be developed into a good soil.

In its present condition the agricultural value of this soil is rather low. In many cases the ditches constructed do not drain the land thoroughly except immediately along the ditch. Little of the type has been cleared and placed under cultivation, and the yields are usually low. Under the most favorable conditions, fair yields of buckwheat, alsike clover, and timothy are obtained. A number of other farm crops, such as corn and small grains, are frequently grown, but yields are uncertain.

In the improvement of this soil, thorough drainage is of first importance. It will probably be advisable to use some commercial fertilizer in order to supply potash and phosphorus, since the soil is usually low in both these mineral plant foods. This soil is acid. It will probably be advisable to grow crops that succeed on acid soils rather than to attempt to correct the acidity.

#### WHITMAN SILT LOAM.

The surface soil of the Whitman silt loam, extending to a depth of 8 to 12 inches, is a dark grayish brown to black silt loam, high in organic matter. The subsoil is drab in color, mottled with brown, yellow, and sometimes red. The mottling quite commonly is more or less localized, with drab predominating. The subsoil in texture is a silt loam to silty clay loam. It becomes heavier with depth. The material is compact and puttylike, and very retentive of moisture,

Where the type is associated with the Spencer soils the depth of the heavy subsoil is usually greater than 36 to 40 inches, but through-

out the region occupied by the Vesper soils the deep subsoil quite commonly is similar to that of the Vesper series, being derived from sandstone. Below 30 to 36 inches, and in some places at an even shallower depth, white or drab sand underlies the silty clay loam, and this in turn rests on sandstone. It is unusual for the hard sandstone to occur within reach of the 3-foot soil auger.

Included with the type are some areas where the dark surface soil is very shallow and occasionally almost lacking. Areas of this character are low lying and very poorly drained, however; and the soil is similar in many respects to the typical Whitman silt loam, although much lower in organic matter.

The Whitman silt loam resembles the Clyde silt loam of the southern part of the State in color, texture, and structure, but it is derived from crystalline material and is acid, while the Clyde soils are encountered in limestone regions.

The Whitman silt loam occurs in irregular patches throughout all the areas of the Spencer and Vesper soils. Associated with the Spencer soil, it occurs generally in narrow strips along streams and drainage courses. Several quite broad, level areas of very wet land, in which there has been an accumulation of organic matter, are included with this type.

Throughout the prevailing level developments of the Vesper soils the Whitman silt loam occurs in many broad areas in the more poorly drained situations. In many of the areas there is not more than a few inches of dark-brown or black soil, while in some places there is a deep surface soil resembling Muck.

The Whitman silt loam has a very nearly level topography. Natural drainage is very poor.

This soil consists of sediments washed from crystalline-rock débris. Because of the low position and wet condition of the land there has accumulated a large amount of organic matter, to which is due the dark color of the soil.

The natural vegetation characteristic of the narrow strips along stream courses is made up largely of alder and willow, with some elm, ash, and birch along the border. Over large areas elm, ash, and birch are more abundant, and in places poplar is commonly associated with the alder and willow. In the wettest areas there is little timber, marsh grasses predominating.

Very little of the type is farmed. A large area southwest of Vesper in sec. 16, T. 23 N., R. 4 E., Hansen Town, is being tilled. In the northwest quarter of sec. 35, T. 24 N., R. 5 E., Sherry Town, and in adjacent "forties" a small area of Whitman silt loam is under cultivation, but the drainage is so poor that crops do not give very good yields in years of average rainfall.

The soil is especially well adapted to grasses for hay and pasture. With drainage, corn for ensilage would also prove a good crop. Because of the high content of organic matter in most areas of the type, grain would probably lodge badly. Those areas with a very shallow accumulation of organic matter will, upon drainage and cultivation, develop into a soil resembling the more nearly level areas of the Spencer or Vesper silt loams.

Before this soil can be cropped with much success artificial drainage must be supplied. Many of the large areas, because of the level topography, will be rather difficult to drain successfully, and much care will be necessary in laying out a drainage system.

#### PLAINFIELD SAND.

The surface soil of the Plainfield sand, extending to a depth of 5 to 8 inches, is a yellowish-brown to brownish-gray, loose and incoherent sand, consisting very largely of rounded quartz grains. In local areas and in virgin land the soil may have a slightly darker color in the surficial 1 or 2 inches, due to accumulations of organic matter. The organic content on the whole is very low. In general the surface soil is free from gravel, but occasionally gravel occurs in small quantities on the surface mixed with the soil, as in an area just north of Grand Rapids.

The subsoil consists of a yellowish to yellowish-brown sand, which becomes lighter in color and texture with depth. The color at the bottom of the 3-foot section usually is pale yellow. More gravel appears in the subsoil than in the surface soil, but in most instances the soil section to a depth greater than 3 feet is very nearly gravel free.

The soil in general is quite uniform. In occasional areas the surface soil is slightly loamy. With increasing distance from the Wisconsin River on the west, as the water table approaches the surface, the Plainfield sand very gradually becomes darker colored and grades into the Whitman sand. A variation in color occurs in small areas in sec. 2, T. 21 N., R. 6 E., and adjoining sections, where the surface soil is a dark-red medium sand underlain at a depth of about 24 inches by a yellowish-brown sand similar to the typical subsoil. The soil is very noticeably coarser in texture than the sand along Yellow River and undoubtedly less retentive of moisture.

The Plainfield sand occurs in a large, almost unbroken area in the southeastern part of the county, bordering the Wisconsin River on both sides. A few small areas are scattered through the southern part of the county. The type has a level to very gently undulating surface, occurring as a broad plain lying 20 to 40 feet above the level of

the river. Several streams from the east cutting through the terrace to the Wisconsin River have eroded the land to a considerable extent in some places. The areas in which erosion has been serious are separated as the eroded phase of the Plainfield sand. Immediately adjacent to the Wisconsin River is a lower terrace, the soils of which have a finer texture than the Plainfield sand on the high terrace. The location of the slope between these terraces is shown on the map by symbol.

The Plainfield sand is of alluvial origin. The material has been derived mainly from sandstone. In places there is evidence of wind action. Practically all of the type is acid.

The original timber growth on this soil consisted of small jack pine, scrub oak, a few Norway and white pine trees, some white oak, bur oak, and scrubby hazel brush. All the timber of any value has been cut, but there is still much scrubby growth over the type.

Part of this soil has been placed under cultivation. Numerous farms on it appear to have been abandoned. The soil has a lower value than the heavier types of the county. It requires careful management, but where well handled gives profitable yields of potatoes, rye, and corn. Clover seldom does well unless given special fertilization. The common farming practices do not include the use of green-manure crops or commercial fertilizers or the following of systematic crop rotations.

The organic-matter content of this soil should be increased by plowing under green-manure crops, of which the legumes are best. The use of lime and commercial fertilizers may be necessary. These materials are in all cases helpful in getting clover started. When a good stand of clover is obtained the second crop may be plowed under and potatoes may be grown the following year, to be followed by some small grain, which should be seeded to clover. By liming the soil and using manure or commercial fertilizers, alfalfa may be successfully grown. Soy beans grow successfully on acid soils, and when this crop is used in place of clover or alfalfa it is not necessary to lime the soil. All the manure available should be applied to this land. Following a definite rotation is important in building up the productiveness.

*Plainfield sand, eroded phase.*—In the area of Plainfield sand along some of the streams flowing from the east into the Wisconsin River the sand terrace in places has been eroded and dissected into a rolling topography. These areas are separated as an eroded phase of the Plainfield sand. The soil material is identical with that of the typical Plainfield sand, but because of the badly eroded surface this land is of little agricultural value.

## PLAINFIELD FINE SAND.

The surface soil of the Plainfield fine sand is a medium-brown to yellowish-brown fine sand, 6 to 8 inches deep. The virgin soil quite commonly shows a dark-brown color in the surface 2 inches, due to an accumulation of organic matter. The soil in general is low in organic content, except adjoining low, wet areas, where the color is a little darker. The subsoil is a yellowish-brown, uniform fine sand. In places it is bright yellow, but more commonly the color becomes lighter with increasing depth. A noticeable characteristic of most of the type is its small content of medium and coarse sand. The soil is much more coherent than the Plainfield sand and consequently not so droughty.

In some areas along the lower terrace adjacent to the Wisconsin River fine sand has been washed in over the coarser medium sand by flood waters. Several such areas occur in the vicinity of Nekoosa and to the south of this place. The soil here consists of a brown to dark-brown fine sand, 8 to 10 inches deep, underlain by lighter colored material of much the same texture to 18 to 24 inches. Underneath this in places is a shallow layer of loamy medium sand to sandy loam. In nearly all cases a medium sand, similar in texture to the soil on the surrounding high terrace, occurs at depths of 24 to 30 inches. As the soil of this character is largely of recent-alluvial origin, deposited by flood waters at irregular intervals, it shows numerous irregularities in composition.

While most of the Plainfield sand occurs along the Wisconsin River, the fine sand is most extensive adjacent to the Yellow and Hemlock Creeks, the type extending in an almost unbroken area from the south county line to a point 2 miles north of Dexterville, following the course of the Yellow River. Over nearly all of Remington Town it is the predominating "island" type in the areas mapped as Sands and Peat (undifferentiated).

The surface of most of the type is very nearly level. There are frequent gentle undulations. The land is all naturally well drained and the soil is somewhat droughty, except bordering marshy areas, where drainage is in places somewhat deficient.

All of this type is of alluvial origin. It has been derived from material which came originally from Potsdam sandstone. Both surface soil and subsoil show varying degrees of acidity.

The timber growth consisted of Norway, jack, and white pine; bur oak, scrub oak, and poplar. Along the Wisconsin River bottoms there is some elm, birch, and willow.

A small proportion of this type is cleared and under cultivation, but, as is the case with the Plainfield sand, it requires very careful

management. Because of its finer texture it seems to be somewhat easier to improve than the sand type. The crops grown and the yields obtained are practically the same as on the latter type, and it will be found to respond to the same methods of soil treatment.

#### PLAINFIELD SANDY LOAM.

To a depth of 7 to 9 inches the soil of the Plainfield sandy loam is a brown, light sandy loam. This is underlain to a depth of about 28 inches by a light-brown medium sand, below which a mixture of medium and coarse sand and fine gravel occurs. There is very much gravel in the lower subsoil.

This type occurs almost exclusively on the lower terrace adjacent to the Wisconsin River. A few small areas are mapped elsewhere in the southern part of the county. The type is of very small extent.

The surface is very nearly level, but natural drainage is fairly good. The original timber consisted of elm, scrub oak, birch, willow, and hazel.

This is an alluvial soil. It consists of material originally derived from sandstone.

In agricultural value this type is somewhat better than the sand and fine sand of the same series, but owing to its limited extent it is of little importance in the agriculture of the county.

#### PLAINFIELD FINE SANDY LOAM.

The surface soil of the Plainfield fine sandy loam extends to a depth of 8 to 12 inches. It consists of a brown to dark-brown, silty fine sandy loam to fine sandy loam. The virgin soil in the surface for 2 or 3 inches has a high content of organic matter, which gives it a rather dark color. The surface soil is underlain by 4 or 5 inches of loamy fine sand, and at 15 to 18 inches a medium sand of a yellowish-brown color is encountered. At 30 to 36 inches the subsoil becomes a coarse sand, containing a high percentage of fine gravel.

This type occurs exclusively on the lower terrace immediately adjacent to the Wisconsin River. The material has been deposited by flood waters. The soils in the Wisconsin bottoms are quite variable in composition and small areas of fine sand often occur within the fine sandy loam.

The original timber on this soil consisted of white and Norway pine, birch, and elm, with willow and alder along streams where drainage is somewhat deficient.

In other parts of this and other States where it is extensively developed this type is a fairly good general-farming soil. Because of its small extent in this county it is of little importance agriculturally.

## BOONE FINE SAND.

The surface soil of the Boone fine sand is 4 to 8 inches deep. It consists of a gray to brownish-yellow fine sand. Quite commonly in virgin areas the soil in the surface 1 or 2 inches has a brown or dark-brown color, due to accumulations of organic matter. In the better drained areas, where there is sparser vegetation, this surface layer of darker material is often lacking. The surface soil is loose, incoherent, and very open. Fragments of sandstone occur frequently on the surface and mixed with the soil. The subsoil consists of a yellow fine sand which frequently becomes coarser with depth. Over a considerable part of the type sandstone comes within 3 feet of the surface. Sandstone fragments are common throughout the lower subsoil.

Because of variations in the sandstone from which this soil is derived, there are frequent variations in texture. In some areas the texture is a medium rather than a fine sand, but in all cases fine sand predominates. Occasional shaly layers in the sandstone have given rise to gritty clay loam or clay layers in the subsoil. The depth to sandstone is quite variable. In some places sandstone does not occur within the 3-foot level, while in some quite large areas it comes within 2 feet of the surface.

Some small, very wet, low-lying areas are included with this type where the soil resembles the Whitman series, except in the lack of organic matter and in the occurrence of sandstone in the subsoil.

Included with this type is a long, narrow area in secs. 21, 24, 25, and 27, T. 23 N., R. 6 E., Rudolph Town, where the soil is a medium sand, resembling very much the Plainfield sand to the south. It differs from that type, however, in its topographic situation, lying 20 to 30 feet above the main body of the Plainfield soils. If more extensive, this soil would be mapped as the Boone sand.

In a few places the Boone fine sand occurs adjacent to the Plainfield fine sand and resembles it very much in color, texture, and topographic situation. In most cases the presence of sandstone fragments affords a means of differentiating between these soils, but in some instances this is lacking and because of depth of the sand it is necessary to separate the soils on the basis of the general location.

The Boone fine sand occurs along the northern boundary of the large sand and marsh areas in the southern part of the county. It is mapped in irregular areas extending east and west across the county, largely in T. 22 N. Outside this general area there are numerous isolated sandstone outcrops where this soil has been formed through the weathering of the underlying rock, as around South Bluff in Remington Town.

The surface of the type varies from level to rolling. The small isolated areas are quite generally rolling. Many of the larger areas have a level to gently undulating topography, with occasionally small surface irregularities, due to wind action in forming small dunes.

Much of the type is well drained and droughty, but in some low-lying areas adjacent to marshes the elevation above the marsh is very slight and the water table lies too close to the surface for good results with ordinary crops. Wind erosion frequently takes place on this soil, especially after it is cleared and put under cultivation.

This soil is very largely derived from the weathering of Potsdam sandstone, but it has been modified in some cases by the action of running water, especially adjacent to the Plainfield soils.

The native vegetation consists of jack pine, some Norway and white pine, scrub oak, birch, and poplar, the latter now predominating.

Only a small proportion of the type is under cultivation, rye, potatoes, and buckwheat being grown. Corn does poorly. The soil where well drained is droughty, owing to its loose, open structure, and has a low agricultural value. Its supply of organic matter should be increased. A rotation of small grain, clover, and potatoes may be followed, the second crop of clover to be plowed under. The use of commercial fertilizer may be helpful in getting clover started. The use of lime will also be beneficial, as the soil is everywhere in an acid condition.

#### BOONE FINE SANDY LOAM.

The surface soil of the Boone fine sandy loam, to a depth of 8 to 10 inches, is a grayish-brown to yellowish-brown fine sandy loam, with a slightly darker color in the surface 1 or 2 inches in virgin areas. Fragments of sandstone occur frequently upon the surface and through the surface soil. The subsoil is a yellowish-brown, or in places slightly reddish brown, fine sandy loam, with a slightly greater content of clay at 15 to 18 inches. Below 20 to 24 inches it becomes lighter textured, grading into a yellowish, fine to medium sand with fragments of sandstone, which is generally reached within 3 feet. In many places the subsoil below the depth of 1 foot is a fine to medium sand.

This type is not very extensive. It occurs in irregular areas associated with the Vesper soils throughout the south-central part of the county. The largest areas occur in secs. 2 and 11, T. 23 N., R. 4 E., west of Vesper, in sec. 2, T. 22 N., R. 4 E., in the vicinity of Altdorf, and along the Yellow River near Pittsville. The only area of any considerable extent mapped outside the region in which the

Vesper soils predominate in secs. 11, 12, 13, and 14, T. 24 N., R. 5 E., adjacent to Mill Creek. In this area sandstone was observed in the NW.  $\frac{1}{4}$  NE.  $\frac{1}{4}$  sec. 14, and for this reason all the fine sandy loam soil was mapped with the Boone series, notwithstanding the fact that in some places no sandstone was in evidence.

The topography of the Boone fine sandy loam is in most places gently rolling to rolling. In certain areas along the Yellow River south of Pittsville and along Hemlock Creek south of Vesper the surface is nearly level, but on account of the situation adjacent to the river the drainage conditions are much better than on the best areas of the poorly drained phase, and the land corresponds in agricultural value with that of more rolling topography.

Some areas mapped with this type consist of sandstone mounds of considerable height covered, for the most part, with a fine sandy loam soil. The slope is too steep for tillage, and rock outcrops are common. Such an area occurs about one-half mile northeast of Lindsey. These rocky and stony areas are shown on the map by symbols.

The Boone fine sandy loam has been derived largely from the weathering of Potsdam sandstone. In some places a few rounded pebbles and boulders occur. The type occurs within, but near the border of, the area covered by the pre-Wisconsin ice sheets, and this location would account for the presence of such boulders. The glaciation, however, was too feeble to have much influence upon the composition of the soil.

This land originally supported a heavy growth of Norway pine, white pine, and some hardwoods, but practically all the timber has been cut or burned off. At present most of the areas are covered with poplar.

The chief crops grown are potatoes, rye, oats, corn for ensilage, and grasses. The type may be considered a fairly desirable soil, but it requires rather careful management. Its organic-matter content should be increased. Where clover or alfalfa is to be grown the use of lime will be profitable. A rotation consisting of small grain, clover, and potatoes, with the second crop of clover plowed under, gives good results.

*Boone fine sandy loam, poorly drained phase.*—The surface soil of the poorly drained phase of the Boone fine sandy loam, extending to a depth of 6 to 10 inches, is a grayish-brown loamy fine sand to fine sandy loam. In some places the surface soil has a dark-brown color, due to the accumulation of organic matter. The subsoil is variable. Prevaillingly it consists of a yellowish-brown to grayish-yellow fine sandy loam, grading at 20 to 24 inches into a quite sticky, gritty clay loam. This heavy layer is of a bluish-drab color, and usually carries considerable sand, which gives it a very gritty feel. Quite

commonly this layer is mottled with red, yellow, blue, and drab. In many places the heavy layer is lacking, the subsoil grading from a fine sandy loam into a light grayish yellow to yellow fine or medium sand and then into the sandstone. Fragments of sandstone are common on the surface and throughout the soil section.

This soil very much resembles the Whitman fine sandy loam in texture, topographic position, and drainage conditions. The surface accumulation of organic matter in this soil is much less, and the drainage on the average is probably a little better.

This phase occurs in the central and west-central parts of the county, where it is associated with the Boone fine sand and the Vesper silt loam. In general, the areas of this soil lie to the north of the Boone fine sand. The topography is level and the natural drainage is generally poor. In a few areas the natural drainage is much better than the average, and a small proportion of the phase has naturally good drainage.

The timber growth on this soil at present is largely poplar, with some alder and willow. Some open strips are covered with marsh grass. The original timber consisted of Norway and white pine.

The material forming this soil has been derived largely through the weathering of Potsdam sandstone, with which there is associated varying quantities of shale. This shale on weathering gives rise to the clayey material in the subsoil. Both surface soil and subsoil are acid.

Only a very small proportion of the phase is farmed. Some of the better drained areas have been put under cultivation recently. Over a large part of the phase artificial drainage will be necessary before the land can be farmed with much success. Even under the most favorable conditions this can be classed as only a fairly good soil. In its present condition most of the type has a low value, and for successful use it will require very careful management.

#### GENESEE FINE SANDY LOAM.

The soil mapped as the Genesee fine sandy loam is quite variable, owing to its alluvial origin and liability to overflows. The type includes sandy, first-bottom soils along the Wisconsin River and the lower courses of the Yellow River, Hemlock Creek, and the East Fork of the Black River.

Along the Wisconsin River the surface soil varies from a fine or medium sand to a fine or medium sandy loam. The color is yellowish brown to light brown, except in depressions, where the accumulation of organic matter has given rise to a darker color. The subsoil quite generally is a medium to coarse sand. Along the Yellow River the soil is a brown fine sandy loam, with occasional small areas of silt loam.

This soil is timbered quite heavily with elm, birch, ash, and some pine. None of the land is under cultivation. Because of its poor drainage and small extent this type is of little importance in the agriculture of the county.

#### GENESEE SILT LOAM.

The surface soil of the Genesee silt loam, extending to a depth of 8 to 10 inches, is a brown to dark-brown silt loam. Where the type is associated with the Spencer soils it resembles them very much in texture, but is slightly darker in color. The subsoil of the type is variable. In general it consists of a yellowish-brown silt loam, grading into a silty clay loam. Lenses of sand are commonly encountered.

Both surface soil and subsoil are subject to considerable variation. Within the general area occupied by the Spencer silt loam the material is a fairly uniform silt loam, but the type includes numerous small areas where the surface soil is black, resembling the Whitman silt loam, and often wet and marshy. Small sandy spots occur occasionally. In the areas associated with the Vesper, Boone, and Plainfield soils this uniformity is lacking. Here there is more or less sand along with the silt loam that has been carried in from the Spencer soils, and small areas of fine sands and fine sandy loams are included within the predominating Genesee silt loam. If more extensive, these sandy areas would be mapped with the Genesee fine sandy loam.

The Genesee silt loam occurs as first-bottom land along some of the larger streams. Along Mill Creek an area of this soil extends from sec. 32, T. 25 N., R. 4 E., throughout the remainder of the course of this stream within the county. The soil here is a desirable silt loam, except in the last 2 or 3 square miles, where there are some sandy spots.

The Yellow River has developed a narrow strip of bottom land in the northwestern part of the county. Throughout most of Richfield Town and the northern part of Wood Town the bottom land where present is too narrow to show on the map. From a point near Pittsville the lower terrace continues southward along the river to the county line without a break except in sec. 10, T. 22 N., R. 3 E. The Genesee silt loam occurs as the predominating type as far south as the Green Bay & Western Railway line near Dexterville. South of the railroad three areas of this soil are mapped separately from the terrace immediately adjacent to the river in secs. 22, 27, and 34. These three areas constitute practically all of the type under cultivation. Just south of the track the land has been protected from inundation by means of a dike, and this type, with the adjoining Peat land, is being ditched and tile drained.

The Genesee silt loam consists of alluvial material derived largely from crystalline rocks.

The timber growth on this soil is quite heavy. Maple, elm, birch, and ash grow adjacent to the streams, and in the wettest areas alder and willow make up the growth.

This soil is well adapted for use as pasture land when drained and protected from flooding. Hay, grain, and corn do very well. On account of the drainage requirements most of the type is of low value at present.

#### MUCK.

In the surface 10 to 15 inches the type mapped as Muck consists of black, well-decomposed organic material with a considerable admixture of silt and clay. This is underlain by a blue or drab silty clay loam, which is usually quite gritty. At a depth of about 2 feet a sticky gray sand occurs and continues to a depth of 3 feet or more. The content of sand in the subsoil is variable. The material quite commonly is very sandy.

Muck covers a total area of 1.5 square miles. It occurs in depressions in the southern part of the area of Vesper soils. The soil resembles very much the associated Whitman silt loam, but has a much higher content of organic matter.

The timber growth consists of alder and willow. In open areas marsh grass is the principal vegetation.

Practically none of the type is under cultivation at present. A small area is used for pasture in the south part of T. 23 N., R. 5 E.

When cleared and drained this soil will have a higher crop-producing value than the Peat land.

#### PEAT.

The soil classed as Peat consists of vegetable material in various stages of decomposition. In color it varies from brown to black. Only those areas are mapped as typical Peat in which organic matter has accumulated to a depth of 2 feet or more. In some areas the depth is greater than 15 feet. Dependent upon the stage of decomposition, the organic matter varies from raw and fibrous plant remains to a very fine grained material, which shows little trace of the original plant fiber. Over most of this type the organic soil is underlain by fine or medium sand. In those parts of the county where the surrounding upland soils are heavy the underlying material is silt and clay, with some sand. In the southwestern part of the county the peaty matter is underlain by decomposing sandstone which contains some shaly layers. These give rise to clayey material.

Throughout the marshy areas in the southern part of the county numerous small sand "islands," varying in size from a few square

rods to 2 or 3 acres, occur in the midst of the marsh land. Where these "islands" occupy less than 25 per cent of the surface the land is mapped as Peat. Many of the marsh areas have been burned over, leaving a deposit of ashes. Where this is of recent origin it appears as a yellowish or reddish-yellow layer, 1 inch to 3 inches thick on the surface. In time this becomes incorporated with the underlying vegetable matter, and the soil takes on the appearance of well-decomposed Peat.

The type of Peat is mapped most extensively in the southern and southwestern parts of the county, where it is the predominating soil over many square miles. Through the central and northern parts of the county it occurs in numerous isolated areas of varying size, the largest being in the northeastern part of the county in Milladore Town.

The surface of this land is nearly level. The small sand islands which occur in the type in the southern part of the county have only a slight elevation above the marsh. Because of the flat topography, the natural drainage is very poor. Much of the Peat land is included in drainage districts and is drained more or less thoroughly by large, open ditches.

The native vegetation on the open areas of Peat consists largely of marsh grass, sedges, and sphagnum moss. Where timbered the land supports tamarack, spruce, and cedar. Wild cranberry is abundant in some places. In the southern part of the county much of the marsh is open. An extensive spruce swamp occurs south of Elm Lake, in Cranmoor Town, and another in the northwest part of Remington Town, near the county line. The marsh in the northern part of Milladore Town is largely open. Just east of the "island" in this marsh there is an extensive area of tamarack and spruce. In some places along the borders of this marsh there is a heavy growth of black ash.

Much of this land is utilized for crops which do not require thorough drainage. About 1,000 acres are devoted to cranberries, largely in Cranmoor Town. There are several cranberry bogs in the western part of Remington Town. In addition to the land actually in cranberries, many acres of the marsh are used as a reservoir for water needed in cranberry production. Marsh grass is cut on a considerable acreage for hay. Where wire grass predominates the crop is sold to grass-matting companies for \$15 to \$18 a ton. Sphagnum moss is gathered and shipped to cities in considerable quantities for the use of florists.

Large areas of Peat are being organized into drainage districts, and ditches are being installed. Adjacent to the ditches the land is well drained, but at some distance from them the drainage is seldom adequate. Private enterprises have tilled some of the land,

giving adequate drainage. After thorough draining the soil under proper farming methods gives good yields of certain crops. It is adapted to grasses, buckwheat, corn, potatoes, and various other crops. Because of its generally low situation it is subject to early frosts, which may prevent the ripening of certain crops, especially corn.

The Peat land is deficient in the mineral plant-food elements. Before profitable crops can be grown over a long period of years these elements must be supplied. They can be incorporated to best advantage in the form of commercial fertilizer. Burned-over marsh lands give fair yields for a few years without the use of fertilizers. but in all cases the type will ultimately require such treatment. With good management this Peat land can be profitably farmed.

Land values on this soil vary greatly. Where no improvements have been made by way of drainage or clearing, the selling value is \$5 to \$15 an acre. Where drainage districts have been organized and outlet ditches constructed the land is usually held at about \$35 an acre. The purchaser of this land assumes the drainage tax. In addition to the open ditches forming a part of the drainage district, additional open-ditch laterals or tile drains may be needed.

*Peat, shallow phase.*—Areas of Peat in which the depth of the accumulation is less than 24 inches are mapped as a shallow phase. The peaty material in these areas rests on a gray to white sand. Scattered throughout the phase are sand "islands" too small to show on the map. Areas in which these constitute more than 25 per cent of the surface material are mapped with the miscellaneous type of Sands and Peat (undifferentiated). Where the covering of peaty matter is shallow the soil resembles the Whitman fine sand or sand. Where the accumulation of organic matter has a depth of approximately 6 inches or more the soil is mapped as Peat, shallow phase; where it is of less depth the soil is classed in the Whitman series.

Peat, shallow phase, occurs in irregular areas along the borders of large marshes and in narrow depressions in the Plainfield soils. The largest area is mapped in the eastern part of Cranmoor Town. With increasing distance from the Wisconsin River the water table in this area lies closer to the surface. The soil gradually passes from Plainfield sand through Whitman sand and Peat, shallow phase, into typical Peat.

The surface of the areas of Peat, shallow phase, is level, and the natural drainage is very poor. The native vegetation consists of marsh grass, sedges, sphagnum moss, willow, and alder.

Outside the cranberry district most of the areas of this phase are in drainage districts and are more or less thoroughly drained. Adjacent to the ditches some fairly good yields are obtained. Good

crops of rye and buckwheat were observed on this land in the course of the soil survey. Considerable marsh hay is cut on some areas. The Peat, shallow phase, has a value probably slightly higher than the typical Peat, but requires practically the same methods of soil treatment.

#### SANDS AND PEAT (UNDIFFERENTIATED).

The soil material mapped as Sands and Peat (undifferentiated) is subject to wide variation. In general, it consists of several classes of marshland through which there are scattered innumerable low, flat "islands" of sand. The soil on the islands consists of a brown or yellowish sand or fine sand underlain by yellow, rusty-brown or nearly white sand of medium to fine texture. The content of organic matter in the surface soil is small and the material is usually loose and open in structure.

The sand islands included in this type are less than 10 acres in extent individually. Those covering 10 acres or more are mapped separately, the soil being classed with the Plainfield series. The soil on these islands includes the same material as that in the larger areas of Plainfield soils. The marshland included in this group may consist of any one or more of several types. Where the islands are very close together the surface material of the intervening lowland is usually made up largely of sand, fine sand or fine sandy loam, containing sufficient organic matter to have a black color. The subsoil usually consists of a gray or nearly white sand varying in texture from coarse to very fine. It is in most places fine in texture. Wherever these black, sandy soils occur in an area 10 acres or more in extent they are mapped separately and classed with the Whitman series.

A noticeable variation occurs in the subsoil of this mixed type. In a number of instances the underlying layer is a fine-textured, nearly white material sometimes referred to locally as clay. It appears to consist chiefly of very fine sand, with a small proportion of silt and probably only a very small percentage of clay. This material sometimes comes within reach of the 3-foot soil auger, but it usually occurs at a greater depth and is most often seen along the banks of freshly dug drainage canals, where it has been reached at a depth of about 3 to 8 feet. This bed of fine material does not appear to be continuous.

In some instances the type of Sands and Peat (undifferentiated) is underlain by sandstone rock with which shaly material is associated. Where open ditches are cut through such formations thin beds of clay or sandy clay are sometimes seen. These have come from the weathering of the shaly sandstone rock. Areas in which this material comes within 3 feet of the surface are of small extent.

Small areas of Peat are also included in this type of undifferentiated soils. This consists of vegetable matter in varying stages of decomposition, with which small quantities of fine earth have become incorporated. The depth of the peaty matter is variable. It is usually underlain by sand. Where the areas of Peat are over 10 acres in extent they are mapped separately.

The size of the sand islands and of the intervening strips of marsh and the relative proportions of a given area occupied by each are variable. On the whole, it is estimated that the marsh and the sand islands have about an equal aggregate extent. In areas where the sand islands cover less than 25 per cent of the surface the soil on the islands is undifferentiated and the area is mapped with the marsh soil. Where the islands make up more than 75 per cent of the total area the whole tract is mapped as one of the Plainfield types.

The type of Sands and Peat (undifferentiated) is mapped chiefly in the south-central part of the county, both east and west of the Yellow River. Near this river the type is made up largely of the Plainfield fine sand, Whitman fine sand, and Peat, shallow phase. In the eastern part of the area of this type the Plainfield sand, Whitman sand, and Peat, shallow phase, are the chief soils included.

The surface of this land is level except for slight undulations due to the low sand islands which rise only a few feet above the marsh. The sand islands are usually fairly well drained, while the intervening areas of marsh are naturally poorly drained. A large proportion of this class of land has been incorporated in drainage districts and is now being reclaimed by large open ditches or canals.

The native vegetation on the sand islands consists chiefly of scrub oak, jack pine, poplar, and sweet fern, while that on the marshes consists of alder, willow, poplar, and marsh grass. Many of the marshy tracts have no tree or brush growth.

Only a very small proportion of this land has been placed under cultivation. Small areas are included in some of the cranberry-growing districts. A few small fields in areas where drainage has been partly established are under cultivation, but the results have usually been unsatisfactory, owing in part at least to insufficient drainage. Marsh hay is cut from some of the open marshes, and wire grass for use in the manufacture of rugs and matting is cut in small quantities.

The construction of large, open ditches does not necessarily in itself provide adequate drainage for a soil of this character. The land bordering properly constructed ditches should be sufficiently drained, but at distances of about one-half mile or more or sometimes even less, from the outlet ditch the drainage may not be sufficient, so that the use of tile drains or additional open ditches is

necessary. When adequate drainage has been provided this land will require careful management over a period of years before profitable crops can be grown. The supply of phosphorus and potash is low in all the soils making up the type, and these elements must be supplied. The supply of nitrogen in the marsh soils is high, but in the soil of the sand islands it is low and should be increased. The plowing under of legumes and the applying of stable manure or mineral fertilizers containing phosphorus and potash will assist in building up the productiveness of the soil on the islands. The use of fertilizer containing potash and phosphorus will be necessary on the Peat soils before cultivated crops can be grown with reasonable certainty of profit.

#### SUMMARY.

Wood County is situated in the central part of Wisconsin. It includes two physiographic divisions, separated by a line extending east and west a short distance north of the Green Bay & Western Railroad. North of this line the surface is nearly level to rolling. The soils are heavy and for the most part of high agricultural value. Many localities are well improved. There are but few marshes and no lakes in this region. South of this line the country is level. The soil here is quite sandy, marshes are numerous, and the land in general has an agricultural value considerably lower than in the northern part of the county.

The Wisconsin River receives the drainage of practically all the county. An area equal to about two townships in the west-central part drains through the East Fork of the Black River into the Mississippi River.

Wood County in 1910 had a population of 30,583. Grand Rapids, the county seat, and Marshfield are the two largest cities, with populations in 1910 of about 6,500 and 5,800, respectively. The county has excellent railroad facilities, and many large cities are within easy reach.

The mean temperature for the year, as recorded at Grand Rapids, is 43.5°. The mean for the winter is 15.9°, for the spring 43.3°, for the summer 67.9°, and for the fall 46.9°. The months from April to September, inclusive, have an average rainfall of over 2.5 inches each, and May and June each have over 3 inches on the average. The average length of the growing season is 126 days.

The best land occurs in the northern half of the county, where Spencer, Gloucester, and Vesper silt loams are the predominating types of soil. The most improved farming section is in the vicinity of Marshfield. Agriculture is least developed in the southern part of the county. Sandy and marshy soils predominate there. Large

drainage projects under way are reclaiming extensive areas of marsh land.

The chief crops grown in Wood County are hay, oats, corn, rye, barley, and buckwheat. Cranberries are produced quite extensively in the southern part of the county, chiefly on Peat lands. Wood County is first in the State in the production of cranberries. General farming is the leading type of agriculture in Wood County, and dairying is the most important branch. The dairy output is chiefly in the form of cheese and butter. The number of cheese factories is increasing quite rapidly, while the number of creameries is slowly decreasing. The northern two-thirds of the county is especially well adapted to the production of hay and grasses, and dairying is most highly developed throughout this region.

Of the total area of the county, about 54.8 per cent, according to the 1910 census, consists of farm land, of which 38 per cent is improved. The average size of the farms is 105 acres. About 93 per cent of the farms are operated by owners, 6 per cent by tenants, and 1 per cent by managers. The average value of all farm land in 1910 is reported as \$32.36 an acre, showing an increase in the preceding 10 years of approximately 125 per cent. The most highly improved farms in the northern part of the county have a selling value of \$100 to \$125 or more an acre, while cut-over hardwood land sells for \$20 to \$30 an acre. Partly improved lands in the southern part of the county have a selling value of \$25 to \$50 an acre. Unimproved lands in the sand and marsh country have a selling value considerably lower than unimproved hardwood land.

Soils of seven series, exclusive of three miscellaneous types, are mapped in Wood County.

The Spencer silt loam, with a rolling phase, is a light-colored timbered upland soil. It occurs within the region of pre-Wisconsin glaciation, where the material has come largely from crystalline-rock formations and where the subsoils are compact, of impervious nature, and strongly mottled. This is the most extensive type in the county. It is a good soil for general farming and dairying, though the drainage over the typical soil is somewhat deficient.

The Vesper silt loam, with a rolling phase, consists of a heavy surface soil, of glacial or loessial origin, underlain by residual sand, sandstone or, in some instances, granitic rock, at an average depth of 18 to 24 inches. Because of its level surface the drainage of this soil is deficient and it is rather cold and backward in the spring. It makes good hay and pasture land.

The Gloucester series comprises brown soils with light-brown or yellowish-brown subsoils. They are derived by weathering from glacial drift composed mainly of crystalline-rock material. The

topography varies from gently to sharply rolling. The soils are well adapted to general farming and dairying.

The Whitman soils are dark-brown to black, low-lying poorly drained types, occurring chiefly within or bordering marshes. The soils are noncalcareous. They are used for agriculture to only a small extent.

The Plainfield soils are light-colored types of alluvial origin, derived mostly from sandstone formations. These soils occur extensively in the southern part of the county. The types mapped are the sand, fine sand, sandy loam, and fine sandy loam. The fine sandy loam is a good soil. The other types require more care in management for profitable cultivation.

The Boone fine sand and fine sandy loam are light-colored soils derived from Potsdam sandstone. The fine sandy loam ranks as a fairly good agricultural soil.

The Genesee fine sandy loam and silt loam occur in overflow situations along streams. Poor drainage is the principal factor limiting the utilization of these soils.

Peat and Muck consist of decaying vegetable matter with which there is incorporated varying amounts of fine earthy material. These soils require drainage before they can be farmed. They are deficient in potash and phosphorus, and these elements must be supplied before profitable crops can be produced over a period of years. The supply of nitrogen is abundant. These types require treatment different from the upland soils.

The type of Sands and Peat (undifferentiated) consists of marshland in which low, flat sand islands are so numerous and of such small extent that separate mapping is impracticable. All the included marshy land requires drainage and careful management to make cultivation profitable. The marshy soil is deficient in phosphorus and potash, but well supplied with nitrogen. The soil on the islands is usually low in all these elements.



[PUBLIC RESOLUTION--No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture "

*Resolved by the Senate and House of Representatives of the United States of America in Congress assembled,* That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided,* That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the Congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]



Areas surveyed in Wisconsin.

# **NRCS Accessibility Statement**

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