Soil survey : Barron County, Wisconsin. [Bulletin No. 73] 1958

SOIL SURVEY

Barron County Wisconsin

Series 1948, No. 1

Issued August 1958

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with the
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY
Soil Survey Division
and the
WISCONSIN AGRICULTURAL EXPERIMENT STATION

How to Use THE SOIL SURVEY REPORT

FARMERS who have worked with their soils for a long time know about differences among soils on their own farms and perhaps about differences among soils on the farms of their immediate neighbors. What they do not know, unless soil surveys have been made, is how nearly their soils are like those on experiment stations or on other farms, either in their State or other States, where farmers have gained experience with new or different farming practices or farm enterprises. Farmers of Barron County can avoid some of the risk and uncertainty involved in trying new crop and soil management practices by using this report, for it maps and describes the soils of their county and therefore allows them to compare soils on their farms with soils on which new developments have proved successful.

SOILS OF A PARTICULAR FARM

All the soils in Barron County are shown on the soil map accompanying this report. One inch on this map is equal to ½ mile on the land. To learn what soils are on any farm, it is first necessary to locate this farm on the map. This is easily done by using landmarks such as roads, streams, villages, dwellings, and other features to locate the boundaries.

The next step is to identify the soils. Suppose, for example, you find on your farm an area marked with symbol CB. Look among the colored rectangles in the margin of the soil map and find the one with CB printed on it; this symbol means Campia silt loam, nearly level. All areas of this soil, wherever they occur on the map, are identified by the color and symbol shown in this rectangle.

What is Campia silt loam, nearly level, like, and to what uses is it suited? This information will be found in the section on Soil Descriptions.

How much does Campia silt loam, nearly level, produce under the management it now receives, and how much will it produce if management is improved? First read the introductory part of the section, Use, Management, and Productivity of Barron County Soils, which explains the fundamentals of good management and how the soils of this county have been placed in management groups, and subgroups, all the soils needing about the same management in one subgroup. Then turn to management group 1–A, which is made up of Campia silt loam, nearly level, and other soils that require about the same management. Read about the crop rotations and management practices suggested for them. Then turn to table 8 and read in columns A the crop yields expected under present management, and in columns B the yields expected under suggested management.

SOILS OF THE COUNTY AS A WHOLE

A general idea of the soils of the county is given in the introductory part of the section, Use, Management, and Productivity of Barron County Soils, and in the section, Soil Series and Their Relation to Landscape Types. These sections tell about the principal kinds of soils, where they are found, and how they are related to one another. After reading these sections, study the soil map and notice how the different kinds of soils tend to be arranged in different parts of the county. These patterns are often associated with well-recognized differences in type of farming, land use, and land use problems.

A newcomer to the county, especially if he considers purchasing a farm, will want to know about the climate; land use; the principal farm products and how they are marketed; the kinds and conditions of farm tenure, including tenancy; availability of roads, railroads, and electric services; the industries of the county; and cities, villages, and population characteristics. Information about all these will be found in the sections, General Nature of Barron County, and Agriculture of Barron County.

Those interested in how the soils of the county were formed and how they are related to the great soil groups of the world should read the section, Genesis, Classification, and Morphology of Soils.

Series 1948, No. 1 Issued August 1958

SOIL SURVEY OF BARRON COUNTY, WISCONSIN

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Area inspected by I. J. NYGARD, Division of Soil Survey, and R. J. MUCKENHIRN, Soil Survey Division, Wisconsin Geological and Natural History Survey

United States Department of Agriculture in cooperation with the Soil Survey Division, Wisconsin Geological and Natural History Survey, and the Wisconsin Agricultural Experiment Station

CONTENTS

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ORIGINALLY settled by lumbermen, Barron County is now predominantly a dairying and livestock area. Livestock farms far outnumber all others in the county. Most of the crops harvested are consumed by livestock on the same farm. The growing season is short and limits crops that can be grown. About half of the farmland is used for pasture. Milk is almost the only farm product sold outside of the county. Most of the county is covered with gravel, sand, and clay deposited by glaciers. Over much of this a thin layer of wind-carried silt was deposited. Lakes and bogs are numerous.

To provide a basis for the best agricultural use of the land, a cooperative soil survey was made by the United States Department of Agriculture, the Soil Survey Division of the Wisconsin Geological and Natural History Survey, and the Wisconsin Agricultural Experiment Station. The survey was completed in 1947 and, unless otherwise specifically stated, information in this report refers to conditions at the time the survey was completed. A preliminary soil map, based on this survey, was prepared and distributed by the University of Wisconsin. It was designed primarily to be used until this report was published.

GENERAL NATURE OF BARRON COUNTY

Location and Extent

Barron County, in the northwestern part of Wisconsin, is a square about 30 miles on each side. It is bounded by Polk County on the west, Washburn and Burnett Counties on the north, Rusk and Chip-

pewa Counties on the east, and Dunn and Chippewa Counties on the south. The total county area of 889 square miles includes 866 square miles, or 554,240 acres, of land area. Barron, the county seat, is in the center of the county. It is 108 miles north of La Crosse, 188 miles west of Green Bay, 191 miles northwest of Madison, and 242 miles north of Milwaukee (fig. 1).

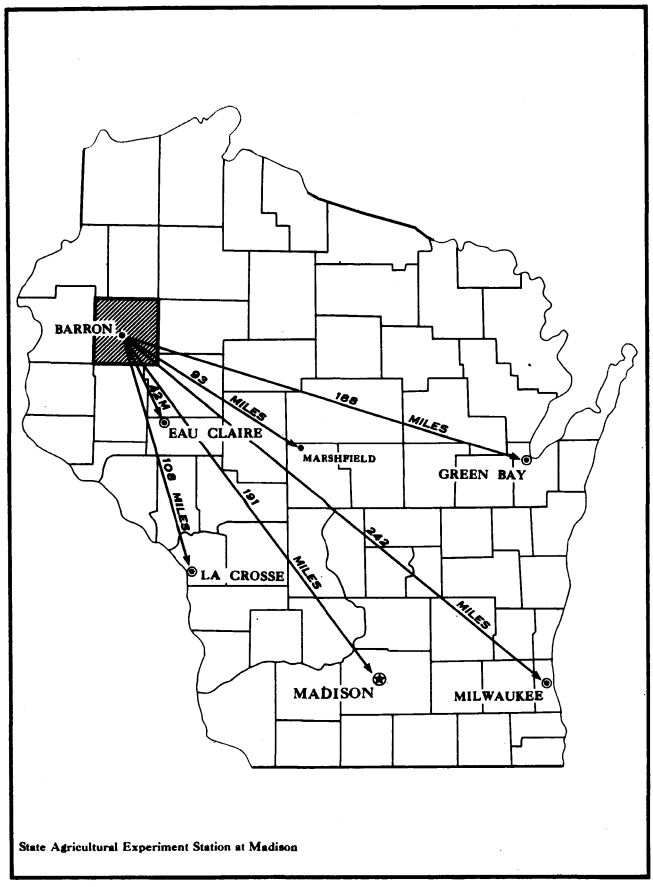

FIGURE 1.—Location of Barron County in Wisconsin.

Physiography, Relief, and Drainage

Barron County lies in the Superior Upland physiographic division of the United States.[4] It consists of a fairly level or gently sloping central plain rimmed on the southwest by dissected sandstone and dolomitic hills, on the north by moraines, and on the east by a range of quartzite ridges. The central plain is a northern extension of the geographical province of Wisconsin recognized as the "Central Plain"

[4] Fenneman, N. M. PHYSIOGRAPHY OF EASTERN UNITED STATES. 691 pp., illus. New York and London. 1938.

by physiographers. This plain slopes to the south. It was strongly dissected by streams before glaciation but is now covered by glacial drift of varying but usually great thickness.

The southwestern hills are part of the "Western Upland" of Wisconsin.[5] They are composed of Lower Magnesian (Prairie du Chien group) limestone, which here overlies the Cambrian sandstone of the Central Plain. This area, however, has been covered by glacial drift derived from igneous rocks, and only a few outcrops of limestone are left exposed. One outcrop shows along Turtle Creek, northeast of Prairie Farm.

The Northern Highland, known as the Barron Hills, lies chiefly in the towns of Sumner and Doyle in the eastern part of the county. This group of rolling quartzite hills extends northeast and southwest. It rises 300 to 600 feet above the nearby Central Plain. These hills consist of pre-Cambrian rock, covered by a relatively thin deposit of glacial till.

On the basis of the local surface relief and geologic materials, six landscape types can be distinguished in Barron County (fig. 2).

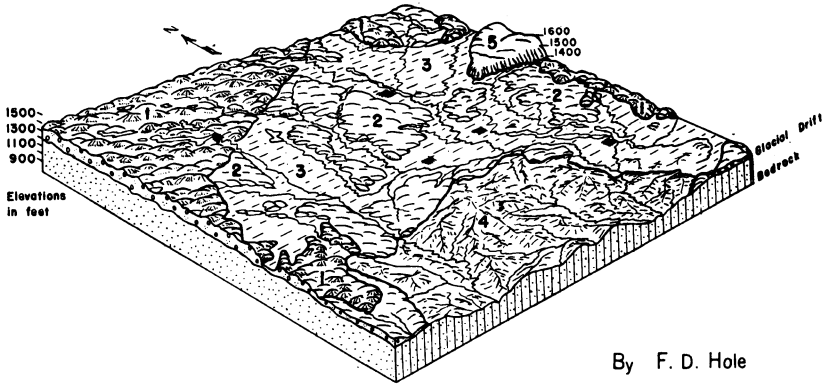

FIGURE 2.—Landscape types in Barron County, Wis.: (1) Rough upland, (2) Smooth upland, (3) Flats, (4) Hilly upland, and (5) Barron Hills.

These landscape types are as follows:

(1) The rough uplands of the northern, western, and eastern edges of Barron County.

(2) The smooth uplands or rolling till plains of the central and northern parts of the county. Recessional moraines which extend from Turtle Lake to Haugen and Angus to the Barron Hills are outstanding on the till plain.

(3) The broad flats or outwash plains extending from near New Auburn, just outside the county, through Cameron, Barron, Rice Lake, and Brill to the northern county line.

(4) The hilly uplands of sandstone and siltstone in the south.

(5) The rugged quartzite Barron Hills of the northeast, with their bold talus slopes.

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[5] Durand, Loyal, Jr. PHYSIOGRAPHIC DIAGRAM OF WISCONSIN. *In* Barron County Agriculture, County Agr. Sta. Ser. Wis. Crop and Livestock Reporting Serv. 56 pp., illus. Madison, Wis.

(6) Alluvial and colluvial soils. These are narrow deposits of material washed from nearby uplands. This landscape type is not shown in figure 2 because the individual areas are too small and scattered.

Much of Barron County has been covered by a thin deposit of loess, or wind-carried soil material. The soils have developed from thin loess and glacial drift, except where the drift is very thin in the southernmost part of the county. Here, such soils as the Boone and Hixton have formed on bedrock of sandstone, siltstone, and shale.

Elevations [6] range from 1,015 feet where the Red Cedar River leaves the county to 1,640 feet in the highest part of the Barron Hills. Other elevations are: Barron, the county seat, 1,122 feet; Cumberland, 1,251 feet; Prairie Farm, 1,065 feet; and Chetek, 1,050 feet.

The general drainage pattern is dendritic and is interrupted by many lakes and bogs. This pattern is rather indefinite in the northwestern part of the county because of the young, morainic type of relief. The larger lakes are Red Cedar, Beaver Dam, Chetek, Prairie, Rice, Bear, and Pokegama. The principal streams of the area are the Hay River and the Red Cedar River with its tributaries, the Yellow and Chetek Rivers. The Hay and Red Cedar Rivers join in Dunn County.

Geology

BEDROCK: Under almost all of Barron County are Cambrian sediments which overlie an ancient peneplain formed on granitic bedrock. These sedimentary rocks have been grouped into three formations. The Trempealeau lies above the Franconia, and the Dresbach is the lowest.[7] The formations consist of beds, or strata, of sandstones, siltstones, and shales, which vary considerably in thickness and other characteristics. Most of these rocks are soft, but some layers are more resistant. The sediments range in color from white through red and yellow-brown to green. Glauconite, or "green sand," is found chiefly in the Franconia formations, especially near the village of Prairie Farm.

The pre-Cambrian bedrock reaches the surface in the northeastern part of the county as the Keweenawan (Huronian) quartzite of the Barron Hills. The quartzite generally is very resistant to weathering but varies markedly both in hardness and color. In the extreme southwestern corner a small amount of Lower Magnesian dolomite (Prairie du Chien group) forms the bedrock.

GLACIAL DEPOSITS: Some geologists believe that the continental glaciers invaded this area three different times. The surface of nearly all of the county is covered by glacial drift (fig. 3). These deposits vary in thickness from more than 150 feet in the northwestern part of the county to 1 foot or less in the extreme south. Two striking landscape features probably caused by glacial activity are the extensive outwash plains and the prominent recessional moraine, which circles the county on the west, northwest, north, and east.

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[6] MARTIN, LAWRENCE. THE PHYSICAL GEOGRAPHY OF WISCONSIN. Wis. Geol. and Nat. Hist. Sur. Bul. 37. Ed. 2, 608 pp., illus. 1932.

[7] THWAITES, F. T. BURIED PRE-CAMBRIAN OF WISCONSIN. Geol. Soc. Am. Bul. 42: 714–750, illus. 1931.

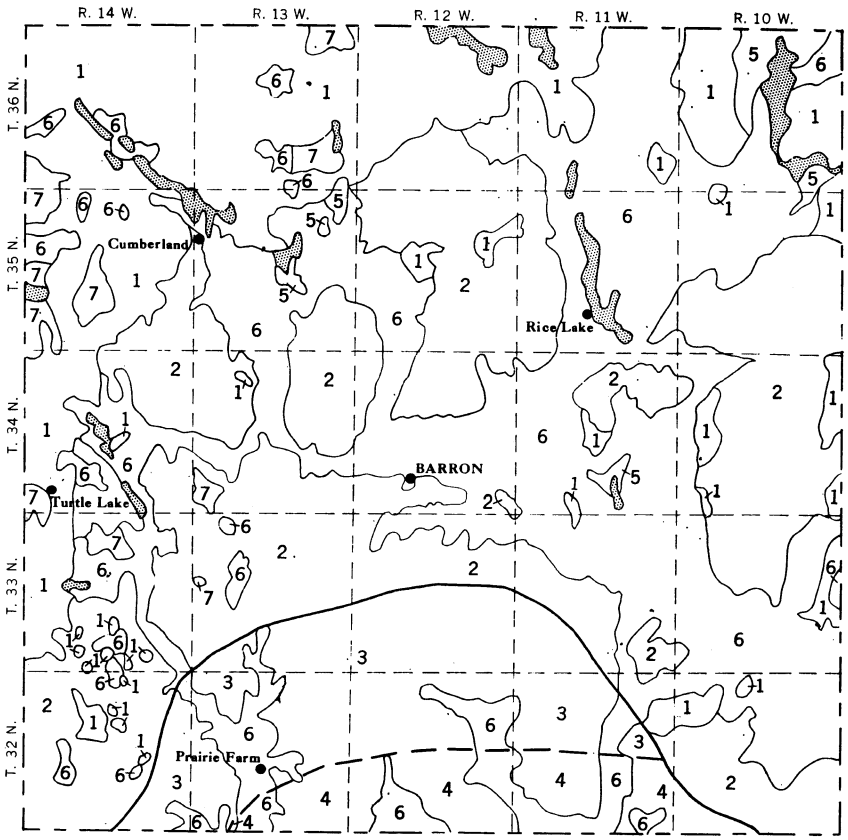

FIGURE 3.—Distribution of soil parent materials in Barron County, Wis.: (1) Deep till, rough moraine; (2) Shallow till, silt cap, smooth moraine; (3) Silt cap, very thin till; (4) Silt cap, scattered glacial boulders; (5) Pitted outwash; (6) Silt cap, smooth outwash; and (7) Glacial lakebeds. The heavy solid line shows the southern limit of Middle Wisconsin (Cary) glaciation, and the broken line shows the southern limit of Early Wisconsin (Iowan) glaciation.

The very thin glacial till in southern and southwestern Barron County is considered by Mathiesen [8] to be older than the thicker till to the north. Either this was a thin deposit, or postglacial erosion has removed practically all of it.[9] The thin drift consists mainly of scattered glacial boulders. It has little influence on soil characteristics. The relief is that of an eroded sandstone area characterized by steep hills and narrow valleys.

In the towns of Prairie Farm, Arland, Dovre, Maple Grove, and Prairie Lake the till is thicker and is considered to be Early Wisconsin or Iowan in age. No prominent moraines occur in this area, and relief is determined by the conformation of the bedrock.[10] The soils

[8] MATHIESEN, JOHN T. THE PLEISTOCENE OF PART OF NORTHWESTERN WISCONSIN. Trans. Wis. Acad. of Sci., Arts, and Letters, 32: 251–272, illus. 1940.
[9] THWAITES, F. T. Personal communications and joint inspection of the area.
[10] See footnote 8.

are influenced by the till, but many small areas of soil on steeper slopes have developed from the bedrock material.

The northern two-thirds of the county is covered by glacial till 3 feet or more in depth. This deposit was laid down by two lobes of the Wisconsin (Cary) ice sheet (fig. 3), which left a rough recessional moraine and, south of that, a smooth ground moraine. This ground moraine is almost free of kettle holes and marshes and has fewer stones than the till north of it. It is thought that the Cary ice retreated so quickly from the area south of the recessional moraine that the ice left no terminal moraine and only a moderately thick deposit of till.

The large recessional moraine is composed of stony drift, which has many steep slopes and numerous kettles and kames. Many lakes, ponds, and marshes occur in this area of deep glacial till.

Both pitted and unpitted outwash plains are in this county. The smooth unpitted outwash consists of level plains of sand and gravel which were deposited by glacial melt waters. The pitted outwash plains contain many kettles, or holes, formed when buried ice blocks melted. Many of these kettles now contain marshes or ponds. The pits are most numerous near the Cary recessional moraine; the deepest pits are near Red Cedar Lake and Beaver Dam Lake. Both horizontal bedding and crossbedding of the strata are found in the outwash plains.

OTHER EFFECTS OF GLACIATION: Several old glacial stream channels cross the county. Some of these have more than one terrace level. The higher terraces, considered to be older, are covered by deeper silt deposits. The younger, lower terraces were probably formed as the ice retreated across the northern boundary of the county.

A loess deposit, ranging from a few inches to several feet in thickness and resting on sandstone, siltstone, quartzite, glacial till, and outwash, covers many areas. This deposit was probably laid down during and shortly after the period when the ice stood at the prominent recessional moraine. In general, the silt is thickest in the southwestern part of the county and gradually thins to the north.

The time of silt (loess) deposition is indicated by the river terraces. The silt mantle is about as thick on the highest river terraces as on the uplands. It is thinner on the medium terraces and absent on the low terraces. This indicates the silt was blown onto this area after the deposition of the till and the formation of the outwash plains and higher river terraces, and for a short time after the formation of the intermediate terraces. No silt is on the lowest, or youngest, terraces.

Several glacial lakebeds show deep deposits of stratified silts and clays. These silts and clays are calcareous at depths of 7 to 9 feet. The surface horizons of the soils developed from these deposits are similar to those of soils developed on deep silt over outwash. Other soils have formed on old beach deposits at the edges of the glacial lakebeds (fig. 4).

Differences among the soils of Barron County do not seem to depend on differences in age of glacial deposits. More influence seems to be exerted by local variations in thickness of the silt deposits, in thickness and composition of the glacial drift, and in the type of bedrock beneath.

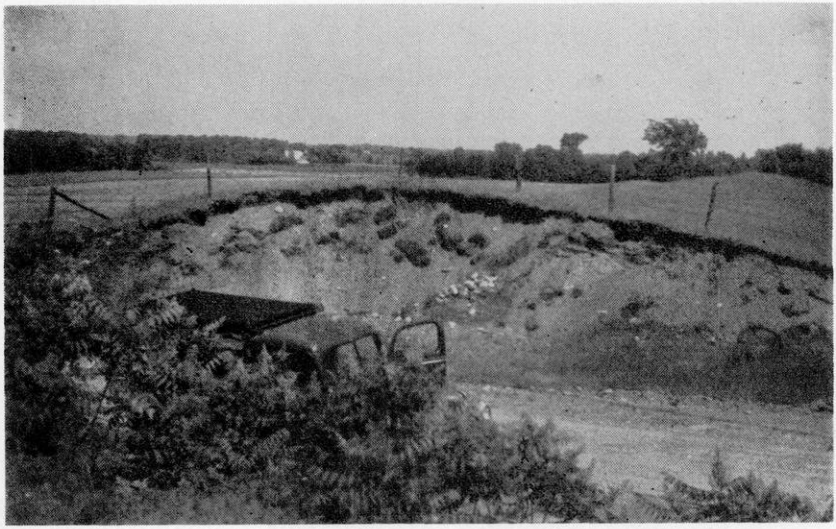

FIGURE 4.—Sandy ridge, probably a beach deposit, bordering an old glacial lake plain now occupied by Campia silt loam. Area shown is northeast of Vermillion Lake.

Climate

The climate is characterized by wide extremes in temperature between winter and summer. Extreme cold for periods of 2 to 3 days alternate with warmer days during midwinter. The average winter temperature, as recorded at the Cumberland station, is 13.5° F. The lowest recorded temperature was 52° below zero, and the highest 107°. Table 1 shows the longtime average monthly, seasonal, and annual temperatures and precipitation. The average number of days without a killing frost ranges from 110 to 120 in the southeastern half of the county to 130 to 140 in the northwestern corner.[11] The average date of the last killing frost in spring is May 11, and of the first in fall, September 24. June 4 is the latest date on which a killing frost has been recorded in spring, and August 28, the earliest in fall.

Probably the longer frost-free season in the northwestern part of the county is due to the better air drainage on higher ground. The length of the frost-free season varies considerably from year to year; it ranges from 70 to 171 days at Barron. The average season is too short to mature open-pollinated varieties of corn for grain; therefore, most of the corn is grown for silage. Since the introduction of earlier maturing hybrid corn, corn production for grain has increased. Small grains and hay crops are well adapted to the climate of the area because they tolerate lower temperatures and light frosts. The average growing season for such crops may be as much as 160 days.

Precipitation is quite evenly distributed throughout the county, mostly in the form of slow rains. June is the wettest month, with

[11] UNITED STATES DEPARTMENT OF AGRICULTURE. CLIMATE AND MAN. U. S. Dept. Agr. Yearbook of Agriculture 1941. 1248 pp., illus.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Cumberland, Barron County, Wis.*

[Elevation, 1,240 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1932)	Wettest year (1941)	Average snowfall
	° *F.*	° *F.*	° *F.*	*Inches*	*Inches*	*Inches*	*Inches*
December	17.0	61	−36	1.02	0.67	0.99	9.4
January	11.4	54	−43	1.04	1.46	1.33	9.8
February	12.0	53	−52	.85	1.40	1.10	10.8
Winter	13.5	61	−52	2.91	3.53	3.42	30.0
March	24.6	77	−22	1.66	1.01	1.45	10.3
April	41.4	87	−1	2.33	1.35	2.40	2.5
May	56.5	104	23	3.87	1.84	4.05	0
Spring	40.8	104	−22	7.86	4.20	7.90	12.8
June	64.2	96	31	4.38	2.34	4.49	0
July	70.9	107	36	3.45	4.19	3.51	0
August	67.4	99	30	4.21	2.37	10.43	0
Summer	67.5	107	30	12.04	8.90	18.43	0
September	59.1	92	19	3.87	1.18	7.74	0
October	46.0	80	8	2.17	1.26	4.63	1.6
November	29.7	74	−11	1.64	1.98	1.31	4.6
Fall	44.9	92	−11	7.68	4.42	13.68	6.2
Year	41.7	107	−52	30.49	21.05	43.43	49.0

[1] Average temperature based on a 23-year record, 1931 to 1953.
[2] Average precipitation based on a 23-year record, 1931 to 1953.

an average of 4.38 inches. Winter precipitation comes in the form of snow. The average total snowfall is about 49 inches.

During the summer months thunderstorms occur. Occasionally they are violent and accompanied by damaging hail and high winds. Tornadoes are infrequent. The average amount of sunshine is somewhat more than 50 percent of the possible amount for the year.

Vegetation

This county was originally heavily wooded with mixed coniferous and deciduous forest. Oak, hickory, maple, and basswood grew on the heavier soils, and pine and hemlock on the lighter soils. There were small scattered areas of open grassland in parts of the county. A few peat bogs supported mixed hardwoods, but most of them were covered with spruce and tamarack trees and willow and alder shrubs or with dwarf heath shrubs and scattered trees.

At present, the largest tracts of woodland are in the northwestern part and along the eastern side of the county, especially in the Barron Hills.

Organization and Population

The French fur trader, Augustine Cadotte, is credited with being the first white man to establish residence in the area now called Barron County. The first Americans to settle were lumbermen operating out of Menominie in Dunn County. In 1848, Knapp, Stout, and Company started a sawmill near Prairie Farm. Permanent settlement was begun soon after 1856, when farmers took up land north of Prairie Farm village. Later the oak openings (areas covered with tall grasses and scattered oak trees) in Dallas Town were cleared. General farming, mostly on a subsistence basis, developed with the clearing of the land. Farming was still incidental to lumbering at the close of the 19th century.

A change in emphasis from forestry to farming took place from about 1900 to 1920. Potatoes, wheat, rye, and buckwheat were the principal sources of income. The climate favored pasture and hay crops, and by 1920 dairying was one of the important farm enterprises. Since 1920 there has been an increase in dairy cattle. In 1949 dairy products sold by Barron County farmers accounted for nearly 70 percent of their total farm income.

The population of Barron County in 1950 was 34,703, or 40.1 persons per square mile. Forty-seven percent of the population was rural and reported farming as the major source of income.

Barron County is divided into 25 minor civil divisions, or towns. These include 10 incorporated cities and villages. Rice Lake, the largest city, has a population of 6,898. Other incorporated places are Barron, 2,355; Cumberland, 1,872; Chetek, 1,585; Cameron, 963; Almena, 406; Turtle Lake, 696; Dallas, 370; Prairie Farm, 343; and Haugen, 246.

Industries Related to Agriculture

A survey by the county agricultural agent shows that within Barron County there are 8 creameries, 11 cheese factories, 9 vegetable packing and processing plants, 8 woodworking mills, 2 meat-packing plants, 1 woolen mill, and 6 machine shops.

The marketing facilities provided by the creameries and cheese factories have encouraged a shift from general farming to a highly specialized type of dairy farming. Milk is by far the major source of farm income.

Hunting and fishing, the principal outdoor sports, attract considerable tourist trade to the county.

Transportation and Markets

Barron County is served by two railroads. The Chicago, St. Paul, Minneapolis, and Omaha Railroad connects Barron County with Duluth, Madison, Minneapolis, and Chicago; and the Minneapolis, St. Paul, and Sault Ste. Marie Railroad connects Barron County with St. Paul and Minneapolis. Scheduled airline transportation is not available, but several small municipal or private airports furnish

some passenger service. Bus transportation is available from most of the county to the nearby cities.

United States Highways Nos. 8, 53, and 63 and State Highways 48 and 25 carry most of the through auto traffic and are routes for truck transportation. The Federal and State highways and many of the county roads are surfaced with asphalt. The roads are kept open throughout most of the winter. Some snowplowing is done by milk trucks as they travel their regular routes to pick up milk.

Milk collection service is available to all parts of Barron County. Most of the milk brought to Rice Lake, Turtle Lake, Cameron, or Barron is processed before shipment to other markets. The principal agricultural markets are Minneapolis, Chicago, and Duluth. Few products other than milk are sold outside the county.

AGRICULTURE OF BARRON COUNTY

Types of Farming and Land Use

The climate of Barron County is more favorable for hay and pasture than for grain crops. This encourages dairying and has brought about a substantial reduction in cash grain crops and a great increase in hay and feed crops. Corn for silage is very important. Legume hay, such as clover or alfalfa, occupies the largest acreage. The acreage of oats, a good nurse crop for hay, has also increased.

Dairy farms are located throughout the county, but the poultry and truck farms are located primarily near Rice Lake and other resort areas.

In 1950 there were only 484 miscellaneous and unclassified farms in the county. The rest were grouped by major source of income as follows:

Type of farm:	*Number*
Dairy	3,180
Poultry	31
Livestock other than dairy and poultry	155
Vegetable	25
Fruit and nut	5
Field crop other than vegetable and fruit and nut	36
General	70

Since 1930 the number of farms has declined and the available farmland has increased. The average size of farms has increased from 102.3 acres in 1930 to 124.1 acres in 1950. The 70- to 99-acre farm is the most common. The number of farms in each town varies considerably. In general, the towns along the northern county boundary have the fewest farms. Maple Grove, Cumberland, and Clinton Towns report more than 200 each, but Cedar Lake and Maple Plain Towns to the north have less than 100 each.

Of the total land area in Barron County, 89.3 percent was in farms in 1950. The percentage of improved land per unit area is highest south of a line connecting Turtle Lake, Cumberland, Haugen, Campia, Canton, and the county line near Tabor Lake.

Cropland made up 49.8 percent of the farmland in 1949, according to census reports. This cropland consisted of the following: 40.3 percent, cropland harvested; 8.1 percent, cropland pastured; and 1.4 percent, cropland idle. Pastured woods covered 23.7 percent of the

county farmland. Another 5.2 percent was wooded but not pastured. A total of 47.4 percent of all farmland was used for pasture in 1949. This consisted of the 8.1 percent that was cropland pastured, the 23.7 percent that was wooded farmland pastured, and another 15.6 percent in pasture that was neither woodland nor cropland. Land in roads, house lots, wasteland, and other nonagricultural uses accounted for 5.7 percent of the farmland.

Most of the land not in farms is county-owned and is used for forestry. In 1948 Barron County passed a zoning law restricting the use of 6,959 acres to forestry. This law is administered by a county commission, which has the power to change the boundaries of zoned land.

Farm Tenure

In 1950, 87.7 percent of the farms were operated by owners, 12.2 percent by tenants, and 0.1 percent by managers. In 1950 there was a total of 494,663 acres in the farms of Barron County. Of this acreage 97,168 acres, representing 19.6 percent of the farmland, was land rented from others by farm operators.

A common system of farm tenure is sharecropping. The owner furnishes the land and farm buildings, half the feed, seed, and fertilizer, and half the livestock. The operator furnishes the other half, plus labor. Usually, in this type of agreement, rent is charged for the living quarters. There are several variations of the above-described agreement, depending on the desirability of the farm and upon the ability of the operator. Many farms are rented for cash.

Farm Power and Mechanical Equipment

Horses are no longer a major source of farm power. The number declined from 14,220 in 1920 to 4,250 in 1950. Except on the smaller farms, horses are used only for the lighter work and odd jobs. Mechanization has been rapid, especially during the war. In 1950, 2,946 farms reported having 3,537 tractors, and 1,182 farms reported having 1,285 motortrucks. Nearly every farm either has a hay loader and other power equipment for making hay or has access to such equipment (fig. 5). The use of corn binders and ensilage cutters is common in the preparation of corn for silage. The use of combines for harvesting of small grains is becoming quite common. On some farms automatic balers and hay choppers are used.

Farm and Home Improvements and Social Facilities

Schools were organized early in the history of Barron County. Education through high school is provided. School bus service is available for most rural high schools. The churches and schools are centers of recreational and social activities. There are four small hospitals within the county.

In general, the farms and farm buildings are well maintained. Since Barron County is primarily a dairy county, almost every farm has a large barn and one or two silos. The rather long and often extreme winters make necessary a large storage space for feed and good buildings for protection of the animals (fig. 6).

FIGURE 5.—Hay baler on Antigo silt loam, nearly level, just north of Vermillion Lake.

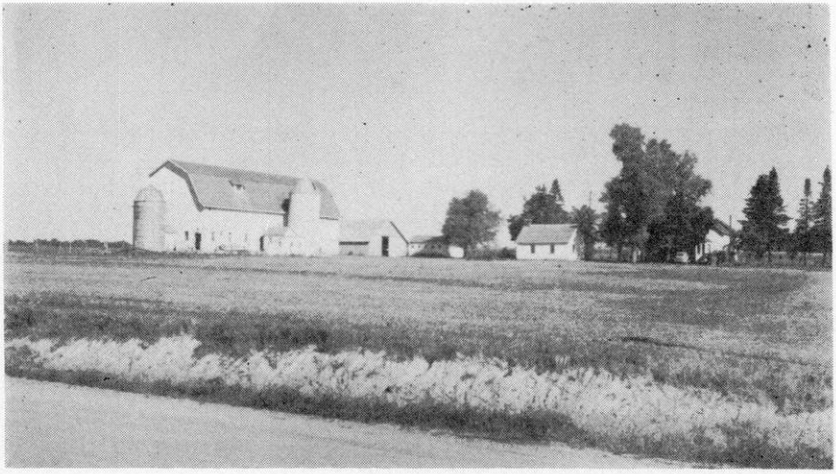

FIGURE 6.—Well-kept farmstead on Otterholt, Spencer, and Almena soils in the central part of Barron County.

According to the 1950 census, 2,322 farms reported having telephones and 3,682 reported having electricity. There were 946 farms that reported being located on hard-surfaced roads; 1,666 on gravel, shell, or shale roads; and 1,335 on dirt or unimproved roads.

Crops

Only about one-eighth of the harvest in Barron County was sold in 1949. Farmers have found it more profitable to feed their crops

to livestock and to market the livestock and livestock products. These feed crops, along with the pasture that occupies about half of the farmland of the county, provide the basis for the important dairy and livestock industry.

Table 2 gives the acreage of the principal crops in Barron County for stated years. Table 3 shows how many bearing trees and grapevines were in the county during the census years.

TABLE 2.—*Acreage of principal crops in Barron County, Wis., in stated years*

Crop	1929	1939	1949
	Acres	*Acres*	*Acres*
Corn:			
For grain	2, 030	7, 439	16, 525
For silage	22, 405	27, 905	29, 619
Small grains threshed or combined:			
Small grains grown and threshed mixed	7, 534	2, 362	2, 410
Wheat	397	1, 362	378
Oats	44, 103	42, 760	52, 635
Barley	13, 973	3, 822	385
Rye	680	3, 340	486
Buckwheat	517	492	199
Hay, total	84, 477	97, 671	89, 940
Alfalfa	4, 530	10, 339	7, 893
Clover and timothy alone or mixed	74, 783	68, 907	71, 037
Small grains cut green	643	3, 624	2, 965
Annual legumes cut for hay	84	847	688
Wild hay	2, 131	2, 084	1, 992
Other hay	2, 306	11, 870	5, 365
Potatoes for home use or for sale	9, 039	3, 555	877
Other vegetables for sale	5, 003	1, 733	2, 938

TABLE 3.—*Fruit trees and grapevines of bearing age in Barron County, Wis., in stated years*

Fruit	1930	1940	1950
	Number	*Number*	*Number*
Apple trees	13, 815	4, 754	8, 310
Plum and prune trees	4, 317	2, 797	2, 324
Cherry trees	222	65	264
Pear trees	22	38	12
Grapevines	281	321	399

Corn.—Corn ranks third in acreage in Barron County and is important as a winter feed for cattle. Before 1919, much of the corn was harvested as fodder or stover, but silos are now generally used. During the 1949 season, 34.5 percent of the corn grown was harvested for grain and 61.8 percent was used for silage. The remaining 3.7 percent was hogged or grazed or cut for fodder.

Practically all of the corn is fed on the farm as grain or silage. With the more extensive use of early maturing hybrids, a larger percentage can be used for grain. At present, most of the corn for grain

is produced in the southern part of the county where the steeper relief allows better air drainage and less frost hazard. The soil is usually plowed in the spring and prepared for seeding between May 10 and May 30. The crop is cultivated from two to four times a season to control weeds and to maintain a good surface mulch. Corn for grain is harvested in October or November. Silage is made when the corn grain begins to dent, or as soon as possible after the first frost.

Oats.—Oats are grown throughout Barron County and are used as a nurse crop for hay plantings. They occupy the second largest acreage in the county. Most of the oats are ground and mixed with protein concentrates for stock feed. The straw is baled and used as bedding for animals. Some oats are cut green as a supplementary hay crop.

Fields to be planted to oats are usually fall plowed and left rough during the winter. The soil is disked and smoothed in the spring and seeded between April 15 and May 15. Most oats are seeded with a grain drill, but they may be broadcast and covered by harrowing. Fertilizer is usually applied to increase yields and to insure a better catch of clover or alfalfa. When ripe, most oats are harvested with a binder, then shocked and threshed.

Clover and timothy hay.—Mixed clover and timothy for hay is the most commonly grown crop in Barron County. It is seeded with oats or some other nurse crop between April 15 and May 10. Phosphate and potash fertilizers and lime show good results on nearly all soils.

Alfalfa.—The alfalfa acreage is not large, but the crop is important because it has a high feed value and because it improves the tilth and increases the organic-matter content of the soils. Generally all of the hay is used on the farm.

Alfalfa requires a fertile well-drained soil and is especially demanding in its need for lime, potassium, and phosphorus.

Improved liming and fertilization, coupled with effective layout of drainage-type terraces or shallow surface drains, is making more moderately well drained or even imperfectly drained land suitable for alfalfa. It is usually seeded between April 15 and May 10 in mixture with bromegrass or with clover and timothy. The nurse crop is oats or some other small grain. Two cuttings are made each season.

Potatoes.—Early in the history of Barron County, potatoes were a major source of cash income as well as an important home food. Average yields for the county reached a high of 160 bushels per acre in 1924 and then decreased steadily to a low of 62 bushels in 1942. This decrease was probably due to lowered soil fertility and higher incidence of diseases and insects. Commercial growers of potatoes now use certified seed stock, spray regularly, and apply large amounts of fertilizers. Some provide supplemental irrigation for their fields. These growers are obtaining 450 to 500 bushels per acre of high-quality potatoes. The average yield for the county is now about 300 bushels per acre. The better soils for potatoes are members of the Antigo, Campia, Otterholt, Santiago, and Onamia series.

Potato fields are usually spring plowed, and most growers plan to have a legume sod or a heavy application of manure to turn under. The seed is planted between April 15 and June 15, and the crop is harvested late in August or in September, depending on the time of seed-

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ing and the weather. Most of the potatoes are graded and sent to market at harvesttime, but some are stored by the local growers for later markets.

Peas.—The pea crop of Barron County occupies a very minor acreage, but on some farms it is an important cash crop. The acreage and yield of peas have varied considerably, depending upon the weather and diseases. Most of the pea acreage is grown under contract. The various canning factories guarantee a price, furnish the seed, fertilizer, and harvesting machinery on credit, and hull the peas. Fall plowing for peas is a common practice, and a firm, deep seedbed is prepared early the following spring. Peas are not cultivated during the growing season. Since peas are harvested early, it is often advisable to plant a cover crop afterward to prevent erosion.

Minor crops.—Wheat, rye, barley, and buckwheat were rather important in the early history of Barron County. They were used as feed and cash crops. As a result of the growing emphasis on dairying, only a few hundred acres are now planted yearly.

Soybeans have been increasing steadily in acreage and may become important as a catch crop for feed when there is a failure of clover or alfalfa. Soybeans and corn have very similar requirements of soil preparation and fertilizer.

Only 10 acres of tobacco was grown in 1949. Most farms produce some vegetables and fresh fruits for home consumption, but very little of these crops is marketed. Green beans were produced on 434 acres in 1950. If well fertilized and carefully managed, they are a very profitable crop. The beans are produced under contract for the various canning companies located within the area.

The only cranberry marsh is located near Rice Lake. About 20 acres is under cultivation, and yields of 1,500 quarts per acre were obtained in 1949. Some maple sirup is produced, especially on the northern edge of the Barron Hills section.

A very small acreage of rutabagas is grown as a cash and feed crop. Rutabagas can be produced successfully on Onamia loam, Otterholt, Antigo, and Campia soils. They do well on a well-drained soil if the summer is relatively cool. In the early history of the area most of the rutabagas were produced on the Chetek and Omega soils near Chetek. As the fertility of these soils has declined, the better soils have been used.

Permanent Pastures

Many permanent pastures are located on soils which are wet, stony, steep or a combination of these conditions. Nearly all areas of the Barronett, Warman, Adolph, and Peat and muck soils are in pasture, and also a large part of the Auburndale soil and the stony types of the Almena, Freer, Milaca, and Santiago soils. In 1949, 194,622 acres was in permanent pasture, of which 117,419 acres was woodland pastured. Another 40,066 acres of cropland was used for pasture in that year. The largest areas of permanent pasture are on the Milaca, Cloquet, and Peat soils and on the Arland and Hixton soils (fig. 7).

Since permanent pastures are usually on the poorer soils, the quality of the grass produced may be low. Herbage quality and yield for

FIGURE 7.—Permanent pasture on Milaca, Cloquet, and Peat soils in northwestern Barron County. These soils produce good yields of pasture if properly managed.

these pastures can be improved by adding lime and fertilizers. Overgrazing, which often causes severe erosion on the steeper areas, should be prevented. The total acreage of permanent pastures is being gradually reduced as the demand for cropland becomes greater. With better farming methods and increases in the livestock population, the acreage in grain, hay, and rotation pasture has increased.

The importance of improving permanent pastures cannot be overemphasized. Most permanent pastures in Barron County are on acid soils low in available lime and poorly supplied with phosphorus and potash. Without treatment, they produce some grass and a little profit. But if profitable yields of good-quality grass are to be obtained from permanent pastures, it is necessary to supply lime, phosphorus, and potassium and to follow good plans of management.

Livestock and Livestock Products

Barron County is primarily a dairy area. It ranked sixth among the Wisconsin counties in value of dairy products sold in 1949. At the time of the survey the density of cattle population was greatest on the better soils, such as members of the Antigo, Otterholt, and Santiago series. The Holstein is the most popular breed of cattle, and the Guernsey, Jersey, and Brown Swiss are also well represented. Most feed other than concentrates is grown on the farm. Nearly all the milk is sold as whole milk, but on some farms the cream is separated and sold either as butterfat or butter (table 4). A minor source of income for the dairy farmer is the sale of calves and breeding stock.

Sheep are raised by a few farmers, mostly in such rougher parts of the county as the Milaca-Cloquet-Peat areas or the areas of Arland, Boone, and Hixton soils.

Poultry production is just about enough to supply the needs of the county for eggs and dressed poultry. The numbers of livestock on farms in Barron County for stated years are given in table 5.

TABLE 4.—*Livestock products produced or sold in Barron County, Wis., in stated years*

Product	1929	1939	1949
Milk produced—gallons	31, 502, 532	32, 491, 901	(1)
Whole milk sold—gallons	24, 451, 791	29, 199, 015	41, 816, 923
Cream sold—pounds of butterfat	1, 632, 229	531, 158	22, 663
Butter sold—pounds	3, 396	7, 959	(1)
Chickens raised—number	345, 237	217, 064	(1)
Chickens sold—number	146, 467	73, 201	81, 811
Eggs produced—dozens	1, 581, 750	1, 225, 549	(1)
Eggs sold—dozens	1, 080, 241	(1)	931, 362
Sheep and lambs shorn—number	8, 293	5, 919	1, 504
Wool shorn—pounds	59, 138	42, 243	11, 620
Honey produced—pounds	111, 314	35, 148	26, 907

[1] Not reported.

TABLE 5.—*Livestock and beehives on farms in Barron County, Wis., in stated years*

Livestock	1930	1940	1950
	Number	*Number*	*Number*
Cattle [1]	71, 111	79, 090	77, 956
Milk cows	43, 900	48, 416	49, 682
Horses	[1] 12, 231	[1] 10, 192	4, 250
Mules	144	[1] 70	63
Swine	[1] 4, 634	[2] 8, 848	[2] 5, 159
Sheep [3]	9, 318	7, 359	1, 682
Goats	25	[2] 74	(4)
Chickens	[1] 219, 453	[2] 163, 440	[2] 135, 322
Other poultry	(4)	[2] 2, 249	1, 115
Beehives	1, 623	778	785

[1] More than 3 months old on April 1.
[2] More than 4 months old on April 1.
[3] More than 6 months old on April 1.
[4] Not reported.

FORESTS

Most of the forests of Barron County are privately owned, and a large percentage of the timberland is in farm woodlots. In 1949, 143,075 acres, or 28.9 percent of the total land area of the county, was in woodland. Only 25,656 acres of the woodland was not pastured. Despite the exploitative logging of the earlier years, about 70 percent of the acreage is considered to have merchantable timber. There are very few virgin stands of timber within the county, but in many places the second-growth trees are nearly large enough for harvesting.

At the time of this survey, upland hardwoods, mostly hard maple and basswood, covered 54,777 acres; oak and hickory covered 36,866

acres; and there was 1,566 acres of scrub oak. The coniferous woodlands were chiefly white pine, 12,027 acres; Norway pine, 393 acres; and jack pine, 2,396 acres (fig. 8). In 1938 only 11,085 acres, or 2 percent of the total area of the county, was in wooded swamp containing principally black ash, elm, tamarack, and whitecedar. The remaining 23,965 acres, unaccounted for by the above figures, was probably in young aspen and birch.

FIGURE 8.—Norway and jack pines on Chetek sandy loam south of Cameron along the Red Cedar River.

The larger forests are located north of the recessional moraine and in the Barron Hills section. These forests are found most extensively on Cloquet, Milaca, and Peat and muck soils and on stony Santiago soils. Many cutover areas are covered with aspen and scrub oak. Mature forests of this section are predominantly sugar maple, except on the Peat soils, which have a swamp-forest type of vegetation—spruce, tamarack, and alder. In the southern part of the county the principal forests are made up of mixed oak and pine. These forests are located primarily on shallow areas of Chetek, Omega, and Boone soils. The forests located on the steeper areas of the Arland and Hixton soils are made up primarily of sugar maple with some oak.

Since the enactment of the rural zoning ordinance and the Wisconsin Forest Crop Law, in 1929, and the Barron County zoning ordinance in 1941, Barron County has set aside 6,959 acres of woodland as a county forest. Most of this land was tax-delinquent land and wasteland. These forests are being replanted with desirable species and protected from fires and grazing. Some of the bottom land, which is sometimes flooded, supports elm, ash, cottonwood, elder, and willow trees. Such areas are useful primarily for wildlife and as a means of controlling streambank erosion.

PURPOSE AND METHODS OF THE SOIL SURVEY OF BARRON COUNTY

The main purpose of this soil survey is to provide accurate and useful soils information for farmers, prospective land buyers, land use planners, land appraisers, and others interested in land values and soil problems.

Agriculture in Barron County is changing. New practices are being tried each year by many farmers. This survey is designed to provide information about the soils which may prevent expensive and time-wasting mistakes in applying new methods. To illustrate, two experimental farms in Barron County are operated by the University of Wisconsin and Barron County cooperatively, to develop and test new methods of farming. These stations can test methods on only a few representative fields, not on all the fields of the county. But, with adequate soil surveys, the results of experiments can be applied to other fields. A soil survey shows which fields of the county have soils like those on which the studies were made and the new practices were tried.

The soil scientists who worked on this survey made detailed studies of the soils and the landscapes in Barron County. They examined the soil in exposed road cuts and excavations and dug sampling holes with a spade or a soil auger.

Such examinations show that most soils consist of several distinct layers, or horizons, which taken together are called the soil profile. The color, structure, consistence, texture, thickness, and stone or gravel content are noted for each horizon and for the material beneath.

Texture, or the proportion of sand, silt, and clay, is determined by feeling the sample, and is later checked by mechanical analysis in the laboratory. The reaction (pH, or degree of acidity) and the presence or absence of lime are determined by chemical tests in the field. Any evidence of poor drainage or of loss of the soil by erosion is also noted. These characteristics and others provide a basis for classifying the soils.

The soil type and the soil phase are the basic units of mapping in soil surveys. Land use and soil management recommendations can be more exact for these units than for broader groups that vary a great deal in the characteristics that affect plant growth. Soils which are much alike in their external and internal characteristics are mapped as one soil type. Some soil types are separated into two or more phases. The separations are based on differences in slope, stone or gravel content, degree of erosion, depth to the bedrock or gravel, or other factors that affect suitability for farming.

A soil series is a group of soil types having profiles similar in all respects except texture of the surface layer. A soil series is usually named after a place near which it was first described. For example, Almena is the name of a soil series that has developed in a deep, moderately porous, but imperfectly drained deposit of silt over glacial till. It was first mapped in Barron County. Two types of the Almena series are mapped—Almena silt loam and Almena stony silt loam. They differ in the amount of stones in the soil profile. Almena silt loam has been further divided into three phases: Almena silt loam,

nearly level; Almena silt loam, gently sloping; and Almena silt loam, sloping. Almena stony silt loam, however, was mapped only as a gently sloping phase.

Land types, such as bare rocky hillsides, or riverwash, that have little true soil, are not given series and type names. They are given descriptive names such as Stony steep land, Riverwash, and Borrow and gravel pits.

When very small areas of two or more series of soil form such a mixed pattern that they cannot be shown separately on a map of the scale used, they are mapped together and called a soil complex. For example, in Barron County there is a Milaca-Cloquet-Peat complex. In these areas profiles of the Milaca series, of the Cloquet series, and of Muck or Peat soils each cover many areas too small to be shown individually on the map.

The soils of Barron County were studied and classified according to their similarities and differences. From the detailed studies of the soils, a mapping legend similar to the one appearing on the colored map for this report was devised. Then the different kinds of soil were plotted on an aerial photograph of the area. The colored map enclosed with this report was then compiled from aerial photographs.

The reader should remember that areas smaller than 3 acres usually are shown only if they are significantly different from the adjoining soils. If all areas having only minor differences were marked, there would be so many units and boundary lines that the map could hardly be read. The owner should allow for such areas that he finds on his own farm, and manage these spots according to the suggestions given for similar soils.

The original soil maps made in the field show more detail of slope and erosion than could be shown on the finished map enclosed. The greater detail was needed by the Soil Conservation Service for use in farm planning. For publication of this report, certain kinds of soils were combined to make the map easier to read and to cut down on the number of separate soils. For example, a total of 34 acres of Boone loamy fine sand, sloping (slopes ranging from 6 to 10 percent), was found in the county. This soil was combined with Boone loamy fine sand, gently sloping, because there was so little of it and it required nearly the same management. If the reader needs a more detailed map of a particular farm, he should ask the Soils Department of the University of Wisconsin or the local Soil Conservation Service office.

SOIL SERIES AND THEIR RELATION TO LANDSCAPE TYPES

Landscape types are distinguished on the basis of the local surface relief and the geologic material. Each soil series occurs in a characteristic position in the landscape and on a characteristic type of parent material. The same soil series, however, may be found in two or more landscape types if parent material and other factors are similar. Differences among the soils are caused by differences in parent material, relief, natural vegetation, and drainage.

The key to the soils (table 6) shows the relation of the soil series to the landscape types shown in figure 2. The soils on each horizontal line in this table form a catena. A catena is a group of soils that have

TABLE 6.—*Key to the soils of Barron County, Wis.*

Soil characteristics:									
Surface relief	Level to steep.	Level to sloping.	Level	Moderately sloping.	Slightly sloping.	Nearly level.	Slight depressions.	Moderate depressions.	Deeper depressions.
Drainage:									
External	Very rapid	Slow to rapid	Slow	Medium to rapid.	Medium	Slow	Intermittently ponded.	Ponded	Ponded.
Internal	Excessive	Somewhat excessive.	Good	Good	Moderately good.	Imperfect	Poor	Very poor	Very poor.
Color:									
Surface soil	Dark gray	Brown	Brown	Brown	Grayish brown.	Brownish gray.	Gray	Gray to dark gray.	Black.
Subsoil	Yellow and brown.	Reddish brown	Yellowish brown.	Yellowish brown.	Yellow	Mottled yellow.	Light gray and yellow mottled.	Gray	Black.
Landscape type, parent material, and depth of soil:									
Smooth upland:									
Silt, 26 to 42 inches deep, over till.				Otterholt	Spencer	Almena	Auburndale	Adolph	Peat and muck.[1]
Silt, 14 to 26 inches deep, over till.				Santiago	Freeon	Freer		Adolph	Peat and muck.[1]
Rough upland:									
Till, now weathered to depths of 14 to 24 inches.		Cloquet		Milaca				Adolph	Peat and muck.[1]
Till, now weathered to depths of 14 to 24 inches.				Milaca-Cloquet-Peat complex.					Peat and muck.[1]
Hilly upland:									
Silt, 24 to 30 inches deep, over sandstone.				Gale					
Till, 18 to 36 inches deep, over sandstone.				Arland		Altoona			
Coarse sandstone, now weathered to depths of 12 to 18 inches.		Boone							
Fine sandstone, now weathered to depths of 18 to 28 inches.				Hixton					
Barron Hills:									
Shallow till over quartzite, 0 to 18 inches deep.	Stony steep land.								

Flat terraces:									
Silt, 30 to 42 inches deep, over gravel.			Antigo		Brill	Poskin	Warman		
Sand and gravel, now weathered to depths of 12 to 32 inches.	Terrace escarpment.	Chetek	Onamia		Scott Lake		Warman		
Sand and gravel, now weathered to depths of about 12 inches.	Pitted outwash.								
Sand and gravel, now weathered to depths of 14 to 26 inches.		Burkhardt							
Sand, now weathered to depths of 18 to 30+ inches.		Omega							
Silt and clay, 30 to 42 inches deep.			Campia		Crystal Lake.	Comstock	Barronett		
Bottoms and local depressions:									
Mixed alluvium, variable depth.	Riverwash					Alluvial land.			
Local alluvium, 18 to 24 inches deep.				Chaseburg	Chaseburg				Wallkill.

[1] This unit listed to show full range in soil relief, drainage, and color, though it is realized it did not develop from the parent material shown and that it is not part of a soil catena.

developed from similar parent materials but under different drainage conditions.

For example, the well-drained Otterholt silt loams have developed from silt deposits 30 inches or more in depth that overlie reddish-brown acid glacial till. Spencer silt loams have developed on silt of similar depth and are also underlain by reddish-brown acid glacial till. But the Spencer differ from the Otterholt silt loams in having impeded drainage. Mottling in the lower B horizon indicates the slower drainage. The Otterholt, Spencer, Almena, Auburndale, and Adolph soils form a catena ranging from the well-drained Otterholt to the very poorly drained Adolph.

The drainage conditions often result from the position that the soil occupies in the landscape. For instance, the Otterholt soils occupy the higher parts or tops of slopes, whereas the Spencer and Almena occupy the more nearly level areas, and the Auburndale and Adolph soils occupy the slightly depressional areas and deeper depressions.

The different landscape types and the soils usually developed on them in Barron County are discussed in the following paragraphs.

Landscape type 1: Rough upland.—The northern and western parts of the county (north of the recessional moraines) consist of numerous short choppy hills. These hills are close together, and small swamps or wet spots lie between them. Soil areas are very small because relief, drainage, and parent material vary within short distances. Textures range from sandy loam to silt loam, and many areas of peat and muck too small to be shown on the map are included. This region is best used for forestry, but some of the more nearly level areas may produce good hay and pasture, or some oats and corn. The soils most common within this region are those of the Milaca, Cloquet, Freeon, Freer, and Adolph series, and Peat and muck.

Landscape type 2: Smooth upland.—This type is characterized by long gentle slopes. The soils developed in silt overlying reddish-brown glacial till. The silt cap ranges in depth from 18 to 42 inches. The soils are members of the Otterholt, Spencer, Santiago, Almena, Auburndale, and Adolph series, with some areas of Peat and muck and of Freeon and Freer soils. In places erosion is rather a serious hazard on these soils because they are silty and low in organic-matter content. The Almena and Auburndale soils, which have rather poor internal drainage and occur on the lower or more nearly level slopes, require drainage for best agricultural production. The soils of the smooth uplands are some of the most fertile and easily managed in the county.

Landscape type 3: Flat terraces.—The soils of this landscape type are underlain by stratified sand and gravel deposited by old glacial streams. In surface texture they vary from sand to silt loam. The silty soils of the Antigo and Campia catenas [12] have developed in various depths of silt deposited over sand and gravel. Other series, such as the Onamia,[13] Omega, Chetek, and Burkhardt, have developed entirely from the glacial outwash material.

[12] The Antigo catena consists of the following series: Antigo, Brill, Poskin, and Warman. The Campia catena consists of the following series: Campia, Crystal Lake, Comstock, and Barronett.

[13] The Chetek catena includes the following series: Onamia, Scott Lake, and Warman.

The relief ranges from level for most of the areas to rough and broken for highly pitted areas near Red Cedar Lake. Escarpments are common between one bench or terrace level and another. The level areas are easy to cultivate and manage. The silty-textured soil types are moderately fertile and have a high water-holding capacity. These silty soils are well suited to corn, oats, hay, and pasture. The sandier types are used for special crops. Some areas are under irrigation.

Landscape type 4: Hilly upland.—These soils in the southernmost part of the county are characterized by the hilly to steep relief caused by bedrock dissection. The soils have developed from a thin deposit of glacial till over sandstone, siltstone, and some shale. Limited areas in the southwestern corner of the county, especially in Turtle Lake and Prairie Farm Towns, are underlain by a calcareous sandstone, which has apparently had very little influence on the soils. The Arland, Gale, Hixton, Altoona, and Boone soils are in this landscape type.

Landscape type 5: Barron Hills.—This area also is covered by a thin deposit of silt and glacial till, but it is characterized by steep relief, numerous quartzite boulders, and talus slopes (fig. 9). Most of the soils in the Barron Hills are in forest, but a few of the less stony areas can be used for pasture. Stony phases of the Freer, Freeon, Santiago, and Adolph series are mapped in the Barron Hills.

Landscape type 6: Alluvial and colluvial soils.—This landscape type is not shown in figure 2 because the individual areas are too small and scattered. The alluvial soils have developed along most of the streams from narrow deposits of material washed from nearby uplands. Alluvial soils vary considerably, according to the source of

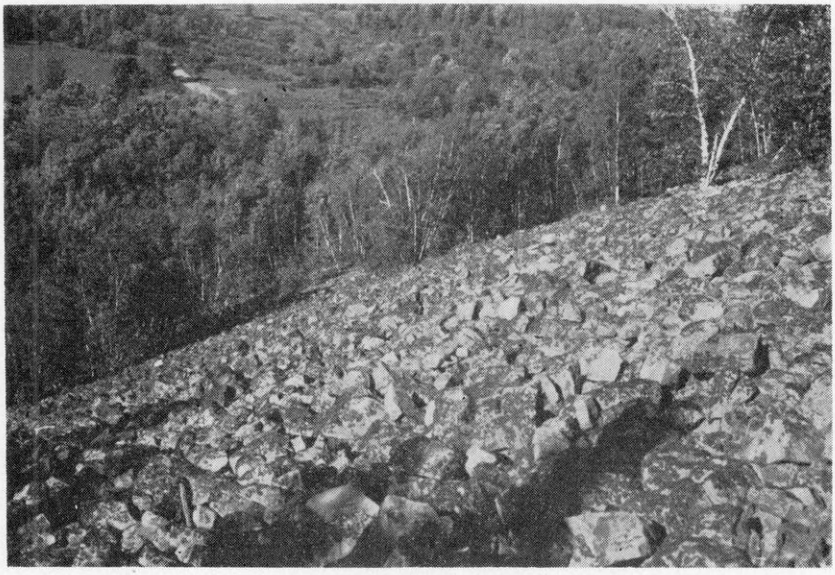

FIGURE 9.—Talus slope of Barron quartzite within the Barron Hills; typical steep slopes and forest cover can be seen in background.

their parent material. Most areas are too narrow and too poorly drained for tilled crops. The colluvial soils are formed in depressions and at the foot of steep slopes. They consist of soil material moved by gravity and to some extent by water. Many of the colluvial soils are well suited to cultivation and can be farmed with the adjoining land. Chaseburg and Wallkill soils, Riverwash, and Alluvial land occur in this landscape.

SOIL DESCRIPTIONS

Differences among soils are caused by differences in parent material, relief, natural vegetation, drainage, and the time the soil has had to form. On the basis of these differences, the soils of Barron County have been placed in 30 soil series and 13 miscellaneous land types and soil complexes. The soils have been placed in 115 soil types and phases according to differences in surface texture, degree of slope, degree of erosion, and soil depth. Table 7 lists these soil types and phases and shows the approximate acreage and proportionate extent of each in this county.

Descriptions of the individual soil phases are given in alphabetical sequence by series names in the following pages. The soil color descriptions are based on readings from Munsell color disks. The terms used for soil acidity represent pH values as follows:

	pH
Extremely acid	Below 4.5.
Very strongly acid	4.5–5.0.
Strongly acid	5.1–5.5.
Medium acid	5.6–6.0.
Slightly acid	6.1–6.5.
Neutral	6.6–7.3.

For crop rotations and other suggested management practices for each mapping unit, first find its management subgroup in table 8 (p. 80), and then read in the section, Soil Management Groups.

TABLE 7.—*Approximate acreage and proportionate extent of the soils mapped in Barron County, Wis.*

Soil	Area	Extent
	Acres	*Percent*
Adolph silt loam	7, 200	1. 3
Adolph stony silt loam	800	. 1
Alluvial land	20, 300	3. 6
Almena silt loam:		
Nearly level	9, 300	1. 6
Gently sloping	10, 300	1. 8
Sloping	700	. 1
Almena stony silt loam, gently sloping	3, 000	. 5
Altoona silt loam	375	. 1
Antigo silt loam:		
Nearly level	33, 700	5. 9
Gently sloping	12, 400	2. 2
Sloping	400	. 1
Antigo silt loam, shallow:		
Nearly level	2, 900	. 5
Gently sloping	8, 200	1. 4
Gently rolling	2, 400	. 4
Sloping	575	. 1

TABLE 7.—*Approximate acreage and proportionate extent of the soils mapped in Barron County, Wis.*—Continued

Soil	Area	Extent
	Acres	*Percent*
Arland silt loam:		
Gently sloping	14, 500	2. 5
Sloping	10, 100	1. 8
Strongly sloping	2, 500	. 4
Eroded, strongly sloping	1, 200	. 2
Moderately steep	850	. 1
Arland fine sandy loam:		
Gently sloping	1, 450	. 3
Sloping	1, 000	. 2
Strongly sloping	1, 250	. 2
Eroded, strongly sloping	650	. 1
Moderately steep and steep	475	. 1
Auburndale silt loam	350	. 1
Barronett silt loam	800	. 1
Barronett loam	350	. 1
Boone loamy fine sand:		
Gently sloping	475	. 1
Strongly sloping	180	(1)
Steep	200	(1)
Borrow and gravel pits	120	(1)
Brill silt loam:		
Nearly level	850	. 1
Gently sloping	500	. 1
Burkhardt loams and sandy loams	425	. 1
Campia silt loam:		
Nearly level	850	. 1
Gently sloping	1, 150	. 2
Chaseburg silt loam	700	. 1
Chetek sandy loam:		
Nearly level	5, 800	1. 0
Gently sloping	5, 000	. 9
Undulating	1, 500	. 3
Gently rolling	525	. 1
Sloping	500	. 1
Chetek sandy loam, shallow:		
Nearly level	5, 200	. 9
Gently sloping	3, 000	. 5
Cloquet sandy loam:		
Undulating and gently rolling	775	. 1
Rolling and hilly	475	. 1
Hilly	600	. 1
Comstock silt loam	1, 150	. 2
Comstock loam	450	. 1
Crystal Lake silt loam	1, 500	. 3
Crystal Lake loam	1, 200	. 2
Freeon silt loam:		
Nearly level	650	. 1
Gently sloping	8, 900	1. 6
Sloping	1, 450	. 3
Freer silt loam:		
Nearly level	1, 900	. 3
Gently sloping	9, 800	1. 7
Sloping	1, 750	. 3
Freer stony silt loam, gently sloping	725	. 1
Gale silt loam:		
Gently sloping	1, 800	. 3
Sloping	950	. 2
Strongly sloping	800	. 1
Eroded, sloping and strongly sloping	525	. 1

[1] Less than 0.05 percent.

TABLE 7.—*Approximate acreage and proportionate extent of the soils mapped in Barron County, Wis.*—Continued

Soil	Area	Extent
	Acres	*Percent*
Hixton loam:		
Gently sloping	1,700	0.3
Sloping	1,300	.2
Strongly sloping	1,000	.2
Eroded, strongly sloping	675	.1
Moderately steep	350	.1
Hixton fine sandy loam:		
Sloping	1,100	.2
Strongly sloping	850	.1
Eroded, strongly sloping	1,000	.2
Moderately steep	3,600	.6
Steep	6,600	1.2
Eroded, steep	575	.1
Lakes and streams	21,500	3.8
Milaca silt loam:		
Gently sloping	2,400	.4
Sloping	2,800	.5
Strongly sloping	1,600	.3
Steep	850	.1
Undulating	1,000	.2
Gently rolling	2,800	.5
Rolling	1,800	.3
Hilly	1,000	.2
Milaca fine sandy loam:		
Gently sloping	850	.1
Sloping	1,400	.2
Strongly sloping	1,150	.2
Milaca-Cloquet-Peat complex:		
Undulating	3,300	.6
Gently rolling	12,400	2.2
Rolling	39,300	6.9
Hilly	14,300	2.5
Omega loamy sand:		
Nearly level	1,600	.3
Gently sloping	12,100	2.1
Sloping	1,900	.3
Strongly sloping	850	.1
Omega loamy sand, gravelly subsoil:		
Nearly level	525	.1
Gently sloping	1,350	.2
Sloping and strongly sloping	1,100	.2
Onamia loam:		
Nearly level	20,300	3.6
Gently sloping	12,900	2.3
Gently rolling	2,700	.5
Otterholt silt loam:		
Nearly level	2,400	.4
Gently sloping	32,600	5.7
Sloping	4,100	.7
Strongly sloping	500	.1
Peat and muck	39,800	7.0
Pitted outwash:		
Rolling	1,700	.3
Hilly	325	.1
Poskin silt loam	5,400	.9
Riverwash	200	(1)

[1] Less than 0.5 percent.

TABLE 7.—*Approximate acreage and proportionate extent of the soils mapped in Barron County, Wis.*—Continued

Soil	Area	Extent
	Acres	*Percent*
Santiago silt loam:		
Nearly level	1,050	0.2
Gently sloping	26,000	4.6
Sloping	15,200	2.7
Eroded, sloping	525	.1
Strongly sloping	3,700	.7
Moderately steep	1,300	.2
Santiago stony silt loam:		
Sloping	1,400	.2
Strongly sloping	1,,000	.2
Steep	1,200	.2
Scott Lake sandy loam	400	.1
Spencer silt loam:		
Nearly level	1,800	.3
Gently sloping	27,500	4.8
Sloping	1,250	.2
Stony steep land	700	.1
Terrace escarpment:		
Strongly sloping	600	.1
Moderately steep	900	.2
Wallkill silt loam	500	.1
Warman silt loam	3,000	.5
Warman loamy sand, gravelly subsoil	425	.1
Warman loamy fine sand	500	.1
Total	568,900	99.6

Adolph Soils

Adolph silt loam (AA).—This very poorly drained soil occurs in small upland depressions in association with Otterholt, Santiago, Milaca, and Arland soils. The areas associated with the Otterholt and Santiago soils are usually silty and deep, but those associated with the Milaca soils are gritty and somewhat shallow. Slopes range from 0 to 2 percent. This soil has developed under a cover of sedges and other water-tolerant plants and trees. A few inches of muck has accumulated on the surface in places.

Profile of Adolph silt loam:

A 0 to 18 inches, very dark gray to nearly black, very strongly acid heavy silt loam of granular structure; mottled in the lower part; upper part contains considerable mucky organic materials and many roots.

G_1 18 to 36 inches, gray strongly acid heavy silt loam, mottled with yellowish brown; darker material from layer above has penetrated to this layer through root channels.

G_2 36 to 40 inches, light brownish-gray, highly mottled with yellowish brown, very strongly acid heavy silt loam; plastic when wet.

D_g 40 inches +, reddish-brown very strongly acid gravelly sandy glacial till, mottled with yellowish brown and light brownish gray; slightly cemented and usually saturated with water.

A few areas of silt loam having slopes of 2 to 6 percent have been included with this soil because they have poor drainage caused by seepage from higher ground.

Because of its very slow permeability and its tendency to accumulate surface water, Adolph silt loam is cultivated only in a few areas that have been drained. Partly drained areas produce excellent pasture, but the native vegetation on the undrained areas is unpalatable to livestock. This soil is in management subgroup 4–E.

Adolph stony silt loam (Ab).—This soil is similar to Adolph silt loam, but it has numerous stones on the surface and throughout the profile and its texture is coarser. The slope may range up to 6 percent. The soil is usually associated with Milaca and Santiago soils.

This soil is not suited to cultivation. Even when drained it produces rather low yields of pasture. It is in management subgroup 5–D and is best suited to permanent vegetation. The more sloping areas, which receive seepage water from higher ground, could be improved by diversion terraces.

Alluvial Land

This mixed group of soils (Ac) was derived from alluvium. The areas of individual soils are too small and too closely intermixed to be mapped separately at the scale used.

Alluvial land occurs along most of the drainage channels in this county. All of it is subject to flooding. About 15 percent of it is moderately well drained, and about 85 percent is poorly drained.

Soil materials in this group vary considerably. The surface soil ranges from very dark gray to dark grayish-brown friable sandy loam to silt loam. The subsoil ranges from dark grayish brown to brownish gray and is usually mottled with reddish brown in the lower part. The underlying material is stratified sand and gravel, glacial till, or, in the central part of the county, sand or sandstone.

Artificial drainage of this land is usually not practical, because of a high water table and frequent overflow. This land is in management subgroup 4–E and is used primarily for pasture or forest. Ash, elm, and aspen trees grow on uncleared areas. This land should remain in forest or grass to prevent streambank erosion and to furnish refuge for wildlife. The better drained areas can furnish pasture for cattle.

Almena Silt Loam Soils

These soils occupy the nearly level to sloping glacial uplands in the central and west-central parts of Barron County. They have developed from silty loesslike material, which is underlain by reddish-brown glacial till at depths of 30 to 42 inches or more. Near the Barron Hills the Almena soils are less silty and more stony than usual because in that area they are underlain by quartzite material.

Typical profile (Almena silt loam, nearly level):

A 0 to 11 inches, grayish-brown to pale-brown medium platy friable strongly acid silt loam; lower part usually mottled and free of stones.

B 11 to 26 inches, yellowish-brown to light yellowish-brown, mottled, moderately plastic, very strongly acid silty clay loam.

C 26 inches +, yellowish-brown massive silt; friable, strongly acid, and somewhat mottled; underlying reddish-brown glacial till moderately compact and somewhat resistant to movement of water.

These imperfectly drained soils have a high water-holding capacity, are permeable to water, and are moderately fertile. Because of poor internal drainage, they are "colder" than the associated better drained Spencer and Otterholt soils, and they warm up later in the spring. Hay, oats, corn, and pasture are the most common crops grown.

Almena silt loam, nearly level (AE).—This phase has very slow surface runoff and slight erosion hazard. Slopes are less than 2 percent. Diversion terraces would help to remove excess surface water. With use of the good management practices and rotations suggested in management subgroup 3–E, this soil will produce good yields.

Almena silt loam, gently sloping (AD).—The profile of this gently sloping phase is very similar to that of the nearly level soil. Because of its steeper slopes, ranging from 2 to 6 percent, this soil has greater surface runoff and is slightly more subject to erosion than the nearly level soil. Diversion terraces are needed to remove excess surface water, especially on longer slopes. If the fertility level is built up and maintained, and good rotations such as those suggested in management subgroup 2–I are followed, good yields will result.

Almena silt loam, sloping (AF).—This phase generally occupies the lower part of steep slopes and has slopes of 6 to 10 percent. It differs from the nearly level and gently sloping phases in being shallower and in having a greater surface runoff. A few small spots on slopes of 10 to 15 percent are included.

This soil is more difficult to manage when cropped than the less sloping phases of Almena silt loam. As described in management subgroup 3–F, crop rotations should include close-growing grasses and legumes at least 2 out of every 4 years, and diversion terraces are necessary. The steeper places require even more careful management.

Almena Stony Silt Loam Soil

Almena stony silt loam, gently sloping (AG).—Most of this soil is near the Barron Hills in the northeastern part of the county. It may be associated with other phases of the Almena soils. A few small areas have formed in draws within regions of Spencer and Otterholt soils. Slopes are generally less than 6 percent, but about 150 acres of Almena stony silt loam on slopes of 6 to 10 percent is included in this mapping unit.

This gently sloping soil differs from Almena silt loam, gently sloping, in that it has many stones and boulders on the surface and throughout the profile. The extreme difficulty of removing these stones makes this phase unsuitable for cultivated crops (fig. 10). Several areas of this phase have been cleared for pasture, the yield and quality of which are fair. Forestry is probably the best use for this soil, as suggested in management subgroup 4–D.

Altoona Soil

Altoona silt loam (AH).—This soil occurs primarily in the southern part of the county on 2 to 6 percent slopes. It is associated with the

FIGURE 10.—Area of Almena stony silt loam south of Turtle Lake; except where stones have been removed, soil is used only for pasture.

Arland soils on thin glacial till. Often it occurs on toe slopes and may receive some seepage water from soils above it.

Profile description:

A 0 to 10 inches, dark-gray to brownish-gray friable silt loam of weak platy structure; very strongly acid.

B 10 to 24 inches, dark brownish-gray to light-gray highly mottled sandy clay loam of moderate blocky structure; very strongly acid.

C and D 24 to 30 inches +, yellowish-brown mottled strongly acid fine sand or loamy sand over sandstone bedrock.

This imperfectly drained to moderately well drained soil has a moderately permeable surface soil but a slowly permeable subsoil. Surface runoff is very slow, the erosion hazard slight, and the water-holding capacity high. The soil is moderately fertile but hard to manage because of its poor internal drainage. Diversion ditches or terraces are needed in many places to carry seepage from higher areas.

Most areas of Altoona silt loam are in forest or pasture. Cultivated areas are used for hay, oats, pasture, and some corn. Because the frost hazard is less and the growing season is longer, corn grows more successfully on this soil than on the Almena soils. This soil is in management subgroup 3–F.

Antigo Silt Loam Soils

These soils occur on the large outwash plains in the northern half of the county, as well as in small areas scattered through the county. They developed from silty deposits that are 28 to 42 inches or more deep over loose sand and gravel. They are friable, light colored, well drained, and free of stones.

Profile description (Antigo silt loam, nearly level):

A 0 to 12 inches, brownish-gray to yellowish-brown friable very strongly acid silt loam of weak platy structure; when cultivated, platy aggregates break into soft friable granules.

B 12 to 28 inches, moderate-brown silty clay loam of medium blocky structure; very strongly acid.

C 28 to 38 inches, moderate yellowish-brown, massive, very strongly acid silt loam; moderately friable when moist; this horizon underlain by stratified sand and gravel.

The Antigo soils have been almost entirely cleared and are used for pasture and such crops as corn, oats, hay, and potatoes. They are easy to cultivate and to manage. They have moderate natural fertility but respond well to applications of manure or commercial fertilizer.

Antigo silt loam, nearly level (AJ).—This phase has a high water-holding capacity and is moderately permeable. It has slopes of less than 2 percent, very slow surface runoff, and only slight erosion hazard.

A few areas of Antigo silt loam, colluvial phase, have been included in this mapping unit. This colluvial phase, not mapped separately in this county, has a darker surface soil and occurs in slight depressions and at the foot of steeper slopes. Rotations and management practices for the mapping unit are discussed in management subgroup 1–A.

Antigo silt loam, gently sloping (AI).—This phase is similar to the nearly level phase in appearance and profile characteristics, but slopes range from 2 to 6 percent. Its runoff is greater, Its erosion hazard is more serious, and its management requirements are slightly more demanding. Rotations are suggested in management group 1–B.

Included with this separation is about 800 acres on slightly pitted outwash. The relief is complex on the slopes of 0 to 6 percent. These pitted areas would be difficult to stripcrop or terrace; therefore, greater care is needed to maintain the fertility level and organic-matter content and to prevent erosion.

Antigo silt loam, sloping (AO).—This soil on 6 to 10 percent slopes differs from the nearly level phase in having a slightly shallower profile, a higher rate of surface runoff, and a greater erosion hazard. A few small areas of this soil have complex slopes, and a few areas are colluvial in origin. Rotations and management practices are suggested in management subgroup 2–C.

Antigo Silt Loam Soils, Shallow

The shallow Antigo silt loam soils are mostly in the southern and central parts of the county. Like the deeper Antigo silt loams, they have developed from silty deposits on outwash plains.

Typical profile (Antigo silt loam, shallow, nearly level phase):

A 0 to 10 inches, brownish-gray to yellowish-brown friable silt loam; weak platy structure and strongly acid reaction.

B 10 to 24 inches, moderate-brown silty clay loam that has a medium blocky structure and a very strongly acid reaction.

D 24 inches +, moderate-brown, strongly acid, stratified, loose sand and gravel.

These soils are similar to Antigo silt loams in management requirements, workability, and natural fertility. The same crops are grown on these shallow soils, and under good management yields are almost as high. The water-holding capacity is somewhat less because of the shallow profile. Some crops may be damaged by drought during dry periods.

Antigo silt loam, shallow, nearly level (AM).—This phase is on the broad, flat areas of the outwash plains, where the silty deposit ranges from 15 to 30 inches in depth. Slopes are 2 percent or less. The soil has good internal drainage and is usually almost free of stones. Corn, oats, hay, potatoes, and some pasture are produced. Under good management practices, as outlined in management subgroup 1–B, excellent yields can be expected.

Antigo silt loam, shallow, gently sloping (AL).—The profile characteristics and management requirements on these slopes of 2 to 6 percent are similar to those for the nearly level phase. More care is needed to prevent erosion damage, however, especially on the longer slopes. The good management practices in management subgroup 1–C include the maintenance of the organic-matter content and fertility level of this soil. The shallow profile limits the water-holding capacity and may allow drought damage to crops. Most of this phase has been cleared and is cultivated.

Mapped with this unit is about 600 acres of Antigo silt loam, on complex slopes of 0 to 6 percent. This included soil was formerly considered to be Withrow silt loam, gently undulating phase, but, because of its limited extent and similar profile characteristics, it is included with this gently sloping phase of Antigo silt loam, shallow. It has a somewhat deeper profile and has depressions in which water sometimes accumulates. In use suitability and management requirements, it is about the same as the gently sloping phase.

Antigo silt loam, shallow, gently rolling (AK).—This phase occupies areas of slightly pitted outwash where slopes range from 6 to 10 percent. Surface runoff is medium, and the erosion hazard is moderate. The porous substratum and good tilth make this soil relatively easy to work. Its steeper slopes and more complex topography demand more care in management. Any loss of surface soil by erosion further limits the already limited water-holding capacity of this soil, and its productivity as well.

It would be difficult to terrace or stripcrop this soil. More attention should be given to the length of the crop rotation and to maintenance of plant nutrients and organic-matter content. This soil is well suited to corn, oats, hay, and pasture. Potatoes do fairly well. Some good rotations are listed in management subgroup 2–C.

Antigo silt loam, shallow, sloping (AN).—The 10- to 20-percent slopes of this phase are a great erosion hazard. The surface runoff is more rapid and the water-holding capacity is lower than for the nearly level phase. Most areas occur as long narrow strips along the terrace escarpments or around the edges of pits in outwash. They are usually associated with more nearly level areas.

Although this soil is well suited to production of corn, oats, hay, potatoes, and, to some extent, pasture, clean-cultivated crops such as

corn should not appear in the rotation more often than once in 4 or 5 years. The organic-matter content and fertility level must be maintained. Such practices as contour tillage or terracing should be used to prevent erosion (see management subgroup 2–D). This phase should be kept in grass whenever possible.

A few acres of Antigo silt loam, shallow, which occur on complex slopes of 10 to 15 percent, have been included with this phase. These areas are similar to the rest of the unit in profile characteristics. They are best suited to grass.

Arland Silt Loam Soils

These soils occur mostly in the southern part of the county where about 18 to 34 inches of glacial till, some of it mixed with loesslike silt, overlies sandstone bedrock. The till is gritty and contains many sandstone fragments. In some places the till layer is so thin that the B horizon rests directly on residual sandstone material. These soils have developed on gentle to strong slopes of 2 to 15 percent under a forest cover of maple, red oak, aspen, and sumac.

Profile description (Arland silt loam, gently sloping):

A 0 to 10 inches, brownish-gray to grayish-brown friable granular silt loam; very strongly acid; weak platy structure.

B 10 to 23 inches, brown to grayish-brown light silty clay loam containing considerable glacial drift; firm blocky structure; very strongly acid.

C and D 23 to 26 inches, yellowish-red to reddish-brown very strongly acid glacial till, underlain by partly decomposed sandstone.

These soils are moderately fertile and easily tilled. Their permeability and water-holding capacity are moderate. They are used for corn, oats, hay, and pasture. These soils occur in the southern part of the county and at higher elevations. Their growing period is slightly longer than that of the Otterholt and the less well drained Spencer and Almena soils to the north.

Arland silt loam, gently sloping (Av).—This gently sloping soil has slow surface runoff and slight erosion. Slopes range from 2 to 6 percent. It is nearly stone free, except for 140 acres indicated on the map by stone symbol.

This soil is moderately fertile, is easy to cultivate and manage, has a high water-holding capacity, and is easily conserved. When the fertility is maintained, good crop yields may be expected (see subgroup 1–B).

Arland silt loam, sloping (Ax).—The sloping phase varies more in depth of profile and in thickness of the glacial till deposit than the gently sloping phase. Runoff is medium, and the erosion hazard is moderate. The soil is moderately difficult to work and manage because it has slopes of 6 to 10 percent. Management subgroup 2–C suggests practices for this soil.

Arland silt loam, strongly sloping (Ay).—This soil is like the gently sloping phase in profile but is more shallow to bedrock. The depth varies from 18 to 32 inches. Surface runoff is rapid, and the water-holding capacity is somewhat low. The soil is moderately difficult to manage because it has slopes of 10 to 15 percent.

Intertilled crops such as corn should not be grown more often than once in 4 or 5 years. Special practices, such as those in management subgroup 2–D, are needed to control erosion.

Arland silt loam, eroded, strongly sloping (Au).—In this phase are the few areas of strongly sloping Arland silt loam that have been eroded severely. These areas usually occur at the heads of draws or on points of hills, but may also occur on long, uniform slopes. The surface soil, or A horizon, is slightly lighter in color, but the profile is otherwise similar to that of the gently sloping phase. Surface runoff is very rapid, and successful management is very difficult.

Most areas are either idle or are being used for oats, hay, and pasture. Suitable rotations and supplemental practices are given under management subgroup 4–C. It will be necessary to restore the fertility level and organic-matter content by heavy applications of manure and fertilizer. After 5 to 10 years in pasture, the soil may be returned to cultivation. At that time, the soil may be managed as in management subgroup 2–C, with special emphasis on erosion control.

A few acres of Arland silt loam, eroded sloping phase, have been included with this mapping unit. This phase, not mapped separately in the county, is similar to the eroded strongly sloping phase in appearance and profile characteristics but is somewhat easier to reclaim. Also included is about 16 acres of eroded Arland silt loam on slopes of 15 to 20 percent. These areas may be managed the same as the rest of the unit.

Arland silt loam, moderately steep (Aw).—This phase is not suited to intertilled crops, because it has slopes of 15 to 20 percent. It is shallower and more variable in depth than other phases of Arland silt loam and shows numerous rock outcrops and sandy spots. This soil should be kept in permanent pasture, as suggested in management subgroup 4–B. Cultivated areas are extremely likely to erode.

About 240 acres of Arland silt loam on steeper slopes of 20 to 30 percent is included in this unit because it has similar characteristics and is of small extent.

Arland Fine Sandy Loam Soils

These soils occur only in the southern part of the county where there is mixed hardwood forest dominated by oak, red maple, birch, aspen, and a few scattered pine trees. They have developed on thin layers of leached glacial till that were deposited over sandstone residuum and sandstone bedrock. The Arland fine sandy loams differ from the silt loams in lacking a silty surface cover and in showing more influence of the underlying bedrock, which is at depths of only 18 to 32 inches.

A typical profile of the gently sloping phase follows:

A 0 to 11 inches, grayish-brown, weak granular, very strongly acid fine sandy loam; low in organic matter; often contains some glacial gravel and stones.

B 11 to 24 inches, brown to yellowish-brown heavy fine sandy loam to sandy clay loam; weak blocky structure; very strongly acid.

C and D 24 inches +, yellowish-red to reddish-brown very strongly acid glacial till over yellowish sandstone; till is more sandy than that in the Arland silt loam soils and often contains many sandstone boulders.

Arland fine sandy loam soils are friable and have a weakly developed B horizon. Their fertility is low. The soils are well drained; they warm up early in the spring and are easy to till. They are used for corn, oats, hay, and pasture.

Arland fine sandy loam, gently sloping (AQ).—This phase has developed on slopes of 2 to 6 percent on uplands. It has a slow surface runoff and a slight erosion hazard. Management practices described in management subgroup 2–A are suitable.

Arland fine sandy loam, sloping (As).—This phase occurs on slopes of 6 to 10 percent. It has more rapid surface runoff and greater erosion hazard than the gently sloping phase. It should be managed as explained in management subgroup 2–B.

Arland fine sandy loam, strongly sloping (AT).—This phase, on 10 to 15 percent slopes, is somewhat droughty, low in organic-matter content, and moderate in erodibility. It varies more than the gently sloping phase in thickness to bedrock and in texture of the B horizon. It is in management subgroup 3–A.

Arland fine sandy loam, eroded, strongly sloping (AP).—This phase, on slopes of 10 to 15 percent, has a very rapid surface runoff and a great erosion hazard. The A horizon is very shallow, less than 4 inches deep, but otherwise the profile is like that of the gently sloping phase. This phase occurs mostly at the heads of draws or on the points of hills. It is associated with other phases of Arland fine sandy loam.

Most areas are being used for hay or pasture or are lying idle. They are not very productive because of low fertility and low organic-matter content. Suitable rotations and supplemental practices are given under management subgroup 5–B. The soil is best suited to forest and should be planted to white and Norway pines. Great care must be taken to prevent further erosion while trees are becoming established.

Included with this phase is about 211 acres of eroded Arland fine sandy loam on slopes of 6 to 10 percent, and about 28 acres on slopes of 15 to 20 percent. These included areas are very similar to this phase in appearance and profile characteristics.

Arland fine sandy loam, moderately steep and steep (AR).—There are only a few hundred acres of this soil, and most of it is used for hay, pasture, or forest. The slopes of 15 to 30 percent have a very rapid surface runoff and are a great erosion hazard. The profile is more shallow and more variable in depth than those of other phases of Arland fine sandy loam.

This phase should be kept in permanent pasture as outlined in management subgroup 4–A. An occasional hay crop can be harvested from alfalfa-brome pasture mixtures.

Auburndale Soil

Auburndale silt loam (Az).—This soil is in wet depressions within the smooth upland. It is a Low-Humic Gley developed from 32 to 42 inches of silty material over glacial till. This poorly drained soil is associated with the Otterholt, Santiago, and Almena soils. Slopes are usually less than 2 percent, but may be as great as 10 percent. The

native vegetation, tolerant of wet soil, consisted of elm, ash, white oak, aspen, and an undergrowth of small plants.

Typical profile description:

A 0 to 11 inches, gray friable silt loam; strongly acid; weak platy structure; often slightly mottled in lower part.

B_g 11 to 34 inches, gray to light brownish-gray, mottled, plastic heavy silt loam; strongly acid; weakly developed blocky structure.

C_g 34 to 48 inches, grayish-brown to yellowish-red, massive, strongly acid heavy silt loam underlain by reddish-brown glacial till.

The water-holding capacity is high, and the natural fertility is moderate. The soil is best suited to hay and pasture, as described in management subgroup 4–E.

Barronett Soils

Barronett silt loam (Bb).—This soil is in wet depressions within the old lake plains. Slopes range from 0 to 2 percent. The soil is characteristically darker in color than the associated soils. Both internal drainage and runoff are very slow. The native vegetation included sedges and other water-tolerant plants. The water-holding capacity of the soil is high, and its fertility is moderate.

Typical profile:

A 0 to 10 inches, very dark gray friable strongly acid silt loam; thin platy structure; moderately plastic.

G 10 to 30 inches, gray to grayish-brown, mottled with yellowish-red, strongly acid loam; massive structure; moderately plastic when wet.

C_1 30 to 40 inches, pinkish-gray to brown, heavy, strongly acid silt loam; underlying parent material stratified below 34 inches and calcareous below 60 inches.

Barronett silt loam is in management subgroup 4–E. A few acres in very slightly pitted outwash areas have slopes ranging up to 6 percent.

Barronett loam (Ba).—This soil has developed in wet depressions and along the edges of the glacial lake plains on slopes of 0 to 2 percent. It is characterized by a very dark gray, friable, strongly acid loam surface layer, which may be influenced by an overwash of sandy material from higher ground. The subsoil and parent material are the same as those of Barronett silt loam.

Most areas of this soil are now in forest. As suggested in management subgroup 4–E, they should not be cleared.

Boone Loamy Fine Sand Soils

These soils are in south-central Barron County on Cambrian sandstone bedrock. They developed under forest cover on slopes ranging up to 30 percent. Both runoff and internal drainage are rapid. Water-holding capacity and natural fertility are very low. These soils are mostly in forest.

Typical profile (Boone loamy fine sand, gently sloping):

A 0 to 9 inches, grayish-brown to dark yellowish-brown, friable, very strongly acid loamy fine sand; weak crumb structure.

B 9 to 24 inches, yellowish-brown to yellowish-red very strongly acid loamy fine sand; this is a B horizon, but very weakly developed.

C 24 inches +, very pale brown to yellowish-brown very strongly acid loose sand; contains many fragments from underlying sandstone bedrock.

Boone loamy fine sand, gently sloping (Bc).—Most of this unit is on slopes of 2 to 6 percent, but a few acres on slopes less than 2 percent or up to 10 percent have been mapped in with it. Most of this phase is used for forest, but a few areas are in hay, pasture, or oats. The soil is poorly suited to corn, small grains, and hay. If such crops are grown, use rotations shown in management subgroup 3–D. Liberal applications of complete fertilizers are needed. Moisture must be carefully conserved and soil blowing prevented. Fertility is low.

Boone loamy fine sand, strongly sloping (Be).—This soil is similar to the gently sloping phase except for having slopes of 10 to 15 percent and a profile that is somewhat more shallow and variable in depth. Most areas are in forest and, as suggested in management subgroup 5–C, should not be cleared. Those areas that have been cleared are in pasture or are idle.

Boone loamy fine sand, steep (Bd).—This phase occurs in small areas scattered through the sandstone hills in southern Barron County. It has slopes of 20 to 30 percent. Its appearance and profile characteristics are similar to those of the gently sloping phase, but this soil is more shallow and variable in depth to bedrock. It is in management subgroup 5-C.

Borrow and Gravel Pits

The larger Borrow and gravel pits are shown on the map by soil boundaries, with the words "borrow pit" as a symbol. The small pits are shown by the conventional crossed-pick symbol. These areas have no agricultural value.

Brill Silt Loam Soils

These soils occur in slight depressions in outwash plains, especially along the edges of the plains. They have developed from noncalcareous silt deposited over sand and gravel. They are moderately well drained soils and are associated with the better drained Antigo and the more poorly drained Poskin and Warman soils. Surface runoff is very slow, water-holding capacity is high, and natural fertility is moderate.

Typical profile (Brill silt loam, nearly level):

A 0 to 12 inches, dark grayish-brown friable silt loam; very strongly acid; fine platy structure; soil aggregates are slightly vesicular.

B 12 to 26 inches, brown to reddish-brown, mottled, very strongly acid silty clay loam; medium blocky structure; moderately plastic.

D 26 to 36 inches, reddish-brown to yellowish-brown, very strongly acid, stratified sand and gravel.

In some places this soil has a silty C horizon, 8 to 14 inches deep, above the gravel.

Most areas of the Brill silt loams are being used for corn, oats, hay, or pasture.

Brill silt loam, nearly level (Bh).—This phase has slopes of less than 2 percent. It responds well to applications of lime, manure, and fertilizer. When the fertility level is maintained as suggested in management subgroup 2–E, good crop yields can be expected. Al-

falfa can be grown successfully on many areas, but it does better if the soil is drained.

Brill silt loam, gently sloping (Bg).—This phase closely resembles the nearly level phase, but its slopes of 2 to 6 percent give slightly better surface drainage. This soil is in management subgroup 2–G.

Burkhardt Soils

Burkhardt loams and sandy loams (Bk).—The mapping unit for Burkhardt soils includes both loam and sandy loam types. Slopes range from 0 to 6 percent. The soils have developed under a cover of grasses or mixed grass and trees. They are south of Cameron on the outwash terraces. Burkhardt soils are a prairie-border equivalent of the Chetek soils, from which they differ chiefly in the color of the A and B horizons.

Typical profile (Burkhardt loam, nearly level):

A 0 to 12 inches, very dark brown to dark-brown, granular, friable, strongly acid loam.
B 12 to 22 inches, reddish-brown to brown sandy clay loam; very strongly acid; weak blocky structure; clay is concentrated in the lower 1 or 2 inches.
C 22 inches +, dark reddish-brown, becoming yellowish-brown with depth, medium acid, loose, stratified sand and gravel.

Internal drainage of these soils is good to excessive, but surface runoff is very slow to slow. They are used mostly for corn, oats, hay, and pasture. Management subgroup 3–C suggests suitable rotations.

Campia Silt Loam Soils

These are well-drained soils on broad glacial lake plains in the northwestern part of the county. They were derived from 36 to 40 inches of silty material overlying stratified silt and clay, which are calcareous at 8 or 9 feet (fig. 11). The soils developed under a forest cover of white pine and mixed hardwoods.

Typical profile (Campia silt loam, nearly level):

A 0 to 12 inches, gray to brownish-gray, strongly acid, friable silt loam; well-developed platy structure that breaks into soft granules.
B 12 to 29 inches, yellowish-brown to brown strongly acid silty clay loam; moderate blocky structure; medium plastic consistence.
C and D 29 to 42 inches, yellowish-brown strongly acid silty clay loam; stratified below 40 inches and calcareous below 8 feet.

Campia silt loam soils are moderately permeable, have a high water-holding capacity, and are moderately fertile. They are used mainly for corn, oats, hay, and pasture.

Campia silt loam, nearly level (Cb).—This phase has slopes of 0 to 2 percent. It is one of the better agricultural soils of the county (see management subgroup 1–A).

Campia silt loam, gently sloping (Ca).—This soil is on slopes of 2 to 6 percent. It has a slightly greater surface runoff than the nearly level phase and a moderate erosion hazard. It is in management subgroup 1–B.

A few very small areas on slopes of 6 to 15 percent, most of which are north of Vermillion Lake, have been included in this unit. Most of

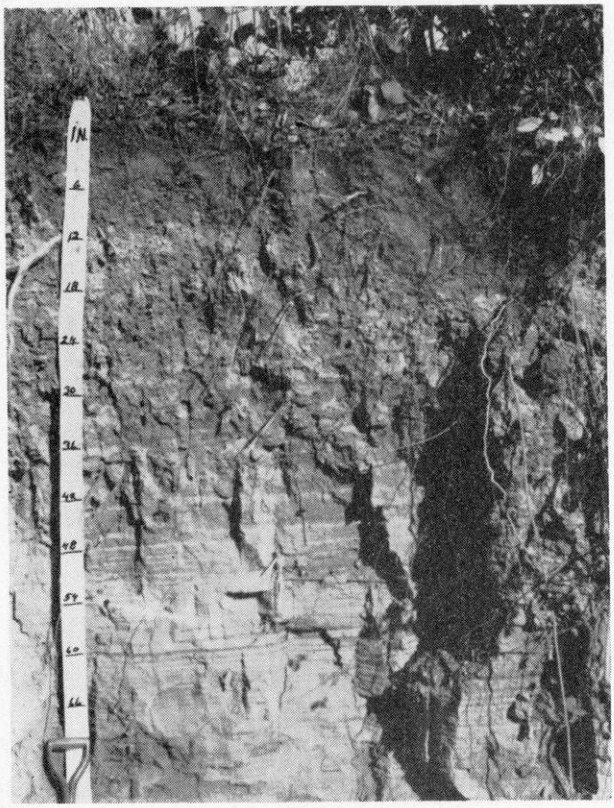

FIGURE 11.—Profile of Campia silt loam showing stratification of silts and clays in lower part.

these steeper slopes are not cultivated. They should be kept in grass and pastured carefully to avoid serious erosion.

Some of this gently sloping Campia soil along State Highway 48 has a loam surface texture because coarser material has washed onto it from higher soils nearby.

Chaseburg Soil

Chaseburg silt loam (Ct).—This colluvial soil formed at the foot of steeper slopes, usually on narrow benches, terraces, or in valley-fill positions. It is often associated with Arland, Gale, Hixton, and Otterholt soils. Slopes range from 0 to 10 percent but are mostly between 2 and 6 percent.

The surface texture is usually silt loam, but some small areas of loam are included. The surface layer is gray to brownish gray. The subsoil is a moderate yellowish-brown friable heavy silt loam of weak subangular blocky structure. Some mottling often shows in the subsoil.

Chaseburg silt loam is moderately permeable. It has a high water-holding capacity and moderate fertility. It is fairly easy to cultivate and manage and is well adapted to corn, oats, hay, and pasture. Where

surface water runs off rapidly, alfalfa can be produced. Suitable crop rotations and the supplemental practices needed to control erosion and water losses are given in management subgroup 2–G. Good crop yields are obtained under good management.

Chetek Sandy Loam Soils

These soils have developed from mixtures of sand and gravel on nearly level to sloping outwash plains and broad terraces. The original forest cover was jack pine, oak, wild cherry, some white pine, and aspen.

Two types of landscapes were recognized in determining the slope phases of the Chetek sandy loam soils. The uniform slopes—nearly level, gently sloping, and sloping phases—face in only one direction. The complex slopes—undulating and gently rolling phases—face in several directions. The hills are conelike and the depressions between hills are undrained.

Chetek sandy loam soils differ from the Onamia soils in their coarser texture and their shallower depth to gravel. The depth to underlying sand and gravel ranges up to 24 inches and decreases as the slope increases.

Typical profile (Chetek sandy loam, nearly level):

A 0 to 12 inches, brownish-gray to brown, strongly acid, rather loose sandy loam; weak crumb structure that becomes platy in lower part.

B 12 to 24 inches, dark yellowish-brown to reddish-brown loam, strongly acid and of weak blocky structure; somewhat sticky in lower part just above the stratified sand and gravel.

D 24 inches +, dark yellowish-brown to yellowish-red, stratified, medium acid, waterworn gravel and sand.

These soils warm up quickly in the spring because they are rapidly permeable to water and have a low water-holding capacity. Droughtiness and low fertility make crop yields low. These soils are used mostly for corn, oats, hay, and pasture.

Chetek sandy loam, nearly level (CE).—This phase occurs near Chetek. Slopes are less than 2 percent. Rotations and management practices are suggested in management subgroup 3–C.

Chetek sandy loam, gently sloping (CD).—This phase on slopes of 2 to 6 percent is very similar to the nearly level phase in appearance, profile characteristics, and management requirements. Runoff is slightly more rapid, and the erosion hazard is somewhat greater than for the nearly level phase. This soil is in management subgroup 3–C.

Chetek sandy loam, sloping (CH).—This soil occurs on both pitted outwash and unpitted outwash. Slopes range from 6 to 10 percent. A few areas are eroded. Surface runoff is medium, and the erosion hazard is slight. This phase has a lower organic-matter content than the nearly level phase. Management is suggested in subgroup 3–B.

Chetek sandy loam, undulating (CK).—This phase has developed on slightly pitted outwash plains. It is nearly identical to the nearly level phase in appearance and profile characteristics, but its relief is more complex. Slopes, which range from 0 to 6 percent, are short and may face in several directions. The soil has slow surface runoff and

a slight erosion hazard. It is moderately difficult to work and manage. Practices are suggested in management subgroup 3–C.

Chetek sandy loam, gently rolling (Cc).—This phase is like the undulating phase in appearance and profile, but its complex slopes range from 6 to 10 percent. Each area of this phase may contain several undrained depressions. Management subgroup 3–B suggests suitable rotations and conservation practices.

Chetek Sandy Loam Soils, Shallow

These soils have formed on outwash plains in association with Chetek sandy loams. They resemble Chetek sandy loams in texture of the upper layers; however, they are usually slightly browner or more reddish brown in the subsoil because they have excessive internal drainage. The underlying gravel and sand are within a few inches of the surface.

Typical profile (Chetek sandy loam, shallow, nearly level):

A 0 to 10 inches, grayish-brown to brown, strongly acid, loose sandy loam; weak crumb structure.
B 10 to 16 inches, brown to reddish-brown strongly acid loam; weak blocky structure.
D 16 inches +, dark yellowish-brown to yellowish-red stratified mixtures of waterworn gravel and sand.

The degree of development of the B horizon varies.

Chetek sandy loam, shallow, nearly level (Cg).—Slopes of this phase are less than 2 percent. The depth of the profile ranges from 12 to 20 inches. Surface runoff is very slow and permeability is rapid. The natural fertility is low, and the water-holding capacity very low.

This soil does not produce high yields, although it will grow most of the crops usually planted in this locality. Crops do well if provided with plenty of plant nutrients and moisture. Adapted rotations and suggestions for management are given in management subgroup 3–C.

Chetek sandy loam, shallow, gently sloping (Cf).—This phase, on 2 to 6 percent slopes has a profile very similar to that of the nearly level phase, but there is somewhat more runoff. In fact, this soil is so droughty that moisture conservation is necessary. Suitable rotations and supplemental practices are given in management subgroup 3–C.

A few small areas of Chetek sandy loam, shallow, moderately sloping, are in this mapping unit. The slopes are 6 to 10 percent. This included soil is somewhat shallower than the gently sloping phase and has greater erosion hazard and more surface runoff. Such crops as oats, clover, timothy, alfalfa, and bromegrass are suited to these greater slopes. For satisfactory yields, fertility must be maintained and the moisture-holding capacity built up.

Cloquet Sandy Loam Soils

These soils developed from sandy glacial till in the northeastern and northwestern corners of the county. They are associated with

the Milaca soils. The native vegetation consisted of pine and mixed hardwoods. Many areas are now cleared and in crops or pasture. Natural drainage is excessive to good.

Typical profile (Cloquet sandy loam, undulating and gently rolling):

A 0 to 9 inches, yellowish-brown to grayish-brown, strongly acid, loose, friable sandy loam; weak crumb structure.
B 9 to 27 inches, yellowish-brown to yellowish-red strongly acid sandy loam; weak fine blocky structure.
C 27 inches +, dark reddish-brown light sandy clay loam to gravelly loam glacial till; massive structure.

Cloquet sandy loam, undulating and gently rolling (CN).—Slopes of this phase range from 2 to 10 percent. The surface soil may range from a loam to a loamy sand, the subsoil from a loam to a sandy loam, and the substratum from a light sandy loam to a sandy clay loam. The profile is usually 18 to 30 inches deep. Crops and management practices are suggested in management subgroup 3–B.

Cloquet sandy loam, rolling and hilly (CM).—This phase is like the undulating and gently rolling phase, but slopes range from 10 to 20 percent. The profile is more shallow than that of the undulating and gently rolling phase, surface runoff is higher, and the soil erodes more easily when cleared. As suggested in management subgroup 5–C, this soil should remain in forest.

Cloquet sandy loam, hilly (CL).—Complex slopes of 15 to 30 percent characterize this phase. It resembles the undulating and gently rolling phase, but its profile is shallower. It varies more in depth to underlying material and in texture of the A and B horizons. Most areas are in forest, the best use for this soil according to management subgroup 5–C.

Comstock Soils

Comstock silt loam (CP).—This imperfectly drained soil is located near the edges of glacial lake plains. Its poor drainage may be caused by seepage from associated better drained Campia and Crystal Lake soils. Slopes range from 0 to 2 percent. The original forest cover included oak, elm, and some basswood.

A typical profile near Turtle Lake:

A 0 to 12 inches, mottled grayish-brown to gray strongly acid silt loam; medium platy structure.
B 12 to 36 inches, brown to light-brown, mottled, very strongly acid silty clay loam; moderately developed medium blocky structure.
C 36 inches +, light brownish-gray mottled silt loam which contains some very fine sand, clay, and silt; stratified with depth and calcareous below 7 feet.

The surface soil is moderately permeable, but the subsoil is slowly permeable. Surface runoff is very slow, but the water-holding capacity is high. This soil now produces mainly oats, hay, and pasture, and some corn. Management practices are described in management subgroup 3–E.

Comstock loam (Co).—Most areas of this soil are on nearly level (0 to 2 percent slopes) glacial lake deposits along the western county line, where sandy material has washed in from higher ground. This

sandy material has changed the average texture of the surface horizon; without it, this soil would be Comstock silt loam. The subsoil and substratum are identical to those of Comstock silt loam, and the two soils are in management subgroup 3–E.

Crystal Lake Soils

Crystal Lake silt loam (Cs).—This soil is slightly better drained than the associated Comstock silt loam, which it resembles. Slopes are less than 2 percent.

Typical profile:

A 0 to 11 inches, grayish-brown to brown strongly acid silt loam; platy structure; breaks into soft granules.
B 11 to 32 inches, brown to light-brown, mottled, strongly acid, friable silty clay loam; weak blocky structure.
C 32 inches +, brown to yellowish-brown mottled silty clay, very fine sand, and silt; becomes stratified in the lower part and calcareous below 7 feet.

This soil is moderately fertile. When it is managed as suggested in management subgroup 2–E, good to excellent yields of corn, oats, hay, and pasture are produced.

A few areas of this unit near Crystal Lake and Scott Lake have a nearly neutral reaction in the surface horizon. The surface texture is more gritty, but otherwise these areas are like the others of this soil.

Crystal Lake loam (Cr).—This soil type occurs on slopes of less than 2 percent, mostly along the western county line. The subsoil and substratum are identical to those of Crystal Lake silt loam. The surface layer is grayish brown to dark reddish brown and friable. The structure is granular, and the reaction is strongly acid. This soil should be managed as described in management subgroup 2–F.

Freeon Silt Loam Soils

These soils are moderately well drained. They are not so well drained as the associated Santiago soils, but they otherwise resemble them. The original forest cover was mixed hardwoods and pines.

Typical profile (Freeon silt loam, nearly level):

A 0 to 10 inches, very dark brown to brown strongly acid granular silt loam that usually contains some grit; thin platy structure.
B 10 to 26 inches, brown to reddish-brown, mottled, strongly acid silty clay loam; medium blocky structure; slightly plastic and sticky when wet.
C 26 inches +, yellowish-red to reddish-brown glacial till.

These soils have a moderately permeable surface soil, slowly permeable subsoil, high water-holding capacity, and moderate natural fertility. Most areas are used for corn, oats, hay, or pasture.

Freeon silt loam, nearly level (Fb).—Erosion is not a hazard on this soil because its slopes are less than 2 percent. Its slow internal drainage makes it somewhat colder than the associated Santiago silt loam. Management subgroup 2–E suggests suitable rotations and accompanying practices.

Freeon silt loam, gently sloping (Fa).—This soil is very similar to the nearly level phase in appearance and in profile. Its slopes of

2 to 6 percent cause greater surface runoff, however, and put it in management subgroup 2–G.

Freeon silt loam, sloping (Fc).—This soil is very similar to the nearly level phase, except for its slopes of 6 to 10 percent. Surface runoff is medium, and there is a moderate erosion hazard.

High yields can be expected if the fertility level and organic-matter content are maintained. Alfalfa-bromegrass mixtures are very satisfactory on this soil when it is managed as described in management subgroup 2–H. Excess surface water should be removed.

A few small areas having slopes of 10 to 15 percent have been included with this soil. They will need some special management because of their greater erosion hazard.

Freer Silt Loam Soils

These imperfectly drained soils have developed under a forest cover of white pine, maple, elm, ironwood, and ash trees, and hazel and sumac shrubs. They are more poorly drained than Santiago and Freeon soils and better drained than the Adolph. Most of the parent material comes from a deposit of silt, about 16 to 28 inches thick, over reddish-brown glacial till. Slopes range from 0 to 10 percent.

A profile follows (Freer silt loam, nearly level):

A 0 to 8 inches, very dark brown to grayish-brown, mottled, strongly acid, granular silt loam containing some grit; thin platy structure.

B 8 to 26 inches, light brownish-gray, highly mottled, strongly acid, silty clay loam; medium blocky structure; slightly plastic and sticky when wet.

C 26 inches +, yellowish-brown to reddish-brown strongly acid glacial till.

Freer silt loams have high water-holding capacity. They are well suited to corn, silage, oats, hay, and pasture. They are considered to be cold soils, and corn may not mature.

Freer silt loam, nearly level (Fe).—Most of this phase is just south of the recessional moraine. It is very similar to the nearly level phase of Almena silt loam in profile characteristics and management requirements. It is in the same management subgroup, 3–E. The profile is shallower than that of the nearly level phase of Almena silt loam, however, and usually contains grit. The 0 to 2 percent slopes have a slow surface runoff, and the water-holding capacity is high.

Freer silt loam, gently sloping (Fd).—This phase, on slopes of 2 to 6 percent, is very similar to the nearly level phase in profile characteristics and appearance. In spite of its slightly greater erosion hazard, it often produces better crops than the nearly level soil because its surface drainage is better. It is in management subgroup 2–I.

Freer silt loam, sloping (Ff).—This soil is more shallow and more variable in depth than the nearly level phase. It may also receive more seepage water from higher ground. Slopes range from 6 to 10 percent. Practices for use of this soil are suggested in management subgroup 3–F.

A few acres of Freer soils that are more variable and somewhat stony are on 10 to 15 percent slopes, and these have been included in this mapping unit.

Freer Stony Silt Loam Soil

Freer stony silt loam, gently sloping (FG).—This soil has developed on slopes of 2 to 6 percent from relatively thin deposits of silt over glacial till. It is an imperfectly drained soil of the rolling uplands. Numerous stones are on the surface and throughout the profile.

Typical profile, just east of the Barron Hills:

A 0 to 10 inches, very dark brown to grayish-brown, mottled, strongly acid, granular silt loam; numerous stones throughout this horizon and on the surface.

B 10 to 24 inches, light brownish-gray, highly mottled, silty clay loam; slightly plastic and sticky when wet; contains numerous stones and boulders.

C 24 inches +, yellowish-red to reddish-brown glacial till.

The many stones throughout the profile of this soil are characteristic. The soil is not suited to crops because of the difficulty of working it. If it is cleared of forest at all, it should be used for pasture, as suggested in management subgroup 4–D.

A few areas of similar soils that are more sloping or less sloping than usual for this phase are included. They have the same use and are managed in the same way.

Gale Silt Loam Soils

Small areas of these soils have developed from 24 to 36 inches of loess or loesslike material over sandstone. They occur in the southern part of the county. The original forest was maple, oak, aspen, elm, and birch. Gale silt loams lie between the deeper Otterholt and the shallower Boone soils of the upland.

Typical profile (Gale silt loam, gently sloping):

A 0 to 9 inches, grayish-brown to brown, very strongly acid silt loam; medium platy in place but breaks out into medium-sized granules.

B 9 to 24 inches, yellowish-brown, strongly acid silty clay loam of medium blocky structure.

D 24 inches +, very pale brown and yellowish-brown, very strongly acid fine sand; contains sandstone fragments and is underlain by hard sandstone.

Surface runoff and internal drainage are good; water-holding capacity and natural fertility are moderate. These soils are easily worked. They are used to produce corn, oats, hay, and pasture.

Gale silt loam, gently sloping (GB).—The surface runoff from this phase is slow, and the erosion hazard is slight. Slopes range from 2 to 6 percent. Suitable rotations and suggested supplemental practices are given in management subgroup 1–B.

Gale silt loam, sloping (GC).—Except for its slopes of 6 to 10 percent, this phase is similar to the gently sloping phase in appearance and in most profile characteristics. It varies more in depth to underlying material. Surface runoff is medium. Management subgroup 2–C suggests practices that are suitable for this moderately erodible soil.

Gale silt loam, strongly sloping (GD).—This soil differs from the sloping phase in having a more shallow surface horizon, a more

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variable depth to underlying material, and slopes of 10 to 15 percent. When cleared, this soil has very rapid surface runoff.

As for the other soils in management subgroup 4–B, it is best not to cultivate this soil, but to leave it in forest or pasture. A few of the milder slopes can produce cultivated crops under very careful management.

Gale silt loam, eroded, sloping and strongly sloping (GA).—This unit has slopes of 6 to 15 percent that have been severely eroded. The surface soil is shallow, and the organic-matter content is low. The usefulness of this unit can be restored gradually if it is managed as suggested in subgroup 4–C.

Hixton Loam Soils

These well-drained soils developed from fine-grained sandstone, which in some places contained considerable silt and clay. This sandstone varies in degree of disintegration. It is 18 to 36 inches below the surface. These soils are mostly in the south-central part of the county on gently sloping to moderately steep uplands. The original cover was forest.

Typical profile (Hixton loam, gently sloping):

A 0 to 11 inches, grayish-brown to yellowish-brown very strongly acid loam; medium platy structure that breaks down into soft granules.
B 11 to 24 inches, brown to yellowish-brown medium acid loam to light sandy clay loam of weak blocky structure.
C 24 inches +, yellowish-brown medium acid loose sand and partially decomposed sandstone.

These soils are moderately permeable to water, and they have moderate water-holding capacity and fertility. They are easy to work. On lesser slopes, rotations of corn, oats, hay, and pasture are suitable. Under good management and fertilization, moderate to good yields of crops can be expected. Erosion is a great hazard only on the steeper slopes where fertility and organic-matter content have not been maintained.

Hixton loam, gently sloping (HH).—This phase has slopes of 2 to 6 percent and should be managed as suggested in management subgroup 2-A.

Hixton loam, sloping (HL).—This soil resembles the gently sloping phase but has slopes of 6 to 10 percent. Surface runoff is medium and the erosion hazard is moderate. The soil is somewhat droughty, but with such practices as those suggested in management subgroup 2–B, good yields of oats and hay can be obtained.

Hixton loam, strongly sloping (HM).—This phase of Hixton loam is like the gently sloping phase, except that its B horizon varies more in degree of development, its A horizon is thinner, and slopes range from 10 to 15 percent. These steeper slopes have more rapid surface runoff and are more difficult to work and manage. They need rotations and management practices such as are suggested in management subgroup 3–A.

Hixton loam, eroded, strongly sloping (HG).—Eroded slopes of 10 to 20 percent characterize this phase. The surface layer, a brown

to yellowish-brown strongly acid loam, has a medium granular structure and has a very low organic-matter content. Although the subsoil and substratum are very similar to those of the other phases of Hixton loam, the depth to parent material is only 16 to 24 inches.

Most areas are idle or are used for hay and pasture. Yields are low. The value of this soil can be restored over a period of years by following suggestions in management subgroup 4–C.

Hixton loam, moderately steep (HK).—This phase has slopes of 15 to 30 percent and, consequently, more rapid surface runoff and a greater erosion hazard than the less sloping phases. The profile is more shallow. The soil should be managed as outlined in management subgroup 4–B.

Hixton Fine Sandy Loam Soils

These fine sandy loam soils are closely associated with the Hixton loam soils, which they resemble except for surface texture. They have moderate to rapid surface runoff and a high erosion hazard. These soils are rapidly permeable to water.

A characteristic profile (Hixton fine sandy loam, sloping):

A 0 to 12 inches, grayish-brown to yellowish-red strongly acid friable fine sandy loam of weak platy structure.
B 12 to 26 inches, yellowish-brown to reddish-brown strongly acid loam of weak blocky structure.
C 26 inches +, yellowish-brown loose sand and partly disintegrated sandstone.

Oats, hay, pasture, and occasional corn crops are produced on these soils on the slopes of less than 20 percent. The steeper slopes are used mostly for pasture or left as woodland. Yields of crops are low during dry seasons. Special efforts should be made to conserve water on these soils. Since the organic-matter content is low, management practices should maintain or increase the natural supply. Liberal quantities of mineral fertilizers should be applied to hay crops.

Hixton fine sandy loam, sloping (HD).—This soil is not so subject to sheet and gully erosion as the steeper phases of Hixton fine sandy loam, because its slopes are only 2 to 10 percent. It can be used for crops when managed as suggested in management subgroup 2–B.

Hixton fine sandy loam, strongly sloping (HF).—This phase has a lower organic-matter content than the sloping phase, and its stronger slopes range from 10 to 15 percent. It should be managed according to the suggestions given in management subgroup 3–A.

Hixton fine sandy loam, eroded, strongly sloping (HB).—The surface layer of this eroded, strongly sloping phase is a yellowish-brown strongly acid fine sandy loam to loam. It has a medium granular structure and a low organic-matter content. The subsoil and substratum are very similar to those of the gently sloping phase of Hixton fine sandy loam. Slopes range from 6 to 15 percent.

Many areas are idle. Some are used for hay or pasture, but yields are low. This soil should be used for forest (see management subgroup 5–B).

Hixton fine sandy loam, moderately steep (HC).—This soil, on slopes of 15 to 20 percent, is more shallow, more droughty, and lower

in organic matter than the less sloping phases. It should be managed according to the suggestions in management subgroup 4–A.

Hixton fine sandy loam, steep (He).—Slopes of this phase range from 20 to 30 percent. It differs from other phases of Hixton fine sandy loam in being more shallow and in having less organic matter in the surface horizon. Management subgroup 5–A suggests that this soil not be cleared. If it is stripped of forest, surface runoff is rapid and the erosion hazard is great.

Hixton fine sandy loam, eroded, steep (Ha).—The surface layer of this phase is yellowish brown, strongly acid, and low in organic matter. The subsoil is similar to that of Hixton fine sandy loam, sloping. This eroded phase has slopes ranging from 20 to 30 percent. Management subgroup 5–B suggests ways of managing this soil.

Milaca Silt Loam Soils

These soils occur north of the recessional moraine, mostly along the north and west sides of the county. They have developed from reddish-brown glacial till. They vary widely in steepness and in type of slope.

The gently sloping, sloping, strongly sloping, and steep phases of this soil type are on relatively uniform slopes. These smooth and uniform slopes slant in one direction. The undulating, gently rolling, rolling, and hilly phases are on complex slopes. The complex slopes are short and choppy, face in several directions within the same area, and usually include small depressions or spots of wetter soils. Those soil phases on the more uniform slopes are much easier to manage for row crops than those on the complex slopes.

A typical profile (Milaca silt loam, gently sloping):

A 0 to 11 inches, gray to pale-brown strongly acid loam; contains many roots; well-developed platy structure.

B 11 to 22 inches, brown to reddish-brown, strongly acid, light sandy clay loam; blocky structure.

C 22 inches +, dark reddish-brown, strongly acid sandy clay loam glacial till, somewhat compact in place.

These soils have good surface runoff and internal drainage, moderate fertility, and a high water-holding capacity. The present forest cover consists of maple, oak, wild cherry, aspen, and a few scattered pines. Crops commonly grown, especially on the lesser slopes of these soils, are corn, oats, hay, and pasture. Because of frost, the corn crop does not mature every season and generally is used for silage.

Milaca silt loam, gently sloping (Mk).—This phase is on slopes of 2 to 6 percent. It is moderately permeable and has slow surface runoff. Stones are common on the surface and in the profile but usually do not interfere seriously with cultivation. Some suggestions for crop rotation and management are given in management subgroup 1–C.

Milaca silt loam, sloping (Mn).—This soil, on slopes of 6 to 10 percent, is associated with and is very similar to the gently sloping phase of Milaca silt loam. Surface runoff is medium, and the erosion hazard is moderate. This soil should be managed as explained in management subgroup 2–B.

Milaca silt loam, strongly sloping (MP).—There is very little of this soil, and most of its slopes range from 10 to 15 percent. A few areas which have slopes of 15 to 20 percent have been included.

This phase varies more in depth than the gently sloping phase and its surface runoff is higher. It is generally more difficult to work and manage than the less sloping phases, and should be used as suggested in management subgroup 3–A.

Milaca silt loam, steep (Mo).—This soil varies considerably in the thickness and texture of its various horizons. It is too steep to be suitable for cultivation. Most of it is now in forest. If it is cleared, surface runoff is very rapid and the erosion hazard is great. About 180 acres of Milaca silt loam in this unit has slopes even steeper than 30 percent. Management subgroup 5–A suggests management for soils like this one.

Milaca silt loam, undulating (MR).—This undulating phase is very similar to the gently sloping phase of Milaca silt loam except that it occurs on complex slopes of 0 to 6 percent. Small areas of Freer or Freeon soils, too small to be shown at the map scale used, are included. These inclusions of wetter soils are hard to drain for crops such as alfalfa. More suitable crops and necessary management practices are shown in subgroup 2–G.

Milaca silt loam, gently rolling (MH).—This soil, on complex slopes of 6 to 10 percent, has a more variable profile than the gently sloping phase. It is very susceptible to erosion and should be kept in close-growing crops much of the time. Management subgroup 2–H suggests some crop rotations. The complex relief limits the use of stripcropping for erosion control. The small areas of wetter soils included in this unit are a hazard to winter legume crops.

Milaca silt loam, rolling (MM).—Variations in the thickness and texture of the soil layers characterize this rolling phase. Its slopes of 10 to 15 percent give it greater runoff and erosion hazard than the gently rolling phase and make it more droughty. This soil is not suited to cultivated crops. It should be kept in permanent pasture as suggested in management subgroup 4–A. Most of this phase is now used for hay or pasture.

Milaca silt loam, hilly (ML).—This phase is similar to the gently sloping phase, but it has developed on complex slopes of more than 15 percent. The depth to the C horizon varies more, and the underlying material is often more porous and coarser textured. This soil should remain in forest, as suggested in management subgroup 5–A.

Milaca Fine Sandy Loam Soils

These soils are closely associated with the Milaca silt loams.

Typical profile (Milaca fine sandy loam, gently sloping):

- A 0 to 10 inches, light-gray to pale-brown strongly acid fine sandy loam; weak platy structure.
- B 10 to 18 inches, brown heavy loam to light sandy clay loam; strongly acid; moderately developed blocky structure.
- C 18 inches +, dark reddish-brown strongly acid loam (glacial till); somewhat compact in place.

The materials underlying these soils are very similar to but coarser than those of the Milaca silt loams. The more porous texture gives

them slightly lower fertility but makes them easier to cultivate than the silt loams. Their droughtiness lowers yields of corn and of second-cutting hay during seasons of average or less than average rainfall.

Milaca fine sandy loam, gently sloping (ME).—This soil has slopes of 2 to 6 percent and very slow surface runoff. The surface layer and subsoil are rapidly permeable and have a moderate water-holding capacity.

The depth to the C horizon may be 18 to 22 inches. The stones on the surface and throughout the profile in some places interfere with cultivation. Rotations and management practices suitable for this soil phase are suggested in management subgroup 2–A.

Milaca fine sandy loam, sloping (MF).—This phase has slopes of 6 to 10 percent and, consequently, a greater erosion hazard than the gently sloping phase. A few areas included in this unit are already eroded. The greater surface runoff makes the soil droughty during dry seasons. Most areas are now in forest, but they could be cultivated by following the practices described in management subgroup 2–B.

Milaca fine sandy loam, strongly sloping (MG).—More variation in thickness of horizons and depth of profile is likely in this phase than in the gently sloping phase. Most of it has slopes of 10 to 20 percent, but some steeper areas are included. Some of this soil is already severely eroded.

Most areas are used for forest. The soil can be used for crop rotations such as those named in management subgroup 3–A, with the practices outlined there.

Milaca-Cloquet-Peat Soil Complexes

These complexes are in the undulating and hilly country north of the recessional moraine. The Milaca, Cloquet, and Peat soils are so closely intermingled in an intricate pattern that they could not be separated at this scale of mapping. The proportion of each soil in the complexes varies from place to place, but the Milaca soils usually predominate. In some places the Milaca and Peat soils are about equal in extent; in other places half of the area may be Peat soils.

The profiles of the Milaca soils in these complexes are similar to those of Milaca silt loam and Milaca fine sandy loam soils. The Cloquet soils have a profile like that of Cloquet sandy loam. The Peat resembles that described elsewhere.

Most areas of these complexes are in forest and should not be cleared. If they are cleared, they are best suited to pasture. Fair to good pasture can be obtained under good management. Cropping these soils is very difficult because of the intermingling of small areas of wet and dry soils, which need widely different management practices and crops.

Milaca-Cloquet-Peat complex, undulating (MD).—Slopes for this unit range from 2 to 6 percent. The proportions of the different soils in each area differ considerably, but the Milaca and Peat soils are about equal in extent, and the Cloquet soil covers a smaller area. In some places the Peat soil may cover half of the acreage. The other soils vary a great deal in their permeability and their water-holding capacity. Generally, surface runoff is slow and the natural fertility is low.

Cleared areas are in pasture, and some oats and hay are grown. Cultivation of crops is difficult because of the undulating relief and the poorly drained Peat soil. Management subgroup 4–E suggests some crops and management practices that can be used.

Milaca-Cloquet-Peat complex, gently rolling (MA).—The Milaca and Cloquet soils in this mapping unit occur on slopes ranging from 6 to 10 percent. In both appearance and profile characteristics, soils of this complex are very similar to the corresponding soils in the undulating phase of the complex. They are managed as suggested in management subgroup 4–E.

Milaca-Cloquet-Peat complex, rolling (MC).—This complex is within the steeper areas of the morainic upland on slopes of 10 to 15 percent. In appearance and in most profile characteristics, the soils of this unit are similar to those of the undulating phase, but the percentage of Cloquet soil is often somewhat higher. In some sections, especially near Bear Lake, the Peat soil occurs in larger areas. This reduces the value of the complex for pasture. This complex is best used for forest (see management subgroup 5–A).

Milaca-Cloquet-Peat complex, hilly (MB).—This complex occurs on slopes greater than 15 percent, but mostly on slopes between 15 and 30 percent. Like the rolling complex, this complex is in the steeper part of the morainic upland, and it generally contains more of the Cloquet and Peat soils and less of the Milaca soils. It is in management subgroup 5–A.

Omega Loamy Sand Soils

These excessively drained soils occupy sandy outwash plains, the largest of which is near Chetek. They have developed under a forest cover consisting predominantly of jack pine, oak, aspen, maple, some white pine, and a ground cover of currants, blueberries, and various grasses. They are characterized by a sandy texture throughout and a lack of development in the B horizon.

Typical profile (Omega loamy sand, nearly level):

A_{11} 0 to 3 inches, grayish-brown to pale-brown (brown to very dark brown in forested areas), strongly acid loamy sand of weak granular structure; 2- or 3-inch layer of partially decomposed organic material usually is on the surface in wooded sites.

A_{12} 3 to 18 inches, brown to yellowish-brown strongly acid sand of single-grain structure; may be slightly cemented in places.

D 18 inches +, yellow to yellowish-red, slightly acid, loose, stratified sand that becomes coarser with depth.

The rate of surface runoff from these soils is slow, the water-holding capacity is very low, and the wind-erosion hazard is severe where the soils are cultivated. The fertility level is low, but the soils are easily worked and tilled.

These soils are used principally for corn, hay, oats, pasture, and truck crops. Yields are low, especially in dry seasons. Improvement depends to a great extent on the maintenance of the highest possible fertility and organic-matter content.

The following phases of Omega loamy sand are separated on the map on the basis of slope differences that affect management.

Omega loamy sand, nearly level (OE).—The rate of runoff from these slopes of 0 to 2 percent is very slow. The soil should be managed as suggested in management subgroup 3–D. Large amounts of fertilizer, manure, and organic matter must be added before crops will be profitable. Rotations should consist of grasses for at least 4 out of 5 years.

Omega loamy sand, gently sloping (OA).—Slopes of 2 to 6 percent are the principal difference between this phase and the nearly level phase. This phase is in the same management subgroup, 3–D.

Omega loamy sand, sloping (OF).—This phase is like the nearly level phase, but greater slopes, ranging from 6 to 10 percent, make more intensive management necessary. Besides heavy fertilization and long rotations, this phase may need stripcropping, terraces, and protection from wind erosion, as suggested in management subgroup 3–D.

Omega loamy sand, strongly sloping (OG).—The surface layer of this phase is somewhat more shallow than is typical for Omega loamy sand, but the profile is otherwise similar. Slopes range from 10 to 20 percent. The intensive management necessary and the low returns from cultivated crops make this phase unsuitable for such use. It is included in management subgroup 5–C. It is best to leave this soil in forest.

Omega Loamy Sand Soils, Gravelly Subsoil

These soils are on relatively recent stream terraces and near the streambanks of older outwash terraces. They are very sandy and excessively drained. The forest cover under which they developed included jack pine, oak, maple, and some white pine.

Typical profile (Omega loamy sand, gravelly subsoil, nearly level):

A 0 to 2 inches, very dark brown to brown strongly acid loamy sand of weak granular to single-grain structure.
B 2 to 16 inches, reddish-yellow to yellowish-red loose loamy sand.
C 16 inches +, yellowish-red and yellow loose stratified sand and gravel.

The depth to underlying sand and gravel varies from 12 to 30 inches. Permeability of the surface and subsoil is rapid, surface runoff is slow, and the water-holding capacity is low. These soils have a moderate wind-erosion hazard and very low natural fertility. They have a gravelly subsoil and are easily worked. Yields of corn, oats, hay, and pasture are comparable to those on the Omega loamy sands.

Omega loamy sand, gravelly subsoil, nearly level (OC).—This phase has slopes ranging up to 2 percent. Suitable rotations are described in management subgroup 3–D.

Omega loamy sand, gravelly subsoil, gently sloping (OB).—This soil is very similar to the nearly level phase in appearance and profile characteristics but its slopes range from 2 to 6 percent. It belongs to the same management subgroup, 3–D.

Omega loamy sand, gravelly subsoil, sloping and strongly sloping (OD).—This phase occurs mostly along the edges of draws or on breaks toward the stream bottoms. Slopes are mostly uniform and range from 6 to 15 percent, but about 64 acres of this soil is on complex slopes of 10 to 15 percent. The texture of the surface soil and subsoil

and the thickess of the A horizon vary considerably. As suggested in management subgroup 5–C, this soil is best suited to forest.

Onamia Loam Soils

These soils have developed on the well-drained glacial outwash plains. They have moderate water-holding capacity, a moderately permeable surface soil and subsoil, and a moderate fertility level.

Profile (Onamia loam, nearly level):

A 0 to 10 inches, light-gray to pale-brown strongly acid loam; thin platy structure that breaks into soft granules.
B 10 to 24 inches, very pale brown to yellowish-red, very strongly acid sandy clay loam; contains a few pebbles and small stones.
C and D 24 inches +, yellowish-red, stratified, strongly acid, cobbly sand and gravel composed of waterworn noncalcareous crystalline rock.

Most areas of Onamia loam are used for corn, oats, hay, and pasture.

Onamia loam, nearly level (OL).—This phase has 0 to 2 percent slopes. Those areas that are associated with the Antigo soils are somewhat deeper and more silty than those associated with the Chetek soil. This soil should be cropped and managed according to the suggestions in management subgroup 1–C.

Onamia loam, gently sloping (OK).—This soil resembles the nearly level phase, but its slopes range from 2 to 6 percent. Most slopes are uniform, but some undulating or complex slopes are included. The surface runoff is greater than on the nearly level phase and the soil is somewhat more droughty. Also, the A horizon is shallower and the depth to underlying parent material varies more. The soil has a slight hazard of erosion. Like the nearly level phase, it is in management subgroup 1–C.

Onamia loam, gently rolling (OH).—These complex slopes of 6 to 10 percent are inconvenient to farm. Management such as that suggested in management subgroup 2–B is needed to conserve the soil. The erosion hazard is moderate, and some of the stronger slopes are already seriously eroded. Surface runoff is medium. The surface soil is thinner than that of the yearly level phase, and the profile varies more in depth.

Otterholt Silt Loam Soils

These soils have developed from a mantle of silt 20 inches or more thick that rests on glacial till. They occur on well-drained slopes of 1 to 15 percent. The forest cover was mostly oak, red maple, ash, aspen, cherry, and a few pines.

Typical profile (Otterholt silt loam, nearly level):

A 0 to 9 inches, dark-brown to grayish-brown very strongly acid friable silt loam; thin platy structure; numerous roots and worm casts.
B 9 to 30 inches, reddish-brown, very strongly acid, weakly blocky silty clay loam; gray coatings often present on the surfaces of the structural faces.
D 30 inches +, reddish-brown, strongly acid, massive glacial till.

Where the silt layer was deeper than 30 inches, a horizon of friable silt lies between the subsoil and the glacial till. This indicates that the soil profile has been developing entirely within the silt horizon.

These are among the best agricultural soils in the county. They are easy to work and nearly stone-free. Fertility is moderate and water-holding capacity is high. The surface soil is moderately permeable and has slow to medium runoff. The erosion hazard is slight to medium. Otterholt silt loams are well adapted to the common agricultural crops of the county—corn, oats, hay, and pasture.

Otterholt silt loam, nearly level (On).—This phase has slopes of less than 2 percent. The till parent material lies within 30 to 42 inches of the surface, and its texture varies from a fine sandy loam to a sandy clay.

This is considered an excellent soil. Suitable rotations are suggested under management subgroup 1–A.

Otterholt silt loam, gently sloping (Om).—This soil is very similar to the nearly level phase in appearance and profile characteristics, and is well suited to the same crops. Its slopes of 2 to 6 percent have more rapid surface drainage and a slightly greater erosion hazard than those of the nearly level phase. This phase should be managed as suggested in subgroup 1–B.

Otterholt silt loam, sloping (Oo).—These slopes of 6 to 10 percent are in more danger of erosion than the nearly level areas of the same soil. Already eroded spots show on the points of hills or on the longer slopes. This soil has less organic matter in the surface layer and a shallower depth than the nearly level phase. Management subgroup 2–C has suggestions for its use.

Otterholt silt loam, strongly sloping (Op).—This soil is like the nearly level phase in appearance and in most profile characteristics, except that it has less organic matter in the surface soil and a more variable depth to parent material. Surface runoff is rapid and the erosion hazard is moderate on these slopes of 10 to 15 percent. Some spots are eroded now. This soil is a little more difficult to manage for ordinary crops than the less sloping phases, and it is in management subgroup 2–D.

Peat and Muck Soils

Peat and Muck (Pa).—The Peat and Muck soils were not separated in mapping this county. Both have developed in deep depressions within the glacial uplands, on old lake deposits, and along streams. These soils have formed where the water table stands at or above the surface most of the time. Slopes range from 0 to 2 percent.

Typical profile of a shallow Peat soil:

0 to 10 inches, dark-brown peat that contains many fragments of sedges, mosses, and tamarack in various stages of decomposition.
10 to 24 inches, brown partially decomposed plant remains.
24 inches +, glacial till, lacustrine clay, or alluvium saturated with water and usually gray.

Muck soils may have 10 inches of black muck instead of peat as the surface layer. The depth of the layer of peat or muck and plant remains varies considerably and often is more than 42 inches. The decomposition of the surface layer varies a great deal from one place to another. Permeability of the surface layer is slow, and of the subsoil, very slow. Runoff is very slow, and the water-holding capacity is extremely high.

These soils are very difficult to manage when not drained. Hay, pasture, and some special cultivated crops can be produced when the soils are drained. Natural fertility is low, and frost is a great hazard to crops. Suggestions for management are given in management subgroup 5–D.

Pitted Outwash Land Types

These land types are mostly near Cumberland and Red Cedar Lake. Level plains of sand and gravel were washed out and deposited by water from melting glaciers. Blocks of ice were frequently washed along and buried in the gravel. When these melted, pits or kettles were left on the surface. Many of these kettles are now filled with water or swampy deposits.

Because the sand and gravel beds lie at all angles, the surface textures of the soils vary from sandy loam to silt loam within very short distances. Both the surface soils and subsoils are rapidly permeable. Runoff is very rapid. Both the natural fertility and the water-holding capacity are low.

Most of this land is in forest or pasture. The erosion hazard is great when such land is cleared.

Pitted outwash, rolling (Pc).—Small intermixed areas of Chetek, Onamia, and Antigo soil materials cover this land type, which has slopes of 10 to 15 percent. It can be used for pasture, as suggested in management subgroup 4–A.

Pitted outwash, hilly (Pb).—This hilly land type is made up of Chetek and Onamia soil materials. Its slopes of 10 to 20 percent have a greater surface runoff and erosion hazard than the slopes of the rolling complex. A few small areas are rather uniformly covered with a thin silt deposit. This land type is used mostly for forest, as suggested in management subgroup 5–C.

Poskin Soil

Poskin silt loam (Pd).—This imperfectly drained soil developed on slopes of 2 percent or less from silty material deposited over stratified sand and gravel. Drainage is better than that of the very poorly drained Warman soils and not so good as that of the associated Antigo and Brill soils. Poskin silt loam has slow permeability in the subsoil, a high water table, very slow surface runoff, high water-holding capacity, and moderate natural fertility.

Typical profile:

A 0 to 11 inches, dark-gray to grayish-brown, strongly acid, friable silt loam; weak thin platy structure.

B 11 to 31 inches, highly mottled, pale-brown to brownish-gray and yellowish-red, very strongly acid silty clay loam; fine blocky structure.

D 31 inches +, mixtures of yellowish-brown and yellowish-red, strongly acid, stratified sand and gravel; where silty deposit was somewhat deeper, there is a layer of friable silty material between the B horizon and the stratified sand and gravel.

This soil is moderately difficult to work and manage because of its poor internal drainage. Most of it is used for corn, oats, hay, and pasture. Suitable rotations are suggested in management subgroup 3–E.

Riverwash

This miscellaneous land type (RA) consists of mixtures of sand and gravel with some fine material, recently deposited in streambeds or near streams. These areas are frequently overflowed. The surface soil and subsoil are rapidly permeable. This land has very slow surface runoff and very low water-holding capacity.

Riverwash has little if any agricultural value. It is in management subgroup 5–D. Most areas are in forest or are lying idle. The gravel beds may be a local source of road material, but this is not greatly needed.

Santiago Silt Loam Soils

These soils have developed on nearly level to moderately steep glacial upland. The parent material is a thin loesslike silt, usually less than 24 inches deep, over reddish-brown glacial till. The original forest was oak, maple, basswood, birch, elm, and pine. The profile resembles that of Otterholt silt loam, but it is shallower.

A typical profile (Santiago silt loam, nearly level):

A 0 to 12 inches, dark-brown to grayish-brown very strongly acid friable silt loam; thin platy structure; numerous roots and worm casts.
B 12 to 24 inches, reddish-brown very strongly acid silty clay loam; weak blocky structure; somewhat gritty.
C 24 inches +, reddish-brown to dark reddish-brown strongly acid massive glacial till.

These soils have good internal drainage and moderately permeable surface soil and subsoil. The fertility level is moderate and the water-holding capacity is high. Because of their friable silty surface layer, Santiago silt loams are easy to work. On slopes of less than 10 percent, they are well adapted to corn, oats, hay, and pasture. Yields are rather high.

Santiago silt loam, nearly level (SD).—This is one of the best agricultural soils of the county. Slopes range from 0 to 2 percent. Management subgroup 1–A suggests some rotations that are suited to this soil.

Santiago silt loam, gently sloping (SB).—This soil has a profile similar to that of the nearly level phase. The slopes are 2 to 6 percent, however, and the A horizon is more shallow. Some areas occur near recessional moraines that have complex relief. The soil is in management subgroup 1–B.

Santiago silt loam, sloping (SE).—The silt loam surface layer of this soil is more shallow than that of the nearly level phase. The entire soil varies more in depth. Slopes of 6 to 10 percent allow medium surface runoff. The erosion hazard is moderate.

Although this phase is adapted to the same crops as the nearly level phase, yields are usually lower, the soil is more difficult to work and manage, and more care is necessary to prevent erosion. This soil is in management subgroup 2–C.

Santiago silt loam, eroded, sloping (SA).—The silty surface soil and the rather compact glacial till substratum make this phase of Santiago silt loam very susceptible to erosion. Since it is more shallow to underlying glacial till than the Otterholt soil, permanent erosion damage shows more quickly.

This phase of Santiago silt loam occurs on slopes of 6 to 15 percent. The A horizon is shallow or missing. The B and C horizons are similar to those of the nearly level phase. The soil has slow permeability in its surface layer, and moderate water-holding capacity. Runoff is rapid, and the erosion hazard is great.

This soil is in management subgroup 2–C. It needs heavy applications of manure, lime, and fertilizer. Close-growing crops should be maintained as much of the time as possible to conserve the soil.

Santiago silt loam, strongly sloping (SF).—This phase is on slopes of 10 to 15 percent along draws and in the steeper areas of the Otterholt and Santiago soil association. Most of the slopes are simple, but a few complex slopes are included.

The organic-matter content is lower and the thickness of the profile varies more for this strongly sloping phase than for the nearly level phase. The rapid surface runoff and great erosion hazard make it necessary to manage this soil as suggested in management subgroup 2–D.

Santiago silt loam, moderately steep (SC).—This phase occurs along draws and on steeper slopes in the Otterholt and Santiago soil association. Slopes range from 10 to 30 percent. A few areas have complex slopes, and there are a few eroded spots.

The grayish-brown friable silt loam surface layer has a rather low organic-matter content. The soil is otherwise similar to the nearly level phase. This soil is difficult to work and to manage because of its very rapid surface runoff and great erosion hazard. Management subgroup 4–B has some suggestions for its use and conservation.

Santiago Stony Silt Loam Soils

These soils are so stony that they cannot be cultivated. Otherwise they would be like the Santiago silt loams. Most of the stones are quartzite. These stony phases occur near the Barron Hills. Most of the areas are in forest; a few on the lesser slopes are cleared for pasture.

Santiago stony silt loam, sloping (SG).—This phase has developed on slopes of 6 to 10 percent; in a few places, slopes are less than 6 percent. The soil ranges from 16 to 24 inches in depth. Its nearly black to dark-brown, strongly acid, friable stony loam surface layer has a thin platy structure and contains many roots and worm casts. The stones are from Barron Hills quartzite and from some other glacial materials. The subsoil, a reddish-brown stony silty clay loam, is somewhat gritty, strongly acid, and of weak blocky structure. The parent material, or substratum, is a reddish-brown glacial till.

This soil is not likely to erode, but the stones make it very difficult to manage. Most areas are in forest, which is the best use for them. A few areas have been cleared for pasture, which gives moderate to good yields. The pastures are hard to renovate because of the stones. Management subgroup 4–D suggests some practices.

Santiago stony silt loam, strongly sloping (SK).—Slopes of 10 to 20 percent are the main difference between this phase and the sloping phase. The soils are very similar in appearance, profile characteristics, and management requirements. They are in the same management subgroup, 4–D, but this phase has rapid surface runoff and a moderate erosion hazard when overgrazed.

Santiago stony silt loam, steep (SH).—Most of this soil has slopes of 20 to 30 percent, but a few acres have slopes greater than 30 percent. This phase looks much like the sloping phase. It has a very rapid surface runoff and a moderate erosion hazard when cleared. Most areas are in forest and should remain so, as suggested in management subgroup 5–A.

Scott Lake Soil

Scott Lake sandy loam (SL).—This soil occurs in small bodies on old river terraces near the edges of small lakes and marshes or near streams where the water table is somewhat high. It is moderately well drained and is associated with the excessively drained Chetek soils on sandy and gravelly outwash plains. Slopes are less than 2 percent. The natural forest cover was mixed hardwoods and some pine.

Typical profile:

A 0 to 11 inches, dark grayish-brown, changing to yellowish-red, strongly acid, friable sandy loam; weak platy structure; contains numerous roots.
B 11 to 32 inches, reddish-brown, mottled with yellowish-red, strongly acid sandy clay loam; medium blocky structure.
C 32 inches +, yellowish-red strongly acid sand to loamy sand of single-grain structure; stratified below a depth of 36 inches.

The texture of the B horizon may vary somewhat. This soil is now used for corn, oats, hay, and pasture. Management subgroup 2–F gives some appropriate practices.

Spencer Silt Loam Soils

These moderately well drained soils are intermediate in relief and drainage between the associated well-drained Otterholt and the imperfectly drained Almena soils. They developed from silty material, which is 30 to 42 inches deep over reddish-brown medium-textured till.

Typical profile (Spencer silt loam, nearly level):

A 0 to 11 inches, dark-gray to brown, strongly acid, friable granular silt loam; thin platy structure when in place.
B 11 to 30 inches, pale-brown to brown, strongly acid, mottled silty clay loam; medium blocky structure; gray coating on the structural faces.
D 30 inches +, dark reddish-brown strongly acid massive glacial till.

The surface soils are moderately permeable, the subsoils slowly permeable, and the fertility level moderate. Scattered stones are found in the profile or on the surface, particularly where depth to till is less than 36 inches. Corn, oats, hay, and pasture are the most common crops.

Spencer silt loam, nearly level (SN).—These slopes of less than 2 percent are easy to work and have a very slight erosion hazard. The soil is considered very desirable for agriculture. With good management, such as that suggested in subgroup 2–E, moderate to good yields can be expected. A few areas are deeper than the rest of the unit and are entirely stone free.

Spencer silt loam, gently sloping (SM).—This soil has slopes of 2 to 6 percent but is similar to the nearly level phase in appearance and most profile characteristics. The same crops are adapted to this

soil. There is a slight erosion hazard, and diversion terraces may be helpful on the longer slopes. The increased surface runoff improves the drainage of this phase (see management subgroup 2–G).

Spencer silt loam, sloping (So).—The medium-gray to brown friable granular silt loam surface soil is somewhat more shallow than that of the nearly level phase, and the organic-matter content is lower. Subsoil and parent materials are very similar. The slopes of this phase range from 6 to 10 percent.

The soil has medium surface runoff and a high water-holding capacity. It is moderately difficult to work and manage because of its slope and its moderate erosion hazard. Diversion terraces and other practices suggested in management subgroup 2–H are helpful in managing this soil.

Stony Steep Land

Only small areas within the Barron Hills are called Stony steep land (Sp) in this survey. These areas include rock outcrops, talus slopes, and extremely stony soil. Most slopes range from 20 to 45 percent. The soil may be rather deep between the stones and in cracks in the bedrocks. A few trees grow here, but there is no land suitable for pasture. Management subgroup 5–A gives a few suggestions for management.

Terrace Escarpment

These units are mapped on the steep slopes at the edges of outwash deposits. The Chetek soil material, only 6 to 12 inches deep, overlies glacial drift.

The surface soil is a brownish-gray acid loose sandy loam to gravelly sandy loam. It has a weak crumb structure and a low organic-matter content. Usually it is underlain directly by stratified, loose, yellowish-brown sand and gravel. A few spots have a B horizon between the thin A horizon and the glacial material, but most do not.

The soil material is rapidly permeable throughout and is very droughty. Natural fertility is very low. Most areas of Terrace escarpment are idle or are in forest or pasture.

Terrace escarpment, strongly sloping (Tb).—Slopes for this land type range from 10 to 20 percent. This land is in management subgroup 5–C.

Terrace escarpment, moderately steep (Ta).—These slopes range from 15 to 30 percent. This land should be left in forest as suggested in management subgroup 5–C.

Wallkill Soil

Wallkill silt loam (Wa).—This soil has formed from muck, over which 12 to 30 inches of silty material has accumulated. It occurs in deeper depressions where material has washed down from surrounding eroded soils. It is also along streams where local overwash and flood deposits have covered muck soils. Slopes range from 0 to 2 percent.

The dark-gray, acid, granular silt loam surface soil contains numerous roots. The black to very dark brown muck directly beneath it varies considerably in thickness.

Wallkill silt loam has moderate permeability, slow to very slow subsoil permeability, very slow surface runoff, high water-holding capacity, and moderate fertility. Most areas are now in hay, pasture, or forest. Suitable practices are suggested in management subgroup 4–E.

Warman Soils

Warman silt loam (WD).—Some ponding of water during wet seasons in very slight depressions within the glacial outwash terraces has aided in developing this soil type. Slopes range from 0 to 2 percent. The parent material is silt, 24 to 30 inches deep over stratified sand and gravel. The native vegetation was sedges and other water-tolerant plants.

Profile description:

A 0 to 10 inches, dark-gray friable strongly acid silt loam; thin platy structure; rather high organic-matter content.

B_g 10 to 30 inches, gray to grayish-brown, mottled, strongly acid, heavy silt loam; massive structure.

D_g 30 inches +, yellowish-brown to yellowish-red, acid, waterlogged, stratified sand and gravel.

This soil has a darker surface color than the associated Onamia and Antigo soils. Both internal and surface drainage are very slow. In a few places the silt is more than 30 inches deep, and here the soil tends to be even more poorly drained. Permeability of both the surface soil and subsoil is very slow, and the water-holding capacity is high.

Fertility is moderate. Most areas are in forest. Those that have been cleared are producing hay and pasture. Management subgroup 4–E gives some suitable crops and management practices.

Warman loamy sand, gravelly subsoil (WC).—This soil is like Warman silt loam in position and manner of formation but has developed from coarser material. This coarse granitic material was deposited in level to depressional areas in the residual sandstone. The sandstone is sometimes at depths of 36 to 48 inches. This phase is associated with Chetek loamy sand. The surface drainage is slow and the water table is high. The original forest cover was pine, poplar, elm, maple, and cherry. Slopes range from 0 to 2 percent.

A typical profile:

A 0 to 12 inches, gray to dark-gray, strongly acid, loamy sand; weak granular structure; often has some black mucky material on the surface.

B 12 to 22 inches, mottled yellowish-red and gray, acid, loamy sand of single-grain structure; contains a few roots.

C 22 inches +, yellowish-brown to yellowish-red, acid, stratified, waterlogged sand and gravel.

The surface soil and subsoil are slowly permeable, and the fertility level is low. When this soil is drained, its water-holding capacity is low. It is in management subgroup 4-E.

Warman loamy fine sand (WB).—This poorly drained soil occurs in the southern part of the county in association with Chetek and related soils.

A profile description follows:

A 0 to 12 inches, brownish-gray to gray strongly acid loamy fine sand; weak granular structure; high organic-matter content.
B 12 to 22 inches, mottled yellowish-red to gray acid loamy fine sand.
C 22 inches +, yellowish-brown to yellowish-red acid stratified sand and gravel; waterlogged; sandstone often lies at depths of 36 to 48 inches.

This phase slopes less than 2 percent and is poorly drained. If it is artificially drained, as suggested in management subgroup 4-E, it produces hay or pasture. It is droughty in dry seasons but gives higher yields than Chetek sandy loam on comparable slopes.

USE, MANAGEMENT, AND PRODUCTIVITY OF BARRON COUNTY SOILS

Soil is the natural medium for crops. Productivity is largely determined by (1) the characteristics of the soil, (2) the management the soil receives, and (3) the climate. Management is ordinarily the only factor entirely under the farmer's control.

The management a soil receives can usually be varied between wide limits. The management actually used will depend upon the farmer's preferences and current economic conditions. A soil can be drained or irrigated; it can be fertilized, limed, properly tilled, and planted to the best crop varieties in a good rotation. Proper measures can be applied to control erosion and conserve moisture. The results will be greatly influenced by the amounts of lime, fertilizer, and water used, the skill with which the management practices are applied, the needs of the particular crop on the soil, and its responsiveness to the practices used.

Within very broad limits, Barron County soils differ in their physical characteristics and, consequently, in their use capability and the management they need. These differences are reflected in productivity, workability, and conservability. An ideal soil for crops is one that is very productive, easily worked, and capable of being conserved with a minimum of effort. All of the soils of this county fall short of this ideal.

The land ranges in relief from nearly level to slopes of about 50 percent. The steeper slopes are only in the southernmost part of the county in the Barron Hills, or in narrow strips forming terrace escarpments.

The natural tilth of the surface soil throughout the county is good. With reasonable management and care, it will not puddle, bake, or become cloddy. The soils of the central areas are usually free of stones, but boulders are numerous throughout the northern part. Sandy spots or rock outcrop occur frequently in the southern part.

Climate limits the production of certain crops. The growing season varies widely from year to year, but is, on the average, rather short. The soil climate (conditions within the soil) varies with the relief, parent material, and internal drainage of the soil. Each of these factors influences the use and the capability of the various soils.

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Lime

In Barron County, soil acidity, or in other words, shortage of calcium, is usually the first factor limiting crop production. Lime is needed on nearly all the soils. Many soils are extremely acid (table 10, p. 96) and initially require 4 to 6 tons of lime per acre.

Lime is necessary to bring the soil to a desirable neutral reaction (for most field crops a pH of about 6.5 is best); to supply calcium as a plant nutrient; and to assist plants in using the commercial fertilizer and manure that may be added. This need for lime has long been recognized. Some farmers have limed their entire farms. The liming has appreciably increased yields of corn and hay (fig. 12).

According to estimates compiled by C. J. Chapman of the University of Wisconsin, the production of agricultural lime in Barron County has increased from 3,505 tons in 1938 to 29,531 tons in 1945. Most of this lime has been used within the county. The principal local sources of lime are the marl pits near Turtle Lake and Staples Lake, and limestone outcrops in the southwestern part of the county. A large amount is trucked in from Dunn County each year.

Fertilizers

There is considerable variation in fertility level and organic-matter content in the soils of Barron County, even in the virgin state. These differences have been widened by cultivation and accelerated erosion. In general all the soils are low in available calcium, phosphorus, and potassium. Most areas which have been farmed for many years are also low in organic matter and nitrogen.

Commercial fertilizers came into general use about 1940. Most of the fertilizer is used for the corn and potato crops. Yields in columns B of table 8 (p. 80) indicate the response of the soils when crops are grown in a good rotation, and properly fertilized and limed. Heavier applications of nitrogen, phosphorus, and potassium and the addition of minor elements, such as boron, will bring even higher yields than are shown in columns B of table 8.

Rotations

The changing of crops in a field from one year to another is now a common practice, but only a few farmers follow definite rotations. Each farmer tries to produce more feed for his livestock. Corn often follows corn, especially if the field is nearly level or the soil is rather high in fertility.

The most common rotation within the county is corn, oats, and 1 or 2 years of hay. Variations of this rotation include the use of the hay crop the second and even the third year for pasture, or the plowing under of the second-year hay for the production of special crops such as potatoes, rutabagas, or peas.

The choice of crop varieties and rotations can be most wisely made after a thorough consideration of all the soil characteristics, the climate, and the use to be made of the crops grown.

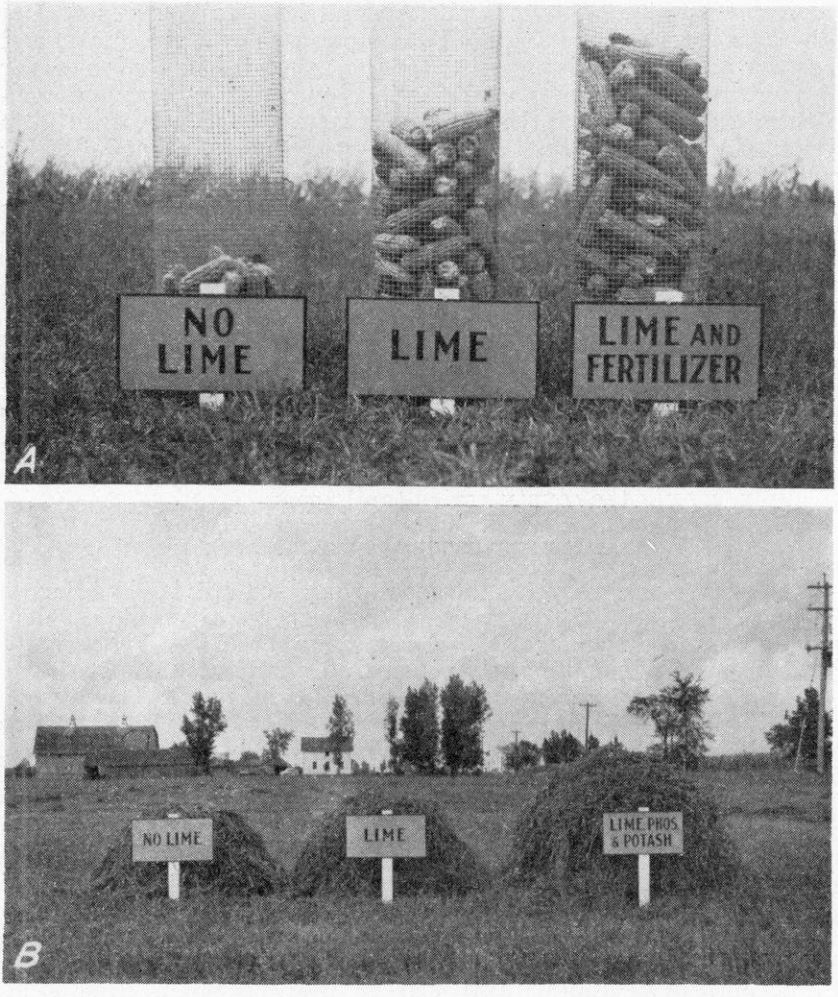

FIGURE 12.—Effect of lime and fertilizer on yields from two soils.

A, Yields of corn on plots of Spencer silt loam near Almena: No lime, 9.8 bushels per acre; lime, 34.4 bushels; and lime and fertilizer, 60.5 bushels. *B*, Yields of first-cutting hay on plots of Antigo silt loam west of Brill. Total yield for the year (two cuttings): No lime, 1.05 tons per acre; lime, 1.73 tons per acre; and lime, phosphorus, and potash, 3.27 tons per acre. (Photos and experimental data by Dr. O. J. Attoe, University of Wisconsin.)

Soil Management Groups

The soils of Barron County have been placed in five management groups on the basis of their suitability for agricultural use and their management requirements. Each management group has subgroups established according to certain specific differences among the soils.

The physical suitability of the soils for agriculture has been estimated on the basis of the experience of farmers, extension workers,

experiment station personnel, soil conservationists, soil surveyors, and others who work with the soil. By comparisons on a given farm and between farms, the soils were listed in the order of their usefulness for agriculture under present conditions. If information based on agricultural experience with the soil was lacking, the soil was assigned to a group by comparing its characteristics with those of related soils for which agricultural information was available.

In the following pages a short discussion of the general characteristics of each management group is given. After each group, its subgroups are separately discussed. Suitable crop rotations and other management practices are suggested for each subgroup.

The suggestions are based upon information from the University of Wisconsin. Further research, or changes in the types of farming and crops grown, will change the patterns of management best adapted to each soil. It is suggested that the reader refer to the most recent publications of the Wisconsin Agricultural Experiment Station and the Agricultural Extension Service on soils and crops. For up-to-date information on soil tests and amounts and kinds of fertilizer and lime to apply, consult the county agricultural agent.

MANAGEMENT GROUP 1—GOOD CROPLAND

In management group 1 is the good to excellent cropland of Barron County. The soils of this group differ in degree of profile development, type of parent material, color, structure, and in other respects, but they are similar in general physical suitability for crops.

These soils have no serious limitations on their use. They are almost free of stones, and the slopes are not steep enough to interfere with tillage. Erosion is only a slight hazard and is easily controlled. The soils are not severely eroded. All are strongly acid, and all are well drained. Air, water, and plant roots penetrate readily. Good tilth is easily maintained.

All soils of this group have a better supply of plant nutrients than other soils of the county, but even the most fertile of them needs fertilizers for some crops. The organic-matter content is relatively low. All of the soils of this group need nitrogen, phosphorus, potassium, and lime. For some crops, minor elements should be added. The amounts to be added depend on natural fertility, previous fertilization, crops to be grown, and other practices.

This group covers 173,150 acres, or 30 percent of the county. Estimated yields under two levels of management are given in table 8.

Management subgroup 1–A

Antigo silt loam, nearly level (0 to 2 percent slopes).
Campia silt loam, nearly level (0 to 2 percent slopes).
Otterholt silt loam, nearly level (0 to 2 percent slopes).
Santiago silt loam, nearly level (0 to 2 percent slopes).

The soils of subgroup 1–A occupy 40,900 acres in Barron County. Except for the Santiago silt loam, all have developed from deep silty material and overlie moderately permeable to rapidly permeable substrata. The soils have a high water-holding capacity, are well drained, and are very easy to manage and to conserve. The organic-matter content of each is relatively low.

All areas need lime to produce clover and alfalfa successfully. Where a good level of fertility is maintained, these soils can be used intensively for corn, oats, clover, alfalfa-bromegrass mixtures, and such special crops as peas, potatoes, and rutabagas.

Crop rotations suitable for subgroup 1–A soils are as follows:

Corn, oats, and alfalfa-bromegrass for 2 years.
Corn, oats, and red clover-timothy for 2 years.
Corn, oats, alfalfa-bromegrass for 2 years, and peas.
Corn, oats, red clover-timothy, and potatoes.
Corn for 2 years, oats, and alfalfa-bromegrass for 2 years.

Management Subgroup 1–B

Antigo silt loam, gently sloping (2 to 6 percent slopes).
Antigo silt loam, shallow, nearly level (0 to 2 percent slopes).[1]
Arland silt loam, gently sloping (2 to 6 percent slopes).
Campia silt loam, gently sloping (2 to 6 percent slopes).
Gale silt loam, gently sloping (2 to 6 percent slopes).
Otterholt silt loam, gently sloping (2 to 6 percent slopes).
Santiago silt loam, gently sloping (2 to 6 percent slopes).

[1] The color grouping on the map erroneously lists this soil in management subgroup 1–A.

This subgroup covers 96,650 acres. The soils are similar to those of management subgroup 1–A, but their slopes are slightly steeper, and erosion control is a little more difficult.

The silt loam surface layer of the soils of this group is easily tilled. The soils are well drained and permeable, and they have a high water-holding capacity. They are moderately fertile, but they need the fertilizer elements that all the soils of management group 1 need. Rotations should be longer than for soils of group 1–A and should include one more year of hay or pasture, especially on the steeper slopes. On sloping land, stripcropping or terracing is advisable.

Crop rotations suitable for subgroup 1–B soils are as follows:

Corn for 2 years, oats, and alfalfa-bromegrass for 3 years (if contoured).
Corn, oats, red clover-timothy, and potatoes (if contoured).
Corn, peas or oats, and alfalfa-bromegrass for 2 years.
Corn, peas, red clover-timothy, and potatoes.

Steeper areas should be seeded and cultivated on the contour. Waterways in the draws should be grassed.

Management subgroup 1–C

Antigo silt loam, shallow, gently sloping (2 to 6 percent slopes).[1]
Milaca silt loam, gently sloping (2 to 6 percent slopes).
Onamia loam, nearly level (0 to 2 percent slopes).
Onamia loam, gently sloping (2 to 6 percent slopes).

[1] The color grouping on the map erroneously lists this soil in management subgroup 1–B.

These soils cover 35,600 acres in Barron County. Slopes range from 0 to 6 percent, but slopes of 2 to 3 percent are most common. These soils have management requirements similar to those of subgroup 1–B, but average yields are somewhat lower because their water-holding capacity is lower. Drought may damage crops during some seasons.

These soils have moderate fertility and respond well to lime and fertilizer. An appropriate rotation for these soils would consist of corn, oats, and alfalfa-bromegrass for 2 years.

The steeper areas should be seeded and cultivated on the contour if possible.

MANAGEMENT GROUP 2—FAIR TO GOOD CROPLAND

The soils of management group 2 generally have moderate productivity for most of the crops grown in the county, but each has one or more characteristics unfavorable to agriculture. Such handicaps as low fertility, natural susceptibility to erosion, poor drainage, excessive drainage, or stoniness may lower the yields or make the soil a little harder to work and to conserve.

These soils are not so good for crops as any of the soils of management group 1, but they are better than any soil in management group 3. The soils of group 2 are not extremely stony, severely eroded, or steep. Their physical properties are moderately favorable for tillage and for normal circulation and retention of moisture. The soils can be conserved by suitable management practices. All of these soils need nitrogen, phosphorus, potassium, and lime for crops and pasture, and some minor elements for special crops.

This management group covers 125,850 acres, or nearly 23 percent of the county. Estimates of yields to be expected under two levels of management are given in table 8.

Management subgroup 2–A

Arland fine sandy loam, gently sloping (2 to 6 percent slopes).
Hixton loam, gently sloping (2 to 6 percent slopes).
Milaca fine sandy loam, gently sloping (2 to 6 percent slopes).

There are 4,000 acres of these soils in Barron County, mostly in the southern part. The soils are well drained, permeable, and easily managed. Surface textures range from fine sandy loam to loam. The fertility level is somewhat lower than for the silt loam soils of management group 2, and yields are lower unless fertilizer is applied. Except on the steeper slopes, erosion is not a hazard if the fertility level and organic-matter content are maintained.

The following rotations are suitable for soils of management subgroup 2–A:

Corn, oats, and red clover-timothy for 2 years (with contouring or stripcropping).
Oats and clover-timothy pasture.

If alfalfa-bromegrass mixtures are grown on these soils, the small grain in the rotation will need larger amounts of 0–20–20 fertilizer than if clover-timothy mixtures are grown.

Management subgroup 2–B

Arland fine sandy loam, sloping (6 to 10 percent slopes).
Hixton fine sandy loam, sloping (2 to 10 percent slopes).
Hixton loam, sloping (6 to 10 percent slopes).
Milaca fine sandy loam, sloping (6 to 10 percent slopes).
Milaca silt loam, sloping (6 to 10 percent slopes).
Onamia loam, gently rolling (6 to 10 percent slopes).

The 10,300 acres in this subgroup consist mainly of fine sandy loams and loams, which developed from various parent materials. The soils have lower fertility and lower water-holding capacity than the silt loams of management group 2, and the slopes need greater care to prevent erosion damage. They should have a grass cover for longer

periods in each rotation than the more nearly level soils. Terraces or stripcropping should be used on slopes more than 100 feet in length. Shorter slopes should be planted and cultivated on the contour if possible.

Following are two rotations suitable for soils in this subgroup:

Corn, oats, and alfalfa-bromegrass for 2 years.
Oats, and red clover-timothy pasture for 2 years.

The organic-matter content and the fertility level of these soils must be increased and maintained to get the best yields. Side dressings of nitrogen, especially for corn, would be very good when the early part of the growing season is cool.

Management subgroup 2–C

Antigo silt loam, sloping (6 to 10 percent slopes).
Antigo silt loam, shallow, gently rolling (6 to 10 percent slopes).
Arland silt loam, sloping (6 to 10 percent slopes).
Gale silt loam, sloping (6 to 10 percent slopes).
Otterholt silt loam, sloping (6 to 10 percent slopes).
Santiago silt loam, sloping (6 to 10 percent slopes).
Santiago silt loam, eroded, sloping (6 to 15 percent slopes).

The total area of these soils is 33,675 acres. The soils are moderately fertile and have a good water-holding capacity. They are friable and easy to till, but their slopes cause a moderate erosion hazard. Erosion usually can be controlled by contouring and by maintaining the fertility level and organic-matter content of the soils. Stripcropping and terracing are usually necessary on the longer slopes.

Two rotations suitable for these soils are as follows:

Corn, oats, and red clover-timothy pasture.
Corn, oats, and red clover-timothy for 2 years.

One small area of Santiago silt loam, eroded, sloping, is included in this subgroup. It needs special management to prevent further erosion damage. Corn is not a suitable crop for these eroded slopes.

Management subgroup 2–D

Antigo silt loam, shallow, sloping (10 to 20 percent slopes).
Arland silt loam, strongly sloping (10 to 15 percent slopes).
Otterholt silt loam, strongly sloping (10 to 15 percent slopes).
Santiago silt loam, strongly sloping (10 to 15 percent slopes).

These soils occupy 7,275 acres in the county. They have high water-holding capacity, good tilth, and moderate fertility. Rotations should include 3 to 4 years of hay or pasture. Shorter rotations can be used on terraced fields, but a high fertility level must be maintained to get good yields.

Rotations suitable for these soils are as follows:

Corn, oats, and alfalfa-bromegrass for 3 years.
Oats, and alfalfa-bromegrass pasture for 2 years.

These strongly sloping silt loams need special care to prevent erosion. It is important to maintain their organic-matter content. Slopes more than 100 feet in length should be stripcropped or terraced. All tillage on the shorter slopes should be on the contour.

Management subgroup 2–E

Brill silt loam, nearly level (0 to 2 percent slopes).
Crystal Lake silt loam (0 to 2 percent slopes).
Freeon silt loam, nearly level (0 to 2 percent slopes).
Spencer silt loam, nearly level (0 to 2 percent slopes).

These silt loams, covering 4,800 acres, are moderately well drained. Their nearly level surfaces are not damaged by erosion. Surface water is the greatest hazard to crops.

The following rotations are suitable for soils of management subgroup 2–E:

Corn, oats, and red clover-timothy for 2 years.
Corn for 2 years, oats, and alfalfa-bromegrass for 2 years.

Removal of surface water will allow successful growing of alfalfa-bromegrass mixtures.

Management subgroup 2–F

Crystal Lake loam (0 to 2 percent slopes).
Scott Lake sandy loam (0 to 2 percent slopes).

These outwash soils occupy 1,600 acres in broad, flat areas. They are imperfectly drained because they have a high water table and receive seepage from higher ground.

A good rotation for these soils is peas, rye, and red clover-timothy for 2 years. Corn and oats can also be grown. Because of the high water table, alfalfa does not grow well.

Management subgroup 2–G

Brill silt loam, gently sloping (2 to 6 percent slopes).
Chaseburg silt loam (2 to 6 percent slopes).
Freeon silt loam, gently sloping (2 to 6 percent slopes).
Milaca silt loam, undulating (0 to 6 percent slopes).
Spencer silt loam, gently sloping (2 to 6 percent slopes).

This subgroup covers 38,600 acres and consists mostly of moderately well drained silt loams. The Milaca silt loam is well drained, but it has been placed in this subgroup because the many small areas of imperfectly drained soils associated with it make special management necessary. Most of the soils have mottled subsoils, which indicates that they are wet during early spring. This tends to delay planting of spring grains.

Two suitable rotations are as follows:

Corn, oats, and red clover-timothy for 2 years.
Peas, rye, and red clover-timothy pasture for 2 years.

Soils of management subgroup 2–G are poorly suited to alfalfa, unless the excess surface water that accumulates in rainy seasons can be removed. Diversion terraces are useful for this purpose, but it is hard to terrace undulating slopes such as those of Milaca silt loam.

Management subgroup 2–H

Freeon silt loam, sloping (6 to 10 percent slopes).
Milaca silt loam, gently rolling (6 to 10 percent slopes).
Spencer silt loam, sloping (6 to 10 percent slopes).

There are 5,500 acres of these soils in the county. They have moderate fertility, moderate permeability, and a high water-holding capacity. The Spencer and Freeon soils are moderately well drained. Erosion is a hazard on soils of this subgroup, and the longer slopes should be stripcropped or terraced.

Rotations good on these soils are as follows:

Corn, oats, and red clover-timothy pasture for 2 years.
Oats and red clover-timothy for 2 years.
Peas, rye, and red clover-timothy for 2 years.

Alfalfa can be grown if excess surface water is removed in wet seasons and if the fertility level is maintained. The gently rolling relief of the Milaca silt loam makes it difficult to install surface or internal drainage.

Management subgroup 2–I

Almena silt loam, gently sloping (2 to 6 percent slopes).
Freer silt loam, gently sloping (2 to 6 percent slopes).

This management subgroup covers 20,100 acres. The soils are somewhat poorly drained and cold, especially in spring. Corn for grain is often damaged by frost, either early in spring or late in fall. The fertility level of these soils is moderate. They hold considerable moisture and may receive seepage from higher ground.

The following rotations are suggested:

Corn, oats, and red clover-timothy for 2 years.
Corn, oats, and red clover-timothy pasture.

These soils are well suited to alfalfa-bromegrass mixtures only if excess surface water is removed during wet seasons. Diversion terraces are helpful on long slopes. If soil fertility is maintained, excellent yields of oats, hay, and pasture can be expected.

MANAGEMENT GROUP 3—FAIR TO POOR CROPLAND

The soils in management group 3 are fair to poor for crops under farming practices now used. The suitability of each soil for the crops commonly grown in the county is limited by one or more of the following characteristics: Low fertility, shallowness, steep slopes, stoniness, poor drainage, or erosion damage. The best use for these soils depends on the use made of other soils on the farm and on the need for cropland or pasture. Nearly 12 percent of the county, or 67,550 acres, is covered by these soils.

Management subgroup 3–A

Arland fine sandy loam, strongly sloping (10 to 15 percent slopes).
Hixton fine sandy loam, strongly sloping (10 to 15 percent slopes).
Hixton loam, strongly sloping (10 to 15 percent slopes).
Milaca fine sandy loam, strongly sloping (10 to 20 percent slopes).
Milaca silt loam, strongly sloping (10 to 20 percent slopes).

These soils occupy 5,850 acres. They are droughty because they have fairly shallow A and B horizons. The erosion hazard is moderate, and fertility is relatively low. Stripcropping and terracing are desirable for all of these soils.

Rotations suitable for these soils are:

Corn, oats, and alfalfa-bromegrass for 2 years.
Oats, followed by clover-timothy pasture for 2 years.
Corn, oats, and red clover-timothy pasture for 2 years.

Both corn and oats need nitrogen fertilizer. Alfalfa-bromegrass mixtures do well on these soils when the fertility level is maintained. To get the best crop yields the organic-matter content should be maintained and water should be conserved.

Management subgroup 3–B

Chetek sandy loam, sloping (6 to 10 percent slopes).
Chetek sandy loam, gently rolling (6 to 10 percent slopes).
Cloquet sandy loam, undulating and gently rolling (2 to 10 percent slopes).

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Barron County has 3,700 acres of these soils. The subsoils are sandy or gravelly. Fertility is relatively low, but the soils are permeable and easy to cultivate under a wide range of moisture conditions. Stripcropping is needed to conserve moisture on the longer slopes. The rotation suggested for these soils is corn, oats, and alfalfa-bromegrass for 3 years.

Yields are fairly low unless organic matter and mineral fertilizer are applied heavily.

Management subgroup 3–C

Burkhardt loams and sandy loams (0 to 6 percent slopes).
Chetek sandy loam, nearly level (0 to 2 percent slopes).
Chetek sandy loam, gently sloping (2 to 6 percent slopes).
Chetek sandy loam, undulating (0 to 6 percent slopes).
Chetek sandy loam, shallow, nearly level (0 to 2 percent slopes).
Chetek sandy loam, shallow, gently sloping (2 to 6 percent slopes).

The soils of this subgroup cover 20,925 acres; they are underlain by stratified sands and gravel at depths of 12 to 30 inches. The soils are well drained and permeable, but droughty. They are very easy to cultivate and conserve.

Rotations suitable for these soils are as follows:

Corn, oats, and red clover-timothy pasture for 2 years.
Corn, oats, and alfalfa-bromegrass for 3 years.

Unless the moisture-holding capacity of these soils is improved by increasing their organic-matter content, yields will be low. Fertility should be increased by using fertilizers.

Management subgroup 3–D

Boone loamy fine sand, gently sloping (0 to 6 percent slopes).
Omega loamy sand, nearly level (0 to 2 percent slopes).
Omega loamy sand, sloping (6 to 10 percent slopes).[1]
Omega loamy sand, gravelly subsoil, nearly level (0 to 2 percent slopes).
Omega loamy sand, gently sloping (2 to 6 percent slopes).
Omega loamy sand, gravelly subsoil, gently sloping (2 to 6 percent slopes).

[1] The color grouping on the map erroneously lists this soil in management subgroup 3–B.

A total of 16,050 acres is covered by these soils. They are permeable and easy to cultivate over a wide range of moisture content, but they are extremely droughty during dry periods. The water-holding capacity and the fertility level are low. Stripcropping and the planting of shelterbelts would help to prevent wind erosion and to conserve moisture.

The following rotations are suitable for this subgroup:

Corn, oats, and alfalfa-bromegrass pasture for 3 years.
Oats and red clover-timothy for 2 years.
Beans, rye, and alfalfa-bromegrass for 3 years.

Liberal applications of fertilizers are needed. It is very important to increase the water-holding capacity by building up the supply of organic matter. Rotations that maintain a grass cover for 3 to 4 years in each rotation period are advisable.

Management subgroup 3–E

Almena silt loam, nearly level (0 to 2 percent slopes).
Comstock silt loam (0 to 2 percent slopes).
Comstock loam (0 to 2 percent slopes).
Freer silt loam, nearly level (0 to 2 percent slopes).
Poskin silt loam (0 to 2 percent slopes).

There are 18,200 acres of this management subgroup in Barron County. The use of the soils is limited by poor drainage. Artificial

drainage should be established where feasible. Erosion is not a hazard because the soils are nearly level.

The following rotations are suitable for these soils:

Oats for 2 years, and red clover-timothy for 2 years.
Corn, oats, and red clover-timothy for 2 years.
Oats, and red clover-timothy pasture for 2 years.

Corn does well in some years, but the soils are wet in spring and fall, and the growing season is therefore so short that corn may not mature. Frost heaving is likely to damage alfalfa. Clover-timothy hay, pasture, and oats are commonly grown.

Management subgroup 3–F

Almena silt loam, sloping (6 to 10 percent slopes).
Altoona silt loam (2 to 6 percent slopes).
Freer silt loam, sloping (6 to 10 percent slopes).

This group of soils occupies 2,825 acres. Most of them are poorly drained because of seepage from higher slopes. Some level areas of Altoona silt loam have a high water table. Erosion is a moderate hazard. Drainage-type terraces are desirable on long slopes.

Rotations suggested for these soils are as follows:

Corn, oats, and red clover-timothy for 2 years.
Corn, oats, and alfalfa-bromegrass for 3 years.
Corn, oats, and red clover-timothy pasture for 2 years.

Alfalfa-bromegrass mixtures will not do well on these soils unless excess moisture is removed during wet seasons.

MANAGEMENT GROUP 4—POOR TO VERY POOR CROPLAND

This group of soils is poor to very poor for crops. Each is so difficult to work or to conserve, or both, that it cannot very well be cultivated. However, there is enough fertility and moisture to support a moderate cover of pasture plants. Under farming systems now used, pastures on these soils are fair to good.

A few areas are used for crops, to meet the needs of a particular farm unit, but most of the soils are in forest or permanent grass. Soils of this management group cover 68,525 acres, or 11 percent of the county.

Management subgroup 4–A

Arland fine sandy loam, moderately steep and steep (15 to 30 percent slopes).
Hixton fine sandy loam, moderately steep (15 to 20 percent slopes).
Milaca silt loam, rolling (10 to 15 percent slopes).
Pitted outwash, rolling (10 to 15 percent slopes).

The 7,575 acres in this management subgroup consists of soils derived from various kinds of parent materials. All the soils are relatively low in fertility and are difficult to cultivate. They are best suited to bluegrass or alfalfa-bromegrass pasture. It is essential that overgrazing be prevented, and that a good sod be maintained at all times. If the fertility has been increased enough by fertilizers or manure, an occasional hay crop can be harvested.

Management subgroup 4–B

Arland silt loam, moderately steep (15 to 20 percent slopes).
Gale silt loam, strongly sloping (10 to 15 percent slopes).
Hixton loam, moderately steep (15 to 30 percent slopes).
Santiago silt loam, moderately steep (10 to 30 percent slopes).

The 3,300 acres in this subgroup are made up of soils that are difficult to manage and to cultivate because of their steep slopes. The soils are permeable and well drained. They can be used for pastures of alfalfa-bromegrass or bluegrass. The pastures should not be overgrazed. Moderate to good yields can be expected where the fertility level is maintained. An occasional hay crop can be harvested from alfalfa-bromegrass pastures.

Management subgroup 4–C

Arland silt loam, eroded, strongly sloping (10 to 15 percent slopes).
Gale silt loam, eroded, sloping and strongly sloping (6 to 15 percent slopes).
Hixton loam, eroded, strongly sloping (10 to 20 percent slopes).

Severe erosion has removed more than two-thirds of the surface soil from the 2,400 acres in this management subgroup. These soils could be reclaimed by using large amounts of manure and fertilizer to restore fertility, and by then planting a mixture of pasture plants and oats. The pasture cover should be allowed to remain on the soil for several years.

Management subgroup 4–D

Almena stony silt loam, gently sloping (0 to 6 percent slopes).
Freer stony silt loam, gently sloping (2 to 6 percent slopes).
Santiago stony silt loam, sloping (6 to 10 percent slopes).
Santiago stony silt loam, strongly sloping (10 to 20 percent slopes).

The 6,125 acres in this management subgroup consists of soils that are so stony that cultivation or even pasture renovation is not practicable. The areas that are still forested should not be cleared. For areas already cleared, bluegrass pasture is suggested as a good use. Lime and fertilizers should be added to improve yields. Nitrogen added in the spring will increase yields of pasture plants.

Management subgroup 4–E

Adolph silt loam (0 to 2 percent slopes).
Alluvial land.
Auburndale silt loam (0 to 6 percent slopes).
Barronett silt loam (0 to 2 percent slopes).
Barronett loam (0 to 2 percent slopes).
Milaca-Cloquet-Peat complex, undulating (2 to 6 percent slopes).
Milaca-Cloquet-Peat complex, gently rolling (6 to 10 percent slopes).
Wallkill silt loam (0 to 2 percent slopes).
Warman silt loam (0 to 2 percent slopes).
Warman loamy fine sand (0 to 2 percent slopes).
Warman loamy sand, gravelly subsoil (0 to 2 percent slopes).

The 49,125 acres in this subgroup consists of very poorly drained soils. The soils developed from various kinds of parent material. All occur in level to slightly depressed areas where water is often ponded for part of each season.

Most areas of these soils are in forest and should not be cleared. Auburndale and Barronett soils are mostly cleared and used for grass and hay. Cleared areas produce fair pasture, but crop yields are poor unless excess surface water can be removed. Reed canarygrass for hay and pasture is the most suitable crop if the soils are not drained.

Drainage of these soils improves yields. Drained areas may be cultivated according to the suggestions given for subgroup 3–E. Lime should be applied at the rate of 3 tons per acre every 10 years. On some areas, yields can be increased by heavier applications of nitrogen fertilizer in spring.

MANAGEMENT GROUP 5—VERY POOR CROPLAND

Group 5 soils are very poor for crops or pasture under farming practices now used. They are so difficult to work or so difficult to conserve, or both, that it generally is not practical to cultivate them. Each soil has one or more of the following undesirable features: Steep slopes or hilliness, many loose stones, many bedrock outcrops, severe erosion, or very poor drainage. Many of the soils are also low in fertility, or are excessively drained, or are very acid. As a result of these undesirable characteristics, cultivated crops and pasture plants produce very little, and tillage with common farm implements is very difficult or impossible.

The soils of group 5 are best suited to forests, even though trees often grow more slowly than on soils of the other management groups. These soils differ so widely in physical characteristics that they vary in suitability for different kinds of trees. Available information on the productive capacity of various soils for forest products is limited. Yields depend on the type of soil, the kinds of trees and the density of the stand, and the management practices.

Although these soils should be in forest, farmers sometimes find it necessary to use small areas for crops or pasture. For this reason, table 8 has yield estimates for the crops that are occasionally grown on these soils.

Management group 5 makes up 20 percent of the county, or 112,205 acres.

Management subgroup 5–A

Hixton fine sandy loam, steep (20 to 30 percent slopes).
Milaca silt loam, hilly (15 to 30 percent slopes).
Milaca silt loam, steep (20 to 35 percent slopes).
Milaca-Cloquet-Peat complex, rolling (10 to 15 percent slopes).
Milaca-Cloquet-Peat complex, hilly (15 to 30 percent slopes).
Santiago stony silt loam, steep (20 to 30 percent slopes).
Stony steep land (20 to 45 percent slopes).

The soils of subgroup 5–A occupy 63,950 acres. Surface textures range from silt loam to fine sandy loam. The soils are too steep for crops or pasture, except under very unusual conditions. They are well suited to white and Norway pines and the native hardwoods.

Any areas of these soils that have not been cleared should be left in forest. Cleared areas should be reforested. New plantings should include white and Norway pines, red and white oaks, elm, basswood, ash, and maple. Selective cutting should be practiced, and the woodland should be protected from fire and grazing.

Management subgroup 5–B

Arland fine sandy loam, eroded, strongly sloping (10 to 15 percent slopes).
Hixton fine sandy loam, eroded, strongly sloping (6 to 15 percent slopes).
Hixton fine sandy loam, eroded, steep (20 to 30 percent slopes).

This subgroup is made up of 2,225 acres of severely eroded soils. Two-thirds or more of the surface layer has been lost, and in many places some of the subsoil. Because they have a sandy surface layer, very low fertility, and steep slopes, these soils should not be cultivated or put to any use except forestry. White and Norway pines should be planted on cleared areas. Special care should be taken to prevent erosion while the trees are small.

Management subgroup 5–C

Boone loamy fine sand, strongly sloping (10 to 15 percent slopes).
Boone loamy fine sand, steep (20 to 30 percent slopes).
Cloquet sandy loam, rolling and hilly (10 to 20 percent slopes).
Cloquet sandy loam, hilly (15 to 30 percent slopes).
Omega loamy sand, strongly sloping (10 to 20 percent slopes).
Omega loamy sand, gravelly subsoil, sloping and strongly sloping (6 to 15 percent slopes).
Pitted outwash, hilly (10 to 20 percent slopes).
Terrace escarpment, strongly sloping (10 to 20 percent slopes).
Terrace escarpment, moderately steep (15 to 30 percent slopes).

These soils cover 5,230 acres. They are sandy and shallow, and consequently unsuited to pasture or to cultivated crops. They can best be used for forests of jack pine and Norway pine. White pine, oak, maple, and basswood will also grow. Forest stands should be protected from fire and from overgrazing, and selective cutting should be practiced.

Management subgroup 5–D

Adolph stony silt loam (0 to 6 percent slopes).
Peat and muck.
Riverwash.

These wet soils, covering 40,800 acres, cannot be drained or cultivated. Riverwash and the Adolph soil are very stony. The soils support a forest tolerant of wet conditions. New plantings should include willow and birch, and tamarack seedlings should be encouraged.

Estimated Yields

Estimated average acre yields for the principal crops are given for each soil in table 8. The estimates are based primarily on interviews with farmers and on the results obtained by the University of Wisconsin on the experimental plots located within the county. They are presented only as estimates of the average production that can be expected over a period of years under each of two levels of management.

Yields to be expected from these soils under ordinary management are given in columns A. Ordinary management includes the use of manure, starter fertilizer for corn, and little or no fertilizer for oats or hay. Columns B show what yields can be expected from these same soils when they are more carefully managed. More careful management includes the addition of lime as needed, heavier applications of fertilizer for corn, the use of fertilizer for both oats and hay, and other practices suggested in the section on management groups. Under careful management, potatoes and other special crops are heavily fertilized, and insects are controlled.

High crop yields year after year are usually the result of good soil, good management, or both. Low yields may be caused by an inferior soil; by attempts to grow crops that are not adapted to the soil; by faulty management; or by such hazards to crop production as weather, insects, and diseases. If the crop yields on a certain soil do not compare favorably with those listed in the table, it would pay to examine the managment practices used on the farm. Even higher yields than those given are possible, and profitable, on certain soils. They can be obtained by heavy applications of nitrogen, phosphorus, potassium, and possibly by the use of minor elements such as boron.

Capability Groups of Soils

The capability grouping of soils is an arrangement according to relative suitability for crops, grazing, forestry, or wildlife, and to the risk of erosion or other damage. Soils that are nearly level, well drained, free from overflow, fairly fertile, and not otherwise limited are placed in class I. They are widely adaptable and the user of them has many choices open to him. He can use his class I soils for crops without special practices and can choose one of several cropping systems, or if he wishes he may use the soil for pasture or for some other purpose.

Soils are placed in class II if they are a little less widely adaptable and thus more limited than those in class I. A gently sloping soil, for example, must be farmed on the contour, kept under vegetation most of the time, or handled in some other manner to control erosion. Other soils may be in class II because they are too droughty, too wet, or limited in depth.

Class III soils have more narrow adaptations for use or more stringent management requirements than class II soils, but they can be used for regular cropping. Other soils that are more limited and have narrower crop adaptations than those of class III, but are still usable for tillage part of the time or with special precautions, are placed in class IV.

Soils not suitable for cultivation, or on which cultivation is not advisable, are in classes V, VI, VII, or VIII. Class V includes soils not subject to erosion but unsuitable for cultivation because of standing water or frequency of overflow. Class VI contains the soils which are steep or droughty or have other serious limitations but will produce fairly good amounts of forage or forest products. As a rule, class VI soils should not be cultivated, but some of them can safely be disturbed enough to prepare them for orchards, tree crops, or extremely long-time pastures. Soils in class VII are more limited than those in class VI and usually give only fair or poor yields of forage or wood products. Soils in class VIII are so severely limited that they produce little useful vegetation. They may make attractive scenery, or may be parts of useful watersheds. Some have value for wildlife.

Subclasses: Since the broad capability classes are based on total suitability of the soils for different uses, one class usually contains different kinds of soils. The kinds of management problems then differ because the soils are different. Class II soils in this county, for example, consist of some undulating and gently sloping soils subject to erosion, some nearly level soils needing supplementary drainage or protection from overflow, and some other soils that have enough sand and gravel in the profile to be slightly droughty. It is convenient to recognize, within the broad classes, capability subclasses based on the dominant kind of limitation. As many as four subclasses may be recognized, according to these dominant limitations or risks: Risk of erosion (e), excess water (w), shallow or droughty soils (s), or unusually hazardous climate (c). The subclass is denoted by a small letter following the class number, such as IIe, IIw, IIs, or IIc.

TABLE 8.—*Average acre yields that may be expected over a period of years from crops on soils of Barron County, Wis., under two levels of management*

[The yields in columns A are those to be expected under the common management practices now followed by most of the farmers in the county. Yields in columns B are those to be expected under good management, including use of adapted crop rotations, fertilizers, lime, and erosion-control measures where necessary. See the section on management groups for suggestions on good management. If no yield is given, the soil is considered not suited to the crop]

Map symbol	Soil type or phase	Corn grain		Corn silage		Oats		Peas		Potatoes		Clover-timothy hay				Alfalfa-brome hay				Rotation pasture		Permanent pasture		Management subgroup
												1st yr.		2d yr.		1st yr.		2d yr.						
		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
		Bu.	*Bu.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Lbs.*	*Lbs.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days*[1]	*Cow-acre-days*	*Cow-acre-days*	*Cow-acre-days*	
AA	Adolph silt loam	----	25	----	5.5	----	35	----	----	----	----	----	3.6	----	3.0	----	----	----	----	----	120	70	110	4-E
AB	Adolph stony silt loam	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	65	100	5-D
AC	Alluvial land	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	70	110	4-E
	Almena silt loam:																							
AE	Nearly level	25	41	4.4	8.0	38	60	700	2,000	----	----	2.4	3.8	1.8	2.5	----	----	----	----	105	150	95	125	3-E
AD	Gently sloping	26	42	4.4	8.0	38	60	800	2,100	----	----	2.4	3.8	1.8	2.5	----	----	----	----	100	145	95	125	2-I
AF	Sloping	24	40	4.6	8.3	35	55	700	2,000	----	----	2.2	3.7	1.5	2.5	----	----	----	----	100	145	90	120	3-F
AG	Almena stony silt loam, gently sloping	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	90	120	4-D
AH	Altoona silt loam	22	35	4.0	6.1	35	50	----	1,600	----	----	2.0	3.4	1.2	2.0	----	----	----	----	95	130	85	115	3-F
	Antigo silt loam:																							
AJ	Nearly level	34	58	6.0	10.0	48	65	1,400	2,800	160	350	1.8	3.0	1.4	2.4	2.0	3.2	1.5	2.5	100	140	90	120	1-A
AI	Gently sloping	32	54	5.5	9.0	45	62	1,300	2,700	140	300	1.8	3.0	1.2	2.0	2.0	3.2	1.4	2.5	95	135	85	115	1-B
AO	Sloping	30	48	5.0	8.5	40	60	1,100	2,500	125	200	1.6	2.8	1.1	2.0	1.8	3.0	1.3	2.4	90	120	80	110	2-C
	Antigo silt loam, shallow:																							
AM	Nearly level	30	48	5.0	9.0	40	62	1,200	2,600	125	275	1.7	3.0	1.1	2.0	1.9	3.0	1.4	2.4	95	135	85	115	1-B
AL	Gently sloping	29	50	4.9	8.8	38	60	1,100	2,400	120	260	1.7	3.0	1.1	2.0	1.9	3.0	1.4	2.4	95	130	85	110	1-C
AK	Gently rolling	26	45	4.6	8.0	34	55	1,000	2,000	100	200	1.6	2.8	1.0	1.8	1.7	2.8	1.2	2.0	85	120	75	100	2-C
AN	Sloping	24	40	4.2	7.4	32	50	----	----	----	----	1.5	2.6	.9	1.7	1.6	2.4	1.1	1.8	80	110	70	90	2-D
	Arland silt loam:																							
AV	Gently sloping	33	52	6.0	9.0	45	62	1,200	2,600	130	275	2.0	3.4	1.2	2.0	2.4	4.1	1.6	2.7	95	135	85	115	1-B
AX	Sloping	30	48	5.2	8.5	40.	60	1,100	2,500	125	200	1.8	3.2	1.1	2.0	2.2	3.9	1.3	2.4	90	120	80	110	2-C
AY	Strongly sloping	29	46	5.0	8.4	38	56	1,000	2,200	100	175	1.8	3.2	1.1	2.0	2.2	3.9	1.3	2.4	90	120	80	110	2-D
AU	Eroded, strongly sloping	15	35	2.5	6.5	20	35	----	----	----	----	.8	2.2	.4	1.4	.8	2.8	.4	1.8	50	90	40	85	4-C
AW	Moderately steep	----	40	----	7.5	32	45	----	----	----	----	1.6	3.0	1.0	1.8	2.0	3.5	1.2	2.1	85	110	75	100	4-B
	Arland fine sandy loam:																							
AQ	Gently sloping	30	50	5.5	8.0	40	55	1,000	2,000	120	240	1.8	3.2	1.1	2.0	2.3	4.0	1.4	2.2	90	125	80	105	2-A
AS	Sloping	28	44	5.1	7.8	38	54	800	1,600	110	200	1.7	3.0	1.0	1.7	2.1	3.5	1.2	2.0	85	110	75	100	2-B
AT	Strongly sloping	24	40	4.8	7.2	32	50	----	----	----	----	1.5	2.8	.9	1.6	2.0	3.2	1.1	1.8	80	100	70	90	3-A
AP	Eroded, strongly sloping	10	30	2.3	6.0	15	30	----	----	----	----	.7	2.0	.3	1.2	.8	2.4	.3	1.7	40	75	35	80	5-B
AR	Moderately steep and steep	----	----	----	----	----	40	----	----	----	----	----	2.5	----	1.5	----	----	----	----	----	90	65	85	4-A

AZ	Auburndale silt loam	-----	40	-----	8.0	25	40	-----	-----	-----	-----	-----	3.5	-----	3.0	-----	-----	-----	-----	-----	125	70	115	4-E
BB	Barronett silt loam	-----	34	-----	6.3	-----	46	-----	-----	-----	-----	-----	3.0	-----	2.6	-----	-----	-----	-----	-----	120	65	105	4-E
BA	Barronett loam	-----	32	-----	6.2	-----	44	-----	-----	-----	-----	-----	2.8	-----	2.4	-----	-----	-----	-----	-----	115	65	105	4-E
	Boone loamy fine sand:																							
BC	Gently sloping	12	23	2.2	3.6	20	35	-----	-----	-----	-----	.8	2.2	.5	.9	1.4	2.5	1.2	1.9	45	70	30	55	3-D
BE	Strongly sloping	8	16	1.6	3.2	10	20	-----	-----	-----	-----	.5	1.5	.3	.6	1.0	2.0	.8	1.4	30	50	20	40	5-C
BD	Steep	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	18	38	5-C
	Borrow and gravel pits	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
	Brill silt loam:																							
BH	Nearly level	30	48	4.6	8.2	35	50	1,000	2,400	-----	-----	2.3	3.8	1.7	2.7	-----	-----	-----	-----	105	145	95	125	2-E
BG	Gently sloping	32	50	4.5	8.1	32	46	1,100	2,600	100	275	2.2	3.7	1.6	2.6	-----	-----	-----	-----	100	135	90	120	2-G
BK	Burkhardt loams and sandy loams	22	38	3.8	5.2	34	50	900	1,800	110	210	1.4	2.9	1.0	2.0	1.8	3.0	1.2	2.4	80	115	50	85	3-C
	Campia silt loam:																							
CB	Nearly level	35	60	6.0	10.0	49	66	1,400	2,800	165	360	2.0	3.5	1.2	2.1	2.3	4.0	1.4	2.5	100	140	90	120	1-A
CA	Gently sloping	34	58	6.0	10.0	48	65	1,400	2,800	160	350	2.0	3.5	1.2	2.1	2.4	4.1	1.6	2.7	100	140	90	120	1-B
CT	Chaseburg silt loam	34	52	5.4	9.0	44	60	1,000	2,000	-----	-----	2.1	3.4	1.4	2.5	2.2	3.8	1.5	2.6	105	140	90	120	2-G
	Chetek sandy loam:																							
CE	Nearly level	18	30	3.5	5.5	30	45	800	1,600	90	175	1.0	2.2	.8	1.5	1.5	2.5	1.0	1.8	75	90	40	70	3-C
CD	Gently sloping	16	28	3.4	5.4	28	42	800	1,600	85	170	1.0	2.2	.8	1.5	1.5	2.4	1.0	1.8	75	90	40	70	3-C
CH	Sloping	14	26	3.2	5.0	24	40	600	1,400	80	160	.8	2.0	.6	1.2	1.2	2.2	.8	1.6	65	85	30	60	3-B
CK	Undulating	16	28	3.4	5.4	28	42	800	1,600	85	170	1.0	2.2	.8	1.5	1.5	2.5	1.0	1.8	75	90	40	70	3-C
CC	Gently rolling	14	26	3.2	5.0	24	40	600	1,400	80	160	.8	2.0	.6	1.2	1.2	2.2	.8	1.6	65	85	30	60	3-B
	Chetek sandy loam, shallow:																							
CG	Nearly level	12	25	2.5	5.0	18	35	-----	-----	85	140	.8	1.5	.7	1.4	1.0	2.0	1.9	1.8	50	75	30	60	3-C
CF	Gently sloping	10	22	2.4	5.0	16	32	-----	-----	80	120	.6	1.4	.5	1.2	.9	1.8	.7	1.4	45	70	25	55	3-C
	Cloquet sandy loam:																							
CN	Undualting and gently rolling	25	35	4.0	6.0	30	45	800	1,600	90	175	1.0	2.2	.8	1.5	1.5	2.5	2.0	2.6	75	90	65	90	3-B
CM	Rolling and hilly	16	28	3.3	5.4	28	42	-----	-----	-----	-----	1.0	2.4	.8	1.5	2.0	3.2	1.8	2.2	65	95	60	90	5-C
CL	Hilly	13	27	2.5	5.2	22	40	-----	-----	-----	-----	.8	2.2	.6	1.2	1.8	3.0	1.5	2.0	50	80	50	80	5-C
CP	Comstock silt loam	27	45	4.5	8.0	30	45	1,100	2,500	-----	-----	2.2	3.7	1.5	2.5	-----	-----	-----	-----	100	145	90	120	3-E
CO	Comstock loam	24	40	4.3	7.5	28	40	1,000	2,200	-----	-----	2.1	3.6	1.4	2.4	-----	-----	-----	-----	95	140	85	115	3-E
CS	Crystal Lake silt loam	30	48	4.6	8.2	35	52	1,200	2,500	-----	-----	2.4	3.9	1.8	2.8	-----	-----	-----	-----	105	145	95	125	2-E
CR	Crystal Lake loam	28	46	4.5	8.0	32	48	1,100	2,200	-----	-----	2.3	3.8	1.7	2.6	-----	-----	-----	-----	100	140	90	120	2-F
	Freeon silt loam:																							
FB	Nearly level	28	46	4.5	8.2	45	57	800	1,400	-----	-----	2.1	3.6	1.4	2.4	2.3	4.0	1.5	2.6	105	145	90	120	2-E
FA	Gently sloping	30	48	4.5	8.1	45	57	900	1,600	-----	-----	2.0	3.5	1.3	2.3	2.4	4.1	1.6	2.7	100	145	90	120	2-G
FC	Sloping	28	46	4.4	8.0	43	55	800	1,400	-----	-----	1.9	3.4	1.2	2.2	2.3	4.0	1.5	2.6	95	135	85	110	2-H
	Freer silt loam:																							
FE	Nearly level	23	38	4.3	7.8	35	52	600	1,100	-----	-----	2.2	3.7	1.5	2.5	-----	-----	-----	-----	100	145	95	125	3-E
FD	Gently sloping	25	41	4.4	8.0	37	55	700	1,200	-----	-----	2.4	3.8	1.6	2.5	-----	-----	-----	-----	100	150	95	125	2-I
FF	Sloping	24	39	4.3	7.8	35	52	600	1,100	-----	-----	2.2	3.7	1.5	2.5	-----	-----	-----	-----	100	145	95	125	3-F
FG	Freer stony silt loam, gently sloping	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	75	105	4-D
	Gale silt loam:																							
GB	Gently sloping	32	50	5.0	9.0	45	60	1,200	2,600	140	285	2.0	3.4	1.2	2.0	2.4	4.1	1.6	2.7	95	135	85	115	1-B
GC	Sloping	30	46	5.8	8.5	43	55	1,100	2,400	130	265	1.8	3.1	1.1	1.8	2.2	4.0	1.5	2.6	90	130	80	105	2-C
GD	Strongly sloping	29	44	5.0	8.4	40	53	1,000	2,200	100	175	1.8	3.1	1.1	1.8	2.2	4.0	1.5	2.6	90	130	80	105	4-B
GA	Eroded, sloping and strongly sloping.	20	35	4.0	6.5	25	40	500	1,000	55	115	1.1	1.7	.8	1.3	1.8	3.2	1.0	1.6	65	95	10	85	4-C

See footnotes at end of table.

TABLE 8.—*Average acre yields that may be expected over a period of years from crops on soils of Barron County, Wis., under two levels of management*—Continued

Map symbol	Soil type or phase	Corn grain		Corn silage		Oats		Peas		Potatoes		Clover-timothy hay				Alfalfa-brome hay				Rotation pasture		Permanent pasture		Management subgroup
												1st yr.		2d yr.		1st yr.		2d yr.						
		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
	Hixton loam:	*Bu.*	*Bu.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Lbs.*	*Lbs.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days*[1]	*Cow-acre-days*	*Cow-acre-days*	*Cow-acre-days*	
HH	Gently sloping	30	45	5.0	8.5	35	50	1,100	2,400	125	225	1.5	3.0	1.2	2.0	2.4	3.4	1.4	2.5	90	120	75	100	2-A
HL	Sloping	27	40	4.6	8.0	30	45	1,000	2,100	100	200	1.4	2.8	1.0	1.8	2.2	4.0	1.3	2.4	85	115	75	100	2-B
HM	Strongly sloping	25	35	4.4	7.6	26	40	800	1,800	75	175	1.3	2.6	.9	1.7	2.1	3.8	1.2	2.2	85	110	70	95	3-A
HG	Eroded, strongly sloping	20	32	4.0	7.0	24	36	----	----	----	----	1.0	2.4	.7	1.4	1.6	2.8	1.0	1.6	60	90	50	80	4-C
HK	Moderately steep	----	----	----	----	24	36	----	----	----	----	1.2	2.4	.8	1.6	2.0	3.6	1.1	2.0	80	105	65	90	4-B
	Hixton fine sandy loam:																							
HD	Sloping	23	42	4.4	7.0	30	45	900	1,800	80	175	1.2	2.2	1.0	1.6	2.1	2.7	1.1	1.8	75	100	65	85	2-B
HF	Strongly sloping	20	40	4.3	6.6	28	40	800	1,600	60	150	1.1	2.0	.9	1.4	1.8	2.5	1.0	1.7	70	95	60	80	3-A
HB	Eroded, strongly sloping	----	----	----	----	24	38	700	1,600	----	----	.6	1.2	.5	1.0	1.6	2.2	.8	1.6	50	90	50	75	5-B
HC	Moderately steep	----	----	----	----	26	38	----	----	----	----	1.0	1.8	.8	1.2	1.6	2.2	.8	1.6	60	90	55	75	4-A
HE	Steep	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	50	70	5-A
HA	Eroded, steep	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	30	55	5-B
	Milaca silt loam:																							
MK	Gently sloping	32	48	5.1	8.2	38	52	1,000	2,000	160	250	1.6	3.2	1.3	2.4	2.6	3.5	1.8	2.8	100	130	80	100	1-C
MN	Sloping	30	45	5.0	8.0	35	50	900	2,200	140	230	1.5	3.0	1.2	2.2	2.5	3.2	1.7	2.6	95	125	75	95	2-B
MP	Strongly sloping	27	40	4.5	7.6	32	48	800	1,600	110	180	1.4	2.8	1.1	2.0	2.4	3.1	1.6	2.5	90	120	70	90	3-A
MO	Steep	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	60	80	5-A
MR	Undulating	30	45	5.0	8.0	38	52	1,000	2,000	140	230	1.6	3.2	1.3	2.4	2.6	3.5	1.8	2.8	100	130	80	100	2-G
MH	Gently rolling	26	40	4.6	7.5	34	46	900	1,800	110	200	1.5	3.1	1.2	2.2	2.5	3.3	1.7	2.7	90	120	75	95	2-H
MM	Rolling	----	----	----	----	25	35	----	----	----	----	1.1	2.5	1.0	2.0	----	----	----	----	70	100	65	90	4-A
ML	Hilly	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	60	80	5-A
	Milaca fine sandy loam:																							
ME	Gently sloping	30	44	5.0	7.5	35	50	900	2,000	120	220	1.5	3.0	1.2	2.0	2.5	3.2	1.7	2.6	90	120	75	95	2-A
MF	Sloping	27	41	4.6	7.1	31	46	800	2,000	110	210	1.4	2.5	1.0	1.8	2.4	3.0	1.5	2.2	80	110	70	90	2-B
MG	Strongly sloping	25	36	4.5	7.0	28	42	700	1,400	100	180	1.3	2.4	.9	1.7	2.3	2.9	1.4	2.1	75	105	65	85	3-A
	Milaca-Cloquet-Peat complex:																							
MD	Undulating	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	75	95	4-E
MA	Gently rolling	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	70	90	4-E
MC	Rolling	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	60	80	5-A
MB	Hilly	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	55	75	5-A
	Omega loamy sand:																							
OE	Nearly level	15	25	2.5	4.0	20	40	----	----	----	200	.8	1.8	.5	1.0	1.0	2.0	.8	1.7	50	75	35	70	3-D
OA	Gently sloping	14	22	2.4	3.9	19	38	----	----	----	190	.8	1.7	.5	1.0	1.0	2.0	.8	1.7	50	75	35	70	3-D
OF	Sloping	12	20	2.2	3.6	17	34	----	----	----	160	.7	1.4	.4	.8	.8	1.6	1.6	1.2	45	70	30	65	3-D
OG	Strongly sloping	11	20	2.2	3.5	16	32	----	----	----	----	.7	1.4	.4	.8	.8	1.6	.6	1.2	45	70	25	55	5-C

	Omega loamy sand, gravelly subsoil:																							
Oc	Nearly level	16	26	2.5	4.0	20	40					.8	1.7	.5	1.0	1.0	2.0	.8	1.7	50	75	35	70	3–D
Ob	Gently sloping	14	22	2.4	3.9	19	38					.8	1.7	.5	1.0	1.0	2.0	.8	1.7	50	75	35	70	3–D
Od	Sloping and strongly sloping	12	20	2.2	3.6	17	34					.7	1.4	.4	.8	.8	1.6	.6	1.2	45	70	30	65	5–C
	Onamia loam:																							
Ol	Nearly level	32	54	5.5	9.0	45	60	1,000	2,600	140	250	1.5	2.5	1.2	2.0	1.9	2.8	1.3	2.5	90	120	70	90	1–C
Ok	Gently sloping	30	50	5.4	8.5	41	55	800	2,000	110	200	1.4	2.3	1.1	1.8	1.8	2.7	1.2	2.4	85	110	65	85	1–C
Oh	Gently rolling	28	48	5.3	8.2	38	50	700	1,800			1.2	2.0	1.0	1.6	1.7	2.5	1.1	2.3	80	100	60	80	2–B
	Otterholt silt loam:																							
On	Nearly level	38	64	6.0	10.0	48	68	1,400	2,900	150	350	2.2	2.8	1.5	2.6	2.4	4.1	1.6	2.7	105	155	95	125	1–A
Om	Gently sloping	36	62	6.0	10.0	48	65	1,400	2,800	150	340	2.1	3.6	1.4	2.5	2.3	4.0	1.5	2.6	100	150	90	120	1–B
Oo	Sloping	34	60	5.8	9.5	44	60	1,300	2,600	140	320	2.0	3.4	1.3	2.4	2.2	3.9	1.4	2.5	95	140	85	110	2–C
Op	Strongly sloping	30	55	5.5	9.0	40	55	1,100	2,400	130	250	1.8	3.2	1.1	2.0	2.1	3.9	1.4	2.5	90	135	80	110	2–D
Pa	Peat and Muck				8.0		30						3.0		2.4						120	60	120	5–D
	Pitted outwash:																							
Pc	Rolling																					50	80	4–A
Pb	Hilly																					45	70	5–C
Pd	Poskin silt loam	27	45	4.5	8.0	36	50	800	2,000			2.2	3.7	1.5	2.5					100	145	90	120	3–E
Ra	Riverwash																				20	30		5–D
	Santiago silt loam:																							
Sd	Nearly level	34	56	6.2	9.1	47	65	1,400	2,800	160	350	2.0	3.5	1.2	2.1	2.3	4.0	1.4	2.5	100	140	90	120	1–A
Sb	Gently sloping	32	54	6.0	9.0	45	60	1,200	2,600	140	285	2.0	3.4	1.2	2.0	2.4	4.1	1.6	2.7	95	135	85	115	1–B
Se	Sloping	30	48	5.0	8.5	40	58	1,100	2,500	125	215	1.8	3.2	1.1	2.0	2.3	4.0	1.4	2.5	90	120	80	110	2–C
Sf	Strongly sloping	29	46	5.0	8.4	38	56	1,000	2,200	100	175	1.8	3.2	1.1	2.0	2.3	4.0	1.4	2.5	90	120	80	110	2–D
Sc	Moderately steep	25	40	4.5	7.0	35	50	800	2,000			1.6	3.0	1.0	1.8	2.1	3.8	1.2	2.1	85	110	75	100	4–B
Sa	Eroded, sloping	25	40	4.5	7.0	35	50	700	1,200	75	150	1.5	2.0	1.0	1.5	2.1	3.8	1.2	2.1	75	105	70	95	2–C
	Santiago stony silt loam:																							
Sg	Sloping																					80	110	4–D
Sk	Strongly sloping																					70	100	4–D
Sh	Steep																					50	70	5–A
Sl	Scott Lake sandy loam	20	32	4.0	6.0	30	45					1.8	3.2	1.1	2.0					85	120	80	105	2–F
	Spencer silt loam:																							
Sn	Nearly level	28	48	4.6	8.4	47	58	900	2,300	90	260	2.4	3.8	1.8	2.4	2.5	3.8	1.7	2.5	105	150	95	130	2–E
Sm	Gently sloping	31	52	4.6	8.3	45	57	1,000	2,400	100	275	2.3	3.7	1.7	2.3	2.4	4.1	1.6	2.7	100	145	90	125	2–G
So	Sloping	28	48	4.5	8.2	43	55	900	2,300	90	260	2.2	3.6	1.6	2.2	2.3	4.0	1.5	2.6	95	140	85	105	2–H
Sp	Stony steep land																					10	20	5–A
	Terrace escarpment:																							
Tb	Strongly sloping																					28	50	5–C
Ta	Moderately steep																					25	40	5–C
Wa	Wallkill silt loam		30		7.5	32	52					1.5	3.0	1.2	2.0					100	140	90	120	4–E
Wd	Warman silt loam		31		6.1		42						3.0		2.6						120	65	105	4–E
Wc	Warman loamy sand, gravelly subsoil		25		5.0		30						2.0		1.5						115	60	100	4–E
Wb	Warman loamy fine sand		26		5.1		32						2.1		1.6						115	60	100	4–E

[1] The term "cow-acre-days" is used to express the carrying capacity or grazing value of pasture or range. It equals the number of days of grazing 1 acre will provide for 1 animal unit in a year, without injury to the sod. One animal unit is a mature cow, steer, or horse, or 5 mature sheep.

CAPABILITY CLASSES AND SUBCLASSES IN BARRON COUNTY

Capability classes and subclasses in Barron County are given in the following list. The brief description of each subclass gives the general nature of the soils but is not a complete description.

CLASS I.—Soils safe for use under intensive cultivation, without special practices to control runoff or erosion, and which may be expected to produce high yields with good soil and crop management. No subclasses of class I are used.

CLASS II.—Soils that can be used for tilled crops but under slight risks of erosion or other slight limitations.

IIe: Undulating to gently sloping moderately well drained to well-drained soils.

IIw: Nearly level soils that need some supplemental drainage.

IIs: Nearly level to gently sloping soils that are slightly droughty.

CLASS III.—Soils that can be used for tilled crops, but under moderate risks of erosion or other important limitations.

IIIe: Gently rolling to sloping soils.

IIIw: Poorly drained and imperfectly drained soils.

IIIs: Nearly level to sloping droughty soils.

CLASS IV.—Soils that have severe limitations or high risks of soil damage when used for cultivation and when so used require special management.

IVe: Dominantly, strongly sloping soils subject to erosion, with inclusions of moderately steep, rolling, and hilly soils.

IVw: Imperfectly drained to poorly drained soils.

IVs: Sandy, droughty soils.

CLASS V.—Soils not subject to erosion but totally unsuited to cultivation because of standing water or frequency of overflow.

Vw: Low, wet soils.

CLASS VI.—Soils too steep, too sandy, or too wet for cultivation except to reseed long-growing forage or for tree planting.

VIe: Moderately steep, sloping, strongly sloping, and hilly soils.

VIs: Sloping, strongly sloping, hilly, and steep sandy droughty soils.

CLASS VII.—Soils unsuited to cropping because of erosion, stoniness, droughtiness, or limited depth.

VIIe: Stony steep land.

VIIs: Moderately steep to strongly sloping droughty soils.

CLASS VIII.—Very steep, sandy, stony, rocky, or wet soils not suited to the commercial production of crops. They may have use for wildlife food and shelter areas, or for recreational or water-yielding purposes.

VIIIs: Riverwash.

The capability class and subclass for each soil is shown in the following list:

	Capability class and subclass
Adolph silt loam (AA)	Vw
Adolph stony silt loam (AB)	Vw
Alluvial land (AC)	Vw
Almena silt loam:	
Gently sloping (AD)	IIIw
Nearly level (AE)	IIIw
Sloping (AF)	IIIw
Almena stony silt loam, gently sloping (AG)	Vw
Altoona silt loam (AH)	IIIw
Antigo silt loam:	
Gently sloping (AI)	IIs
Nearly level (AJ)	I
Sloping (AO)	IIIs
Antigo silt loam, shallow:	
Gently rolling (AK)	IIIs
Gently sloping (AL)	IIs
Nearly level (AM)	IIs
Sloping (AN)	IVs
Arland fine sandy loam:	
Eroded, strongly sloping (AP)	IVs
Gently sloping (AQ)	IIIs
Moderately steep and steep (AR)	IVs
Sloping (AS)	IIIs
Strongly sloping (AT)	IVs
Arland silt loam:	
Eroded, strongly sloping (AU)	IVe
Gently sloping (AV)	IVe
Moderately steep (AW)	IVe
Sloping (AX)	IIIe
Strongly sloping (AY)	IVe
Auburndale silt loam (AZ)	IVw
Barronett loam (BA)	IIIw
Baronett silt loam (BB)	IIIw
Boone loamy fine sand:	
Gently sloping (BC)	IVs
Steep (BD)	VIIs
Strongly sloping (BE)	VIs
Brill silt loam:	
Gently sloping (BG)	IIw
Nearly level (BH)	IIw
Burkhardt loams and sandy loams (BK)	IIIs
Campia silt loam:	
Gently sloping (CA)	IIe
Nearly level (CB)	I
Chaseburg silt loam (CT)	IIIw
Chetek sandy loam:	
Gently rolling (CC)	IIIs
Gently sloping (CD)	IIIs
Nearly level (CE)	IIIs
Sloping (CH)	IIIs
Undulating (CK)	IIIs
Chetek sandy loam, shallow:	
Gently sloping (CF)	IVs
Nearly level (CG)	IVs
Cloquet sandy loam:	
Hilly (CL)	VIs
Rolling and hilly (CM)	IVs
Undulating and gently rolling (CN)	IIIs
Comstock loam (CO)	IIIw
Comstock silt loam (CP)	IIIw
Crystal Lake loam (CR)	IIw
Crystal Lake silt loam (CS)	IIw
Freeon silt loam:	
Gently sloping (FA)	IIe
Nearly level (FB)	IIw
Sloping (FC)	IIIe

	Capability class and subclass
Freer silt loam:	
Gently sloping (FD)	IIIw
Nearly level (FE)	IIIw
Sloping (FF)	IIIw
Freer stony silt loam, gently sloping (FG)	Vw
Gale silt loam:	
Eroded, sloping and strongly sloping (GA)	IVe
Gently sloping (GB)	IIe
Sloping (GC)	IIIe
Strongly sloping (GD)	IVe
Hixton fine sandy loam:	
Eroded, steep (HA)	VIIs
Eroded, strongly sloping (HB)	IVs
Moderately steep (HC)	IVs
Sloping (HD)	IIIs
Steep (HE)	VIs
Strongly sloping (HF)	IVs
Hixton loam:	
Eroded, strongly sloping (HG)	IVe
Gently sloping (HH)	IIe
Moderately steep (HK)	VIe
Sloping (HL)	IIIe
Strongly sloping (HM)	IVe
Milaca-Cloquet-Peat complex:	
Gently rolling (MA)	IVe
Hilly (MB)	VIe
Rolling (MC)	IVe
Undulating (MD)	IIIe
Milaca fine sandy loam:	
Gently sloping (ME)	IIe
Sloping (MF)	IIIe
Strongly sloping (MG)	IVe
Milaca silt loam:	
Gently rolling (MH)	IIIe
Gently sloping (MK)	IIe
Hilly (ML)	VIe
Rolling (MM)	IVe
Sloping (MN)	IIIe
Steep (MO)	VIe
Strongly sloping (MP)	IVe
Undulating (MR)	IIe
Omega loamy sand:	
Gently sloping (OA)	IVs
Nearly level (OE)	IVs
Sloping (OF)	IVs
Strongly sloping (OG)	VIIs
Omega loamy sand, gravelly subsoil:	
Gently sloping (OB)	IVs
Nearly level (OC)	IVs
Sloping and strongly sloping (OD)	VIs
Onamia loam:	
Gently rolling (OH)	IIIs
Gently sloping (OK)	IIs
Nearly level (OL)	IIs
Otterholt silt loam:	
Gently sloping (OM)	IIe
Nearly level (ON)	I
Sloping (OO)	IIIe
Strongly sloping (OP)	IVe
Peat and muck (PA)	Vw
Pitted outwash:	
Hilly (PB)	IVe
Rolling (PC)	IVe
Poskin silt loam (PD)	IIIw
Riverwash (RA)	VIIIs

	Capability class and subclass
Santiago silt loam:	
Eroded, sloping (SA)	IVe
Gently sloping (SB)	IIe
Moderately steep (SC)	IVe
Nearly level (SD)	I
Sloping (SE)	IIIe
Strongly sloping (SF)	IVe
Santiago stony silt loam:	
Sloping (SG)	VIe
Steep (SH)	VIe
Strongly sloping (SK)	VIe
Scott Lake sandy loam (SL)	IIIs
Spencer silt loam:	
Gently sloping (SM)	IIe
Nearly level (SN)	IIw
Sloping (SO)	IIIe
Stony steep land (SP)	VIIe
Terrace escarpment:	
Moderately steep (TA)	VIIs
Strongly sloping (TB)	VIIs
Wallkill silt loam (WA)	IIIw
Warman loamy fine sand (WB)	Vw
Warman loamy sand, gravelly subsoil (WC)	Vw
Warman silt loam (WD)	IVw

GENESIS, CLASSIFICATION, AND MORPHOLOGY OF SOILS

The nature and properties of any soil depend on the material from which it was formed, the climate, the plants and animals, the relief or lay of the land, and the length of time during which the soil-forming factors have been acting. All of these factors must be considered to understand the origin of the soils of this county and their differences and similarities.

Genesis of Soils in Barron County

PARENT MATERIAL

The geology of Barron County was discussed in a previous section. Most of the soils have developed from glacial drift. In a small area in the southern part of the county, the soils have developed from sandstone weathered in place. The parent materials are silt of variable depth, glacial till, glacial lake sediments, outwash sand and gravel, recent alluvium, and some residual material in the Barron Hills and the sandstone hills of the southern part.

The last glaciation, the Cary substage, is mostly responsible for shaping the landscape and depositing the soil-forming materials in all but the south-central towns. The sand, clay, boulders, and other rock material deposited directly by the glacier is called glacial till. Some of the material was reworked by the melt water and laid down in more or less stratified deposits as the ice retreated. The largest areas of water-sorted deposits are the outwash plains near Chetek, Cameron, and Rice Lake.

CLIMATE

The strong influence of climate upon soil development is expressed by broad zones of similar soils. The Podzol soil zone lies to the north

and northeast of Barron County, the Gray-Brown Podzolic soil zone to the south, and the Gray Wooded soil zone to the northwest. The soils in each of these zones owe their characteristics partly to the climate.

The annual rainfall varies considerably from year to year. Extremes at Cumberland are 21.05 inches in a dry year and 43.43 inches in the wettest year recorded. The average annual rainfall in the county is 30 to 31 inches. The average temperature ranges from about 13° F. in winter to about 67° F. in summer. Extremes range from −52° F. to 107° F. More detailed information is given in the section on climate.

The influence of the general climate of the region is modified by the local conditions in and near the developing soil. For example, south-facing, dry, sandy slopes have a local climate, or microclimate, that is warmer and less humid than the average climate of the nearby areas. Low-lying, poorly drained bogs are wetter and colder than most soils around them. These differences account for some of the differences in soils within the same general climatic region.

RELIEF

The gradient, pattern, and length of slope strongly influence the speed of runoff water and the rate of erosion. Water runs off from steeper slopes so rapidly that it is likely to carry a great deal of soil if the surface is not protected. In general, soils on steeply sloping land are shallow and not well developed because erosion removes the soil almost as rapidly as it is formed.

Relief influences the natural drainage of each soil. Leaching takes place if the soil receives water, is permeable, and lies above the water table. Soils on lower slopes and depressed flats receive water from surrounding higher land. Seepage and a high water table make such soils swampy. Vegetation grows more luxuriantly and decays more slowly, thus building up larger reserves of organic matter.

PLANT AND ANIMAL LIFE

Plant life and animal life are important factors in soil formation. Plant life is especially significant. Soil formation really begins with the coming of vegetation. As plants grow and die, their remains add organic matter to the upper layers of the soil material. Trees commonly feed on plant nutrients from deep in the subsoil. These nutrients are returned to the surface of the soil when the leaves fall or the trees die. This organic matter accumulates gradually in the soil until the upper layer is distinctly different from the original parent material. Formation of this rudimentary profile makes a soil, as distinguished from the unaltered parent material.

Earthworms, insects, micro-organisms, and other forms of life influence the soil by breaking down the organic matter and by changing the soil structure.

The vegetation under which the soils of Barron County have developed was dominantly a mixture of coniferous and hardwood trees, rather than grasses (see section on vegetation). Under such a cover, the organic matter is concentrated in a thin surface layer.

Soils on the steeper slopes usually have accumulated less organic matter. Very poorly drained soils contain more organic matter. Some soils of Barron County are composed predominantly of organic matter.

TIME

Soil formation takes considerable time. The soil materials of Barron County probably have been in place for at least 10,000 years. Differences in degree of development of these soils seem to be related more to steepness of slope and internal drainage than to variations in age of the parent material.

The most recent soils of the county are the alluvial soils. Their parent material has been altered very little since it was laid down, except by some accumulation of organic matter. Peat and muck soils are also of recent origin.

MAN'S INFLUENCE ON THE SOIL

The main effect of man's use of the soil in Barron County is that of hastening erosion. In many sloping cultivated fields, fully half of the original topsoil has been lost by erosion. The destruction of the original protecting vegetation and the mixing and pulverizing of the top layer of a soil create an erosion hazard. Much of a soil's capacity to support plant life may be destroyed if erosion is allowed to continue.

Most of the soils in Barron County can be improved by good management. Through the use of lime and phosphate, the inclusion of legumes and grasses in the rotations, and through other soil conservation practices, the light-colored, acid soils that are low in nutrients can be made more productive than they were in their original condition.

Classification of Soils

The soils of Barron County are classified in table 9. The zonal soils have well-developed soil characteristics that show the influence of climate and vegetation. The characteristics of the intrazonal soils reflect the dominating influence of some local factor of relief, parent material, or age over the normal effect of the climate and vegetation. The azonal soils do not have well-developed profile characteristics because of their youth or because of parent material or relief.

These three soil orders are divided into suborders, which are described in the table. The suborders are composed of great soil groups, which are defined on the basis of common soil characteristics. Each great soil group contains a number of soil series, which, in turn, contain many soil types and phases.

Many of the soil series in the county are not true representatives of any single great soil group but are intergrades between two great soil groups. The Gale, Arland, and Hixton series, for example, are considered good representatives of the Gray-Brown Podzolic great soil group. The Otterholt and Santiago series, however, seem to be somewhere between the Gray-Brown Podzolic soils and the Gray Wooded soils. Other intergrades are named in the table.

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TABLE 9.—*Soils of Barron County, Wis., classified by higher categories* [1]

ZONAL SOILS

Suborder	Great soil group	Soil series	Remarks
Light-colored podzolized soils of the timbered regions.	Gray-Brown Podzolic	Antigo	Certain of these soils carry a suggestion of grading to Low-Humic Gley soils, and some others of grading to Gray Wooded soils. These characteristics, however, are not sufficiently evident to list the soils as definite intergrades.
		Arland	
		Brill	
		Campia	
		Chetek	
		Crystal Lake	
		Freeon	
		Gale	
		Hixton	
		Otterholt	
		Santiago	
		Scott Lake	
		Spencer	
		Almena	Grade to Low-Humic Gley.
		Altoona	
		Comstock	
		Freer	
		Poskin	
		Boone	Grades to Regosol.
		Milaca	Grade to Podzol.
		Onamia	
	Brown Podzolic	Omega	
	Podzol	Cloquet	Grades to Brown Podzolic.
Dark-colored soils of the humid grasslands.	Prairie (Brunizem)	Burkhardt	Grades to Gray-Brown Podzolic.

Intrazonal Soils			
Hydromorphic soils of marshes, swamps, and seep areas.	Humic Gley	Adolph, Barronett, Warman	Grade to Low-Humic Gley.
	Low-Humic Gley	Auburndale	
	Bog	Muck, Peat	
Azonal Soils			
(No suborders)	Alluvial	Chaseburg, Wallkill	

[1] Miscellaneous land types mapped in the county and not shown in this table are Alluvial land; Riverwash; Pitted outwash, rolling; Pitted outwash, hilly; Stony steep land; Terrace escarpment, strongly sloping; and Terrace escarpment, moderately steep.

Morphology of Soils Representing the Great Soil Groups

Morphological features for each soil type are given in the section, Soil Descriptions. Descriptions of several soil types, each selected to represent a great soil group in the county, are given here in greater detail.

Gray-Brown Podzolic soils.—The morphological characteristics of a Gale silt loam profile examined and sampled in the SE¼NW¼ sec. 19, T. 32 N., R. 10 W., are given below as an example of a typical Gray-Brown Podzolic soil in this county. The vegetation at this site was forest of maple, oak, aspen, some elm, and birch.

Profile of Gale silt loam:

- A_0 0 to 1 inch, very dark gray (10YR 3/1, moist)[14], very strongly acid organic layer; a mixture of roots, stems, and leaf mold.
- A_1 1 to 3 inches, gray to grayish-brown (10YR 6/1 to 5/2, moist), extremely acid silt loam; weakly developed medium platy structure in place but breaks into weak granules when disturbed.
- A_2 3 to 9 inches, brown (10YR 5/3, moist), very strongly acid, friable silt loam; thin platy structure in place but breaks readily into medium crumbs.
- B_1 9 to 13 inches, yellowish-brown (10YR 5/4, moist), strongly acid, heavy silt loam; moderately developed fine subangular blocky structure, tending toward coarse platy.
- B_2 13 to 25 inches, yellowish-brown (10YR 5/4 to 5/6, moist), strongly acid silty clay loam; well-developed blocky structure; aggregates slightly coated with light grayish-brown and light-gray material washed down from layer above.
- D 25 inches +, very pale brown and brownish-yellow (10YR 7/4 to 5/8, moist), very strongly acid, fine-grained sand that overlies sandstone.

Other typical representatives of the Gray-Brown Podzolic soils are the Arland, Hixton, and Chetek. They are associated with the Gale soils in the southern part of the county.

Other soil series in the county are Gray-Brown Podzolic, but have some characteristics that resemble those of other great soil groups. The Otterholt, Santiago, and Antigo, for instance, appear to grade toward the Gray Wooded great soil group (fig. 13). The Onamia soils, especially the coarser textured types, grade toward the Podzol great soil group, and so do the Milaca. Other Gray-Brown Podzolic soils, the Almena, Comstock, Freer, Poskin, and Altoona series, grade toward the Low-Humic Gley soils. The loose and friable Boone soils, developed from sandstone, are intergrades between the Gray-Brown Podzolic and Regosol great soil groups.

Brown Podzolic soils.—The Omega soil is a typical Brown Podzolic soil, and the only example of this great soil group mapped in this county. A sample was examined and sampled in the northwestern corner of the NW¼ sec. 12, T. 32 N., R. 10 W. The forest on this site was jack pine, aspen, oak, maple, and white pine. The ground cover was ferns, blueberry, and various grasses.

Profile of Omega loamy sand:

- A_0 0 to ½ inch, thin cover of partially decomposed, black (10YR 2/1), extremely acid organic material.
- A_1 ½ to 4 inches, very dark brown to brown (10YR 2/2 to 4/3) loamy sand; weak granular structure; very strongly acid.

[14] Color notations follow the Munsell color rating system.

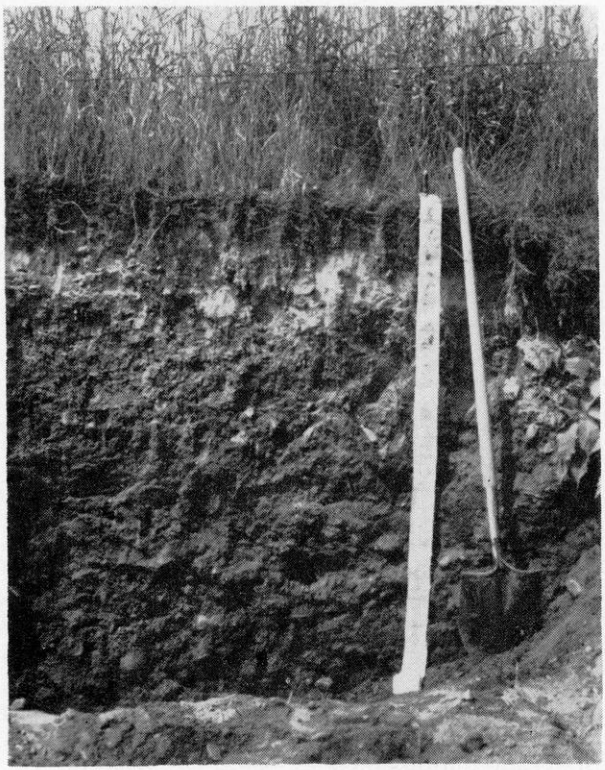

FIGURE 13.—Profile of Antigo silt loam showing grayish A_2 horizon, darker colored B horizon, and gravelly substratum.

B_{21} 4 to 8 inches, brown (10YR 4/3) strongly acid sand; appreciable amounts of organic material; grades into the horizon below.

B_{22} 8 to 18 inches, brown to yellowish-brown (10YR 5/3 to 5/4) loose loamy sand; slightly compact; weakly cemented when dry; strongly acid.

C 18 inches +, yellow (10YR 7/6) and yellowish-red (5YR 5/6), slightly acid, loose, stratified sand with some fine gravel.

In some places where the A_1 horizon is 2 to 5 inches thick, the Omega loamy sand seems to grade toward a Prairie soil. In other places where a thin light-gray A_2 horizon underlies the A_1 horizon, this soil grades more toward the Podzol great soil group.

Podzols.—The Cloquet soil is the only Podzol mapped in this county. A profile was examined in the Barron Hills, in the northeastern corner of the county. The vegetation is an aspen and white birch forest, in which are scattered a few white and red pines.

Profile of Cloquet sandy loam:

A_0 1 to 0 inches, dark grayish-brown organic mat.

A_2 0 to 2 inches, pinkish-gray (7.5YR 6/2, moist), loose, strongly acid sandy loam to loamy sand; weak platy structure; thickness of horizon varies from a mere film, less than ¼ inch thick or lacking in places, to 3 inches.

B_{21} 2 to 8 inches, dark-brown to strong-brown (7.5YR 4/4 to 5/6, moist), weak granular sandy loam; an orterde horizon containing accumulated iron and organic matter, but not cemented.

B_{22} 8 to 20 inches, brown (7.5YR 5/4) sandy loam, weakly cemented.

C_1 20 inches +, yellowish-red (5YR 4/6) stony sandy loam.

In some places the weak development of the A_2 and B horizons suggests a similarity to the Brown Podzolic great soil group. The reaction of this sample was not available.

Prairie soils.—The Burkhardt soil is the only Prairie soil mapped in this county. It occurs in a few small areas on sandy outwash plains under a mixed cover of grasses and trees. Its characteristics intergrade between those of the Prairie and the Gray-Brown Podzolic great soil groups.

A Burkhardt sandy loam profile was examined in a cultivated field near a wooded area, in section 5, about 3 miles south of Cameron. This profile follows:

A_p and A_1 0 to 7 inches, very dark brown (10YR 2/2, moist) friable sandy loam; weak granular structure; contains considerable organic matter.

B 7 to 12 inches, reddish-brown (5YR 5/3) weak blocky loam; contains many fine roots.

C_1 12 inches +, dark reddish-brown (5YR 3/4) loose mixture of sand, gravel, and a very little clay.

The reaction of this soil was not determined.

Humic Gley soils.—These soils have dark-colored surface layers of mineral soil, high in organic matter, and strongly mottled light-gray subsoils. The Adolph, Barronett, and Warman are intergrades between Humic Gley soils and the Low-Humic Gley soils described below.

Low-Humic Gley soils.—Low-Humic Gley soils are similar to the Humic Gley soils, but they have a lighter colored surface layer and a lower content of organic matter. Auburndale silt loam represents this great soil group in Barron County. This poorly drained soil has developed in shallow depressions.

The following profile was examined in a pasture:

A_1 0 to 8 inches, very dark gray (N 3/, moist), very strongly acid, granular heavy silt loam; somewhat sticky when wet.

A_{2g} 8 to 11 inches, grayish-brown and light brownish-gray (10YR 5/2 and 6/2, moist) strongly acid silt loam, slightly mottled with splotches of yellowsh brown and dark reddish brown; moderately developed platy structure.

B_{g1} 11 to 16 inches, gray (10YR 5/1, moist), mottled with yellowish red and strong brown, strongly acid, heavy silt loam; moderately plastic when wet; moderately developed coarse platy structure.

B_{g2} 16 to 34 inches, pinkish-gray (7.5YR 6/2, moist), strongly acid, heavy silt loam; more highly mottled than the horizon above; weakly developed coarse blocky structure.

C_g 34 to 48 inches, strong-brown (7.5YR 5/6, moist), strongly acid, massive heavy silt loam, splotched with light brownish gray; moderately plastic when wet.

C 48 inches +, dark reddish-brown (2.5YR 3/4, moist), medium acid, massive silty clay loam; plastic when wet.

Bog soils.—The Bog soils of this county have not been examined in great detail. These soils have developed in ponds and shallow lakes, where the remains of plant growth accumulate in the water and decompose very slowly. They consist chiefly of more or less decomposed organic matter. Material that is in the early stages of decomposition is called peat; that which is in more advanced stages is called muck.

Alluvial soils.—These soils have not had time to develop a B horizon. Alluvial soils are on unconsolidated material which has undergone little or no modification by soil-forming processes. The Chaseburg and Wallkill are shown as Alluvial soils.

MECHANICAL AND CHEMICAL ANALYSES OF SELECTED SOILS OF BARRON COUNTY

Mechanical and chemical analyses were made of some of the more important soils of Barron County. Table 10 gives mechanical analyses, exchangeable bases, pH, and organic carbon for 9 soil types. Table 11 shows the reaction and the percentage of carbon, by horizons, for 17 other selected soil types.

Information about the distribution of clay throughout the profile, the kind and amount of exchangeable bases, the degree of base saturation, and the acidity of a soil shows the type of soil-forming processes and the degree of soil development.

These analyses were used in making the fertilizer and crop rotation suggestions given in this report. They also help to determine soil classification and to interpret characteristics related to soil use.

Table 10 shows the size distribution of the soil particles throughout the profile. This table shows the tendency for clay to accumulate in the B horizon, although the total content of clay is rather low. Most of these soils have a silt loam to loam texture in the zone of maximum clay accumulation. No horizon has more than 27 percent clay.

These data indicate that the soil parent material was highly weathered before it was redeposited in the county by the glaciers. Clay-forming minerals, usually associated with calcium carbonate or other basic minerals, appear to be lacking or present in only very small amounts in the C horizon. Even the Campia silt loam, which is underlain by calcareous lacustrine silts and clay, has less than 18 percent of clay in the C horizon.

The silt (loess) material is believed to be of local origin. It is very low in calcium and acid in reaction, whereas loessal material in other parts of Wisconsin contains free carbonates and has a neutralizing value equivalent to 8 to 20 percent of calcium carbonate.[15] Its distribution in the county and its thickness on various levels also indicate a local origin. The silt occurs in spots throughout the morainic section of the county. One soil may have a loamy surface texture, and the adjoining soil may have a silt loam texture to a depth of 12 to 36 inches.

Base exchange data are useful in the evaluation of soil fertility, especially when considered with information about the pH, organic-matter content, and texture. A fertile soil usually has a high exchange capacity and a high percentage of base saturation. The exchange capacity is closely related to the type and amount of clay present and the amount of organic matter.

The data in table 10 shows that in a typical soil of Barron County, the sum of the cations (base-exchange capacity) is highest where organic-matter content is highest and where clay content is highest. They also show that the A_2 horizons of these soils are generally the most strongly leached.

[15] GLENN H. ROBINSON. UNPUBLISHED THESIS, UNIVERSITY OF WISCONSIN, 1950.

TABLE 10.—*Mechanical and chemical analyses of selected soils of Barron County, Wis.*

Soil name, horizon symbol, and depth	Mechanical Analysis						Chemical Analysis									
							Exchangeable bases (milliequivalents per 100 grams of soil)									
	Very coarse, coarse, and medium sand (2–0.25 mm.)	Fine and very fine (0.25–0.05 mm.)	Silt [1] (0.05–0.002 mm.)	Clay (<0.002 mm.)	Silt [2] (0.02–0.002 mm.)	Textural class	Ca	Mg	K	Na	Mn	H	Sum of cations	Base saturation	pH	Carbon
	Percent	*Percent*	*Percent*	*Percent*	*Percent*								*Milliequivalents*	*Percent*		*Percent*
Adolph silt loam:																
A_{11} 0–2 inches							8.5	2.3	0.2	0.4	(3)	37.4	48.8	23	5.2	13.72
A_{12} 2–8 inches							3.5	1.6	.1	.1	(3)	15.8	21.1	25	4.9	6.24
AB_g 8–18 inches	3.1	6.0	69.3	21.6	28.4	Silt loam	5.4	2.7	(4)	.1	(3)	9.3	17.5	47	4.7	-------
BG 18–36 inches	4.9	7.1	69.6	18.4	26.5	Silt loam	8.4	4.4	.2	.2	(3)	1.8	15.0	88	5.1	-------
CG 36 inches+	1.3	4.9	70.0	23.8	27.7	Silt loam									5.0	-------
Almena silt loam:																
A_1 0–3 inches	2.7	7.8	68.6	20.9	30.6	Silt loam	10.7	2.7	.4	.2	0.3	18.0	32.3	44	5.4	3.96
A_2 3–6½ inches	3.8	7.9	75.3	13.0	32.2	Silt loam	3.1	1.0	.2	.1	.14	10.3	14.8	30	5.1	1.35
A_{3g} 6½–16 inches	2.5	7.2	79.4	10.9	32.8	Silt loam	2.0	.8	.1	.1	.02	6.5	9.5	32	5.0	.17
B_g 14–30 inches	4.8	9.5	68.2	17.5	22.1	Silt loam	4.3	2.3	.2	.1	.01	8.4	15.3	45	4.9	.15
C_g 30–36 inches	10.7	14.3	60.3	14.7	17.9	Silt loam	5.4	3.0	.2	.2	.01	7.3	16.1	55	5.1	.11
Arland silt loam:																
A_0 2–0 inches															3.9	19.07
A_1 0–2 inches	6.7	16.2	68.4	8.7	31.9	Silt loam	1.8	.5	.2	.1	.10	12.4	15.1	18	4.4	2.43
A_2 2–9 inches	7.4	15.7	67.1	9.8	29.8	Silt loam	.4	.4	.2	(4)	.03	9.4	10.4	10	4.8	.90
A_3 9–13 inches	5.6	14.5	71.6	8.3	29.8	Silt loam	.4	.5	.1	(4)	.01	5.5	6.5	15	5.0	.34
B_{21} 13–19 inches	6.4	14.3	61.3	18.0	24.6	Silt loam	2.7	1.9	.2	.1	(3)	7.8	12.7	39	5.0	.26
B_{22} 19–34 inches	29.3	35.6	17.8	17.3	7.3	Fine sandy loam	3.0	1.8	.2	.1	(3)	6.1	11.2	46	4.9	.11
D 34 inches +	14.9	72.1	6.1	6.9	2.4	Loamy fine sand	.9	.7	(4)	(4)	(3)	2.5	4.1	39	5.1	.08
Campia silt loam:																
A_1 0–3 inches	1.5	7.6	78.3	12.6	35.5	Silt loam	18.0	3.2	.9	.2	.04	8.6	30.9	72	6.5	6.70
A_2 3–12 inches	1.0	8.8	80.3	9.9	34.3	Silt loam	4.9	.8	.3	(4)	.01	4.0	10.0	60	6.3	.78
B_{21} 12–18 inches	.2	7.2	67.8	24.8	27.2	Silt loam	10.0	2.3	.2	.2	(3)	4.8	17.5	73	5.9	.30
B_{22} 18–29 inches	.4	7.7	65.5	26.4	28.3	Silt loam	7.4	3.0	.4	.2	(3)	8.6	19.6	56	5.1	.27
B_3 29–42 inches	.3	14.4	61.9	23.4	22.4	Silt loam	8.2	3.4	.3	.2	(3)	7.1	19.2	63	5.1	.24
C_1 42 inches+	.5	14.5	67.2	17.8	21.2	Silt loam	6.7	3.2	.2	.2	(3)	4.4	14.7	70	5.4	.15
Milaca silt loam:																
A_1 0–1 inches															5.5	15.32
A_{21} 1–3 inches	25.0	12.5	53.5	9.0	29.6	Silt loam	3.6	.8	.2	.1	.01	10.0	14.7	32	5.0	2.12
A_{22} 3–10 inches	24.9	13.5	52.9	8.7	27.7	Silt loam	2.0	.7	.1	.1	(3)	6.1	9.0	32	5.3	.59
A_3 10–16 inches	29.1	15.9	46.5	8.5	24.4	Fine sandy loam	2.4	.8	.2	(4)	(3)	3.8	7.2	47	5.7	.34
B_2 16–22 inches	30.7	16.8	38.6	13.9	19.3	Loam	3.4	1.2	.3	(4)	(3)	4.8	9.7	51	5.3	.22
C 22 inches+	51.5	20.6	12.9	15.0	6.7	Coarse sandy loam	4.2	1.4	.3	.2	(3)	4.4	10.5	58	5.5	.20

Onamia loam:																
A_1 ½–0 inches															5.9	11.04
A_{21} 0–4 inches	38.3	7.3	47.2	7.2	24.3	Sandy loam	4.8	1.3	.2	(4)	.14	7.8	14.2	45	5.5	1.86
A_{22} 4–10 inches	33.5	7.9	51.3	7.3	25.9	Silt loam	1.2	.3	(4)	(4)	.10	4.8	6.3	24	5.3	.51
B_1 10–14 inches	28.4	7.7	54.9	9.0	25.7	Silt loam	1.8	.9	(4)	.1	(3)	4.0	6.8	41	5.0	.20
B_2 14–24 inches	34.6	11.2	34.5	19.7	15.6	Gravelly loam	4.6	2.2	.1	.1	(3)	8.0	15.0	47	5.0	.29
C 24 inches+	73.9	13.7	6.0	6.4	2.6	Loamy coarse sand	1.9	1.0	(4)	.1	(3)	2.7	5.7	53		.11
Otterholt silt loam:																
A_1 0–3 inches	1.8	5.6	78.4	14.2	39.9	Silt loam	19.2	4.2	.8	.3	.13	9.0	33.6	73	5.6	7.09
A_2 3–11 inches	1.9	6.4	82.0	9.7	37.2	Silt loam	.2	.6	.1	0	.03	8.6	9.5	9	4.9	.94
B_1 11–14 inches	1.2	6.0	80.7	12.1	35.5	Silt loam	1.7	.7	.2	(4)	.01	7.1	9.7	27	4.9	.31
B_2 14–26 inches	2.3	9.0	67.9	20.8	26.3	Silt loam	.6	.4	(4)	(3)	(3)	10.7	11.7	9	4.7	.23
C 26–42 inches	6.7	9.3	67.9	16.1	22.1	Silt loam	4.0	1.7	.1	.1	(3)	8.6	14.5	41	4.8	.19
D 42 inches+	14.1	31.1	17.6	10.2	7.8	Sandy loam	2.5	1.1	(4)	.1	(3)	3.4	7.1	52	5.2	.06
Santiago silt loam:																
A_0 ¼–0 inches															5.8	20.89
A_1 0–2 inches							17.6	3.1	.7	.2	.52	18.5	40.6	54	5.4	8.18
A_2 2–12 inches	8.4	8.0	75.3	8.3	34.3	Silt loam	.8	.3	.1	(4)	.01	7.8	9.0	13	4.9	.69
B_1 12–14 inches	6.7	7.2	70.1	16.0	29.4	Silt loam	2.9	1.5	.1	(4)	(3)	7.5	12.0	38	5.0	.26
B_{21} 14–18 inches	11.6	11.1	59.4	17.9	24.6	Silt loam	3.6	1.6	.1	.3	(3)	8.2	13.8	41	5.0	.26
B_{22} 18–24 inches	27.9	17.1	37.7	17.3	14.9	Loam	4.5	2.3	.1	.1	.01	6.1	13.1	53	5.1	.15
C 24 inches	42.5	30.0	17.3	10.2	8.5	Gravelly sandy loam	2.5	1.2	(4)	(4)	(3)	3.6	7.3	51	5.3	.13
Spencer silt loam:																
A_1 0–3 inches	1.6	5.9	76.1	16.4	36.5	Silt loam	16.0	2.9	.5	.2	.33	21.2	41.1	48	5.1	7.37
A_{21} 3–11 inches	1.5	6.1	81.9	10.5	38.2	Silt loam	1.1	.5	.1	(4)	.03	10.5	12.2	14	4.8	1.39
A_{22} 11–14 inches	1.1	6.3	85.0	7.6	38.8	Silt loam	.9	.4	(4)	(4)	(3)	5.4	6.7	19	5.0	.27
B_{21} 14–25 inches	1.2	9.1	70.4	19.3	28.3	Silt loam	3.9	1.8	.1	.1	(3)	11.1	17.0	35	4.9	.19
B_{22g} 25–36 inches	6.8	12.2	60.3	20.7	22.1	Silt loam	4.8	2.2	.2	.2	(3)	9.4	16.8	44	4.9	.12
D 36 inches+	32.1	30.3	21.3	16.3	10.9	Gravelly sandy loam	4.3	2.0	(4)	.1	(3)	3.8	10.2	62	5.4	.08

[1] According to U. S. Department of Agriculture scheme of classification of soil separates.
[2] According to the International scheme of classification of soil separates.
[3] Trace.
[4] Less than 1/10 of 1 percent.

TABLE 11.—*Reaction and percentage of carbon in selected soils of Barron County, Wis.*

Soil and horizon symbol	Depth	Reaction	Carbon
Altoona silt loam:	*Inches*	*pH*	*Percent*
A_{11}	0– 6	4. 6	2. 22
A_{12}	6– 9	4. 5	2. 09
B_{1g}	9–13	5. 1	. 23
B_{2g}	13–24	4. 7	. 37
C_{1g}	24–36	5. 4	. 15
D	36+	5. 7	. 03
Antigo silt loam:			
A_1	0– 3	5. 9	6. 09
A_{21}	3– 6	4. 7	. 83
A_{22}	6–12	4. 9	. 30
B_1	12–15	4. 9	. 36
B_2	15–28	4. 8	. 32
B_3	28–36	4. 8	. 13
D_1	36–40	5. 0	. 10
D_2	40+	5. 3	. 07
Auburndale silt loam:			
A_1	0– 8	4. 8	7. 02
A_{21g}	8–11	5. 1	1. 46
A_{22g}	11–16	5. 3	. 50
B_{2g}	16–34	5. 2	. 32
C_g	34–48	5. 4	. 19
D	48+	5. 7	. 06
Barronett silt loam:			
A_{11}	0– 5	5. 1	6. 29
A_{12}	5–10	5. 0	1. 57
A_{21}	10–13	5. 2	. 46
A_{22g}	13–20	5. 1	. 17
BG	20–30	5. 0	. 12
C_{1g}	30–40	5. 2	. 09
C_{2g}	40+	5. 4	. 10
Boone loamy fine sand:			
A_0	1½– 0	5. 0	7. 96
A_1	0– 4	4. 2	3. 15
A_2	4– 8	4. 7	. 75
B_3	8–23	4. 9	. 63
C	23+	4. 9	. 22
Brill silt loam:			
A_1	0– 4	5. 6	6. 11
A_2	4–12	4. 9	. 51
A_3	12–16	4. 8	. 15
B_{2g}	16–34	4. 7	. 11
B_{3g}	34–42	4. 9	. 10
C	42–60	5. 9	. 04
Chetek sandy loam:			
A_1	0– 3	5. 2	5. 24
A_2	3–12	5. 3	. 75
B_1	12–20	5. 4	. 23
B_2	20–24	5. 5	. 27
C	24+	5. 7	. 04
Comstock silt loam:			
A_1	0– 5	6. 0	4. 80
A_2	5– 8	5. 5	. 79
A_{3g}	8–12	5. 1	. 39
B_{1g}	12–17	5. 0	. 24
B_{2g}	17–36	5. 0	. 12
B_{3g}	36–48	5. 1	. 17
C	48+	5. 2	. 12

TABLE 11.—*Reaction and percentage of carbon in selected soils of Barron County, Wis.*—Continued

Soil and horizon symbol	Depth	Reaction	Carbon
	Inches	*pH*	*Percent*
Crystal Lake silt loam:			
A_1	0– 4	5. 1	4. 54
A_2	4– 6	5. 1	. 55
A_3	6–11	5. 1	. 22
B_{1g}	11–17	4. 9	. 31
B_{2g}	17–28	5. 1	. 19
C_{1g}	28–48	5. 1	. 19
C_{2g}	48+	5. 1	. 12
Freeon silt loam:			
A_1	0– 3	5. 7	3. 95
A_2	3–10	5. 3	. 60
B_1	10–14	5. 1	. 23
B_2	14–26	5. 0	. 20
D	26+	5. 4	. 13
Freer silt loam:			
A_1	0– 3	5. 6	4. 46
A_2	3– 8	5. 3	1. 66
B_{1g}	8–14	5. 3	. 23
B_{2g}	14–26	5. 0	. 22
C	26+	5. 4	. 11
Gale silt loam:			
A_0	1– 0	5. 0	26. 38
A_1	0– 2	4. 4	2. 42
A_2	2– 8	4. 8	. 88
A_3	8–12	5. 1	. 37
B_{21}	12–23	5. 1	. 27
B_{22}	23+	5. 0	. 10
Hixton fine sandy loam:			
A_{11}	0– 2	4. 8	12. 54
A_{12}	2– 4	4. 6	3. 77
A_2	4–11	5. 0	. 79
B_1	11–18	5. 1	. 34
B_2	18–24	5. 0	. 16
C	24+	5. 9	. 11
Omega loamy sand:			
A_0	½– 0	4. 2	23. 95
A_1	0– 4	4. 5	1. 68
B_2	4– 8	5. 4	. 41
B_3	8–17	5. 8	. 19
C	17+	6. 1	. 04
Poskin silt loam:			
A_1	0– 4	5. 3	7. 72
A_2	4–10	5. 1	1. 18
B_{1g}	10–15	5. 0	. 35
B_{2g}	15–29	5. 0	. 25
C	29+	5. 2	. 14
Scott Lake sandy loam:			
A_p	0– 8	5. 6	1. 39
AB	8–11	5. 3	. 31
B_{2g}	11–18	5. 3	. 22
B_{3g}	18–32	5. 4	. 12
C	32+	5. 5	. 06
Warman loamy sand:			
A_0	2½– 0	4. 1	33. 80
A_{2g}	0–10	4. 6	. 31
B_g	10–20	4. 4	. 06
CG	20+	5. 1	. 08

In general, calcium content is high in the surface horizon, where the organic-matter content is highest, and it decreases with depth. The amount of exchangeable calcium increases again in the layer of the B horizon that has the highest clay content, but only one soil contains as much calcium here as in the surface layer. Magnesium is distributed in a similar manner, but in lesser amounts.

From the base exchange data and calcium- and organic-matter content, the Campia silt loam would seem to be the most fertile. This soil has the highest percentage of base saturation, and it contains more exchangeable calcium, magnesium, potassium, and sodium than any of the other soils analyzed. Even this soil, however, will probably need lime for best growth of certain crops.

The deep silty soils such as the Almena, Otterholt, Spencer, and Adolph also have a high sum of cations, but a relatively low percentage of base saturation. These soils can be made more fertile by heavy applications of lime and fertilizer. The more shallow silty soils, Arland and Santiago, are intermediate in exchange capacities between the coarser textured Milaca and Onamia loams and the deeper silty soils.

The percentage of carbon in the upper few inches is rather high. Below the surface layers, the precentage of carbon decreases rapidly; few horizons below the A_2 have more than one-half of 1 percent of carbon. None of these soils have a zone of organic matter accumulation in the B horizon, such as is characteristic of well-developed Podzols.

Generally, the processes of soil formation in Barron County appear to result in Gray-Brown Podzolic soils. The chemical analyses show that the A_2 horizon of most of these soils is strongly leached. However, the development of true Podzol soils has probably been retarded because of the finer texture of the soil material and because the forest vegetation is hardwood instead of evergreen.

The subsoils of all of the soils tested are very strongly or strongly acid. The pH ranges from 4.7 to about 5.4. The pH of the surface soils varies somewhat more; it ranges from 3.9 (extremely acid) in Arland silt loam to 6.5 (slightly acid or almost neutral) in Campia silt loam.

The soils on lacustrine materials, Campia and Comstock, are the most nearly neutral in reaction of the surface horizon. Although these soils are underlain by calcareous silt at depths of 7 to 8 feet, they are acid in the upper 4 feet.

The low pH values and the medium to moderately coarse texture of most of the soils of the county indicate that they are generally low in basic nutrients.

More detailed descriptions of the soils in table 10 follow.

Adolph silt loam.—The following profile was examined in the east-central part of the NW¼NW¼ of sec. 3, T. 34 N., R. 12 W.

A_0 2 to 0 inches, forest litter.
A_{11} 0 to 2 inches, black (10YR 2/1) silt loam.
A_{12} 2 to 8 inches, very dark brown (10YR 2/2) silt loam.
AB_g 8 to 18 inches, gray to dark-gray (10YR 5/1 to 4/1) silt loam, mottled with yellowish brown (10YR 5/8); weakly developed platy structure; penetrated by tongues of dark-brown material (10YR 5/3) from above and by animal burrows filled with dark material; massive below.

BG 18 to 36 inches, gray (10YR 5/1) silt loam, mottled with yellowish brown (10YR 5/1); massive.
CG 36 inches +, gray (10YR 5/1) and reddish-brown (5YR 4/3 and 4/4) silt loam.

Almena silt loam.—A profile description of this soil follows:

A_1 0 to 3 inches, dark-gray (10YR 4/1) silt loam; weakly developed fine granular structure; numerous roots.
A_2 3 to 6½ inches, grayish-brown (10YR 5/2) silt loam; medium platy structure; friable; numerous roots.
A_3 6½ to 14 inches, pale-brown (10YR 6/3) silt loam, mottled with yellowish brown (10YR 5/8); thin platy structure; friable.
B_g 14 to 30 inches, light yellowish-brown (10YR 6/4) silt loam, mottled with yellowish brown (10YR 5/6) and light gray (10YR 7/2); medium blocky structure; aggregates are firm when dry and moderately plastic when wet.
C_g 30 to 36 inches, yellowish-brown (10YR 5/4) slightly mottled silt loam; somewhat compact in place; friable; massive.
D 36 inches +, reddish-brown (5YR 4/4) sandy clay loam glacial till; massive; quite compact in place.

Arland silt loam.—The following profile was observed in a wooded area in the south-central part of the SW¼SE¼ sec. 33, T. 33 N., R. 11 W.

A_0 and A_1 2 to 0 inches, very dark brown (10YR 2/2) organic loam; contains leaf mold and numerous roots and twigs.
A_{21} 0 to 2 inches, gray to grayish-brown (10YR 5/1 to 5/2) silt loam; thin platy structure; friable.
A_{22} 2 to 9 inches, grayish-brown (10YR 5/2) silt loam; medium platy structure; friable.
A_3 9 to 13 inches, grayish-brown (10YR 5/2) silt loam; medium platy structure in place but breaks out as weak blocky; aggregates are vesicular and friable.
B_{21} 13 to 19 inches, brown (7.5YR 4/4) heavy silt loam; somewhat gritty, well-developed blocky structure; firm when dry.
C_1 19 to 34 inches, yellowish-red (5YR 5/8) loam; massive glacial till containing many sandstone fragments.
D 34 inches +, pink and yellowish-red (7.5YR 8/4 and 5/8) slightly weathered sandstone.

Campia silt loam.—This profile was examined on the east side of the NW¼SW¼ of sec. 26, T. 36 N., R. 13 W.

A_1 0 to 3 inches, very dark brown (10YR 2/2) friable silt loam; high in organic matter; fine granular structure.
A_2 3 to 12 inches, gray to brownish-gray (10YR 5/1 to 6/2) friable silt loam; strongly acid; well-developed platy structure which breaks into soft granules.
B_{21} 12 to 18 inches, yellowish-brown (10YR 5/4) silt loam; subangular blocky structure; strongly acid.
B_{22} 18 to 29 inches, yellowish-brown to brown (10YR 5/4 to 4/3 heavy silt loam; moderately blocky structure; strongly acid; moderately plastic consistence.
B_3 29 to 42 inches, yellowish-brown (10YR 5/6), moderately acid, heavy silt loam.
C_1 42 inches +, stratified silt loam; calcareous below 8 feet.

Milaca silt loam.—The following profile was observed in the northeastern corner of the NE¼SE¼ of sec. 30, T. 34 N., R. 10 W. This is a wooded area that is pastured only occasionally.

A_1 0 to 1 inch, black silt loam; contains a mass of small roots and twigs mixed with leaf mold.
A_{21} 1 to 3 inches, gray (5YR 5/1) silt loam; well-developed weak platy structure.

A_{22} 3 to 10 inches, pale-brown (10YR 6/3) silt loam; well-developed platy structure; many roots.
A_3 10 to 16 inches, brown (10YR 5/3) loam; weakly developed platy structure in place, but breaks out as subangular blocky.
B_2 16 to 22 inches, reddish-brown (5YR 4/3) loam; blocky structure; aggregates firm when dry.
C 22 inches +, dark reddish-brown (5YR 3/4) sandy loam glacial till, somewhat compact in place.

Onamia loam.—This profile was sampled in sec. 15, T. 35 N., R. 11 W.

A_1 0 to ½ inch, black loam; high in organic matter; granular structure; contains a mass of shallow roots, leaf litter, and leaf mold.
A_{21} ½ to 4 inches, light-gray (10YR 7/2) friable loam; granular and vesicular; contains many roots.
A_{22} 4 to 10 inches, very pale brown (10YR 7/3) loam; very friable; thin platy structure in place, but breaks out as weak granular.
B_1 10 to 14 inches, very pale brown (10YR 7/3) silt loam; weakly developed structure; slightly sticky when wet.
B_2 14 to 24 inches, yellowish-red (7.5YR 5/6) loam; medium blocky structure that is firm when dry; contains a few pebbles and small stones.
C 24 inches +, yellowish red (7.5YR 5/6) stratified coarse sand and gravel; many waterworn noncalcareous crystalline rocks; strongly acid to depths of more than 6 feet.

Otterholt silt loam.—The following profile was observed in a wooded area which has been pastured. It is located in sec. 4, T. 33 N., R. 12 W.

A_1 0 to 3 inches, very dark brown (10YR 2/2) silt loam; friable; granular structure; high organic-matter content; numerous roots.
A_2 3 to 11 inches, grayish-brown (10YR 5/2) silt loam; thin platy structure; very friable; slightly vesicular; many worm casts and roots.
B_1 11 to 14 inches, brown (10YR 5/3) silt loam; coarse platy to weak blocky structure; aggregates are coated with a floury material, are slightly vesicular, and contain many roots.
B_2 14 to 26 inches, yellowish-brown (10YR 5/4) silty clay loam; moderately developed to well-developed blocky structure; aggregates coated with a gray floury material; few roots.
C 26 to 42 inches, yellowish-brown (10YR 5/4) massive silt loam; somewhat compact in place, but friable when removed.
D 42 inches +, reddish-brown (5YR 4/4) sandy loam glacial till; massive; quite compact in place; till at this site was somewhat more sandy than normal.

Santiago silt loam.—This profile was observed in a wooded area just south of County Highway BB in the northwestern corner of the NW¼NE¼ of sec. 31, T. 35 N., R. 11 W.

A_0 ¼ to 0 inches, black (10YR 2/1) organic loam; contains a mass of small trees and shrub roots.
A_1 0 to 2 inches, black (10YR 2/1) silt loam; medium granular structure that tends toward a platy structure; friable; many roots and worm casts.
A_2 2 to 12 inches, grayish-brown (10YR 5/2) silt loam; platy structure in place; fewer roots than horizon above.
B_1 12 to 14 inches, reddish-brown (5YR 4/3) silt loam; platy structure in place, but breaks out as weak blocky; friable but somewhat more firm than layer above.
B_{21} 14 to 18 inches, reddish-brown (5YR 4/4) silt loam; medium to coarse blocky structure; aggregates firm and coated with a gray floury material.
B_{22} 18 to 24 inches, dark reddish-brown (5YR 3/4) loam; medium blocky structure; few scattered roots.
C 24 inches +, dark reddish-brown (5YR 3/4) gravelly sandy loam to sandy clay loam glacial till; quite compact in place.

Spencer silt loam.—This profile was examined on the north side of the NE¼SW¼ of sec. 2, T. 34 N., R. 14 W.

A_1 0 to 3 inches, very dark gray (10YR 3/1) silt loam; high organic-matter content; friable; thin platy structure.

A_{21} 3 to 11 inches, brown (10YR 5/3) silt loam; very friable; weak thin platy structure; plates are often coated with light-gray floury material.

A_{22} 11 to 14 inches, pale-brown (10YR 6/3) silt loam; weakly developed coarse platy structure in place, but breaks out readily as weak blocky; aggregates coated with light-gray floury material from layer above.

B_2 14 to 25 inches, brown (10YR 4/3), mottled with yellowish brown (10YR 5/6), heavy silt loam; moderately compact; medium blocky structure; firm when dry.

C 25 to 36 inches, light brownish-gray (10YR 6/2), mottled with light gray and yellowish red (10YR 7/2 and 7.5YR 5/8), silt loam; rather compact in place.

D 36 inches +, dark reddish-brown (5YR 3/4) sandy loam; compact, massive glacial till.

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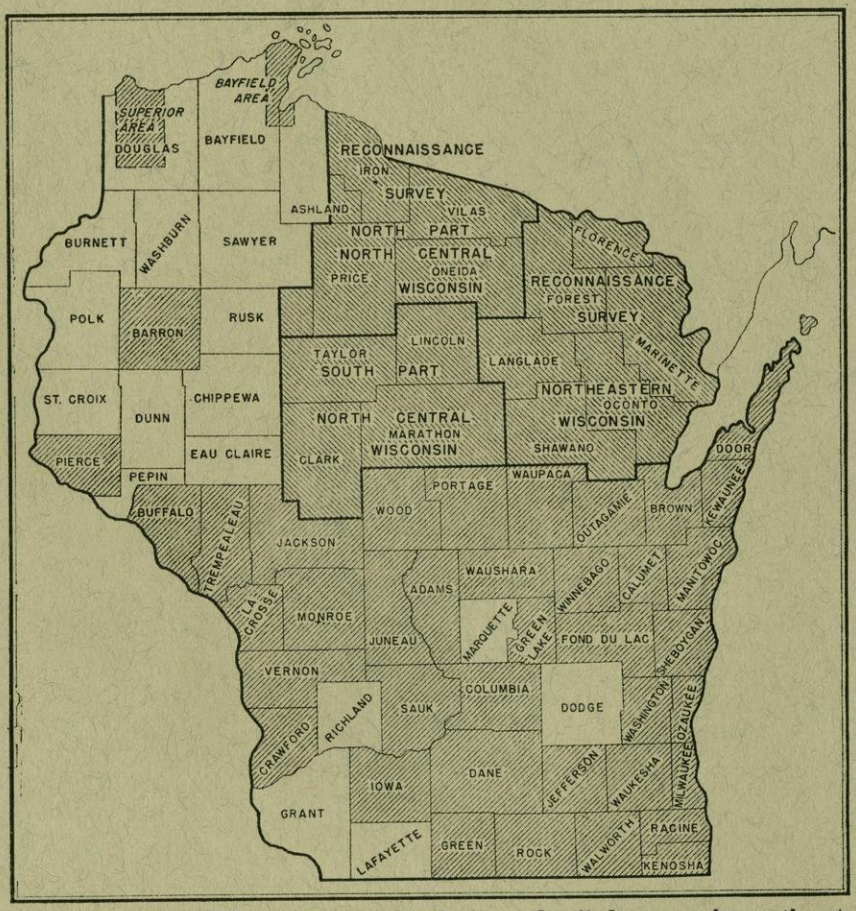

Areas surveyed in Wisconsin shown by shading—detailed surveys by northeast-southwest hatching; reconnaissance surveys by northwest-southeast hatching.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

LEGEND SHEET

BARRON COUNTY - WISCONSIN

UNIVERSITY OF WISCONSIN
AGRICULTURAL EXPERIMENT STATION AND
GEOLOGICAL AND NATURAL HISTORY SURVEY

LEGEND

- Aa Adolph silt loam
- Ab Adolph stony silt loam
- Ac Alluvial land
- Ad Almena silt loam, gently sloping
- Ae Almena silt loam, nearly level
- Af Almena silt loam, sloping
- Ag Almena stony silt loam, gently sloping
- Ah Altoona silt loam
- Ai Antigo silt loam, gently sloping
- Aj Antigo silt loam, nearly level
- Ak Antigo silt loam, shallow, gently rolling
- Al Antigo silt loam, shallow, gently sloping
- Am Antigo silt loam, shallow, nearly level
- An Antigo silt loam, shallow sloping
- Ao Antigo silt loam, sloping
- Ap Arland fine sandy loam, eroded, strongly sloping
- Aq Arland fine sandy loam, gently sloping
- Ar Arland fine sandy loam, moderately steep and steep
- As Arland fine sandy loam, sloping
- At Arland fine sandy loam, strongly sloping
- Au Arland silt loam, eroded, strongly sloping
- Av Arland silt loam, gently sloping
- Aw Arland silt loam, moderately steep
- Ax Arland silt loam, sloping
- Ay Arland silt loam, strongly sloping
- Az Auburndale silt loam
- Ba Barronett loam
- Bb Barronett silt loam
- Bc Boone loamy fine sand, gently sloping
- Bd Boone loamy fine sand, steep
- Be Boone loamy fine sand, strongly sloping
- Bf Brill silt loam, gently sloping
- Bg Brill silt loam, nearly level
- Bh Brill silt loam, nearly level
- Bk Burkhardt loams and sandy loams
- Ca Campia silt loam, gently sloping
- Cb Campia silt loam, nearly level
- Cc Chetek sandy loam, gently rolling
- Cd Chetek sandy loam, gently sloping
- Ce Chetek sandy loam, nearly level
- Cf Chetek sandy loam, shallow, gently sloping
- Cg Chetek sandy loam, shallow, nearly level
- Ch Chetek sandy loam, sloping
- Ck Chetek sandy loam, undulating
- Cl Cloquet sandy loam, hilly
- Cm Cloquet sandy loam, rolling and hilly
- Cn Cloquet sandy loam, undulating and gently rolling
- Co Comstock loam
- Cp Comstock silt loam
- Cr Crystal Lake loam
- Cs Crystal Lake silt loam
- Ct Chaseburg silt loam
- Cu Freeon silt loam, gently sloping
- Fb Freeon silt loam, nearly level
- Fc Freeon silt loam, sloping
- Fd Freer silt loam, gently sloping
- Fe Freer silt loam, nearly level
- Ff Freer silt loam, sloping
- Fg Freer stony silt loam, gently sloping
- Ga Gale silt loam, eroded, sloping and strongly sloping
- Gb Gale silt loam, gently sloping
- Gc Gale silt loam, sloping
- Gd Gale silt loam, strongly sloping
- He Hixton fine sandy loam, steep
- Hf Hixton fine sandy loam, strongly sloping
- Hg Hixton loam, eroded, strongly sloping
- Hh Hixton loam, gently sloping
- Hk Hixton loam, moderately steep
- Hl Hixton loam, sloping
- Hm Hixton loam, strongly sloping
- Ha Hixton fine sandy loam, eroded, steep
- Hb Hixton fine sandy loam, eroded, strongly sloping
- Hc Hixton fine sandy loam, moderately steep
- Hd Hixton fine sandy loam, sloping
- Mb Milaca-Cloquet-Peat complex, hilly
- Mc Milaca-Cloquet-Peat complex, rolling
- Md Milaca-Cloquet-Peat complex, undulating
- Me Milaca fine sandy loam, gently sloping
- Mf Milaca fine sandy loam, sloping
- Mg Milaca fine sandy loam, strongly sloping
- Mh Milaca silt loam, gently rolling
- Mk Milaca silt loam, gently sloping
- Mi Milaca silt loam, hilly
- Mm Milaca silt loam, rolling
- Mn Milaca silt loam, sloping
- Mo Milaca silt loam, steep
- Mp Milaca silt loam, strongly sloping
- Mr Milaca silt loam, undulating
- Na Omega loamy sand, gently sloping
- Nb Omega loamy sand, gravelly subsoil, gently sloping
- Nc Omega loamy sand, gravelly subsoil, nearly level
- Nd Omega loamy sand, gravelly subsoil, sloping and strongly sloping
- Ne Omega loamy sand, nearly level
- Nf Omega loamy sand, sloping
- Ng Omega loamy sand, strongly sloping
- Oh Onamia loam, gently rolling
- Ok Onamia loam, gently sloping
- Ol Onamia loam, nearly level
- Om Otterholt silt loam, gently sloping
- On Otterholt silt loam, nearly level
- Oo Otterholt silt loam, sloping
- Op Otterholt silt loam, strongly sloping
- Pa Peat and muck
- Pb Pitted outwash, hilly
- Pc Pitted outwash, rolling
- Pd Poskin silt loam
- Ra Riverwash
- Sa Santiago silt loam, eroded, sloping
- Sb Santiago silt loam, gently sloping
- Sc Santiago silt loam, moderately steep
- Sd Santiago silt loam, nearly level
- Se Santiago silt loam, sloping
- Sf Santiago silt loam, strongly sloping
- Sg Santiago stony silt loam, sloping
- Sh Santiago stony silt loam, steep
- Si Santiago stony silt loam, strongly sloping
- Sl Scott Lake sandy loam
- Sm Spencer silt loam, gently sloping
- Sn Spencer silt loam, nearly level
- So Spencer silt loam, sloping
- Sp Stony steep land
- Ta Terrace escarpment, moderately steep
- Tb Terrace escarpment, strongly sloping
- Wa Wallkill silt loam
- Wb Warman loamy fine sand
- Wc Warman loamy sand, gravelly subsoil
- Wd Warman silt loam

COLOR GROUPING

1 – GOOD CROPLAND

A - WELL-DRAINED SILTY SOILS ON NEARLY LEVEL TERRACES AND UPLANDS
- Antigo silt loam, nearly level
- Antigo silt loam, shallow, nearly level
- Campia silt loam, nearly level
- Otterholt silt loam, nearly level
- Santiago silt loam, nearly level

B - WELL-DRAINED SILTY SOILS ON GENTLY SLOPING TERRACES AND UPLANDS
- Antigo silt loam, gently sloping
- Antigo silt loam, shallow, gently sloping
- Arland silt loam, gently sloping
- Campia silt loam, gently sloping
- Gale silt loam, gently sloping
- Otterholt silt loam, gently sloping
- Santiago silt loam, gently sloping

C - WELL-DRAINED MAINLY LOAMY SOILS ON NEARLY LEVEL AND GENTLY SLOPING TERRACES AND UPLANDS
- Onamia loam, nearly level
- Onamia loam, gently sloping
- Milaca silt loam, gently sloping

2 – FAIR TO GOOD CROPLAND

A - WELL-DRAINED LOAMY SOILS ON GENTLY SLOPING UPLANDS
- Arland fine sandy loam, gently sloping
- Hixton loam, gently sloping
- Milaca fine sandy loam, gently sloping

B - WELL-DRAINED LOAMY SOILS ON SLOPING UPLANDS AND GENTLY ROLLING TERRACES
- Arland fine sandy loam, sloping
- Hixton fine sandy loam, sloping
- Hixton loam, sloping
- Milaca fine sandy loam, sloping
- Milaca silt loam, sloping
- Onamia loam, gently rolling

C - WELL-DRAINED SILTY SOILS ON SLOPING UPLANDS AND GENTLY ROLLING AND SLOPING TERRACES
- Antigo silt loam, sloping
- Antigo silt loam, shallow, gently rolling
- Arland silt loam, sloping
- Gale silt loam, sloping
- Otterholt silt loam, sloping
- Santiago silt loam, sloping
- Santiago silt loam, eroded, sloping

D - WELL-DRAINED MAINLY SILTY SOILS ON STRONGLY SLOPING UPLANDS AND SLOPING TERRACES
- Antigo silt loam, shallow, sloping
- Arland silt loam, strongly sloping
- Otterholt silt loam, strongly sloping
- Santiago silt loam, strongly sloping

E - MODERATELY WELL DRAINED SILTY SOILS ON NEARLY LEVEL TERRACES AND UPLANDS
- Brill silt loam, nearly level
- Crystal Lake silt loam
- Freeon silt loam, nearly level
- Spencer silt loam, nearly level

F - MODERATELY WELL DRAINED MAINLY LOAMY SOILS ON NEARLY LEVEL TERRACES
- Crystal Lake loam
- Scott Lake sandy loam

G - MODERATELY WELL DRAINED MAINLY SILTY SOILS ON GENTLE SLOPES OF UPLANDS, TERRACES, AND LOCAL ALLUVIAL LAND
- Brill silt loam, gently sloping
- Chaseburg silt loam
- Freeon silt loam, gently sloping
- Milaca silt loam, undulating
- Spencer silt loam, gently sloping

H - MODERATELY WELL DRAINED SILTY SOILS ON SLOPING AND GENTLY ROLLING UPLANDS
- Freeon silt loam, sloping
- Milaca silt loam, gently rolling
- Spencer silt loam, sloping

I - SOMEWHAT POORLY DRAINED SILTY SOILS ON GENTLY SLOPING UPLANDS
- Almena silt loam, gently sloping
- Freer silt loam, gently sloping

3 – FAIR TO POOR CROPLAND

A - WELL-DRAINED LOAMY SOILS ON STRONGLY ROLLING UPLANDS
- Arland fine sandy loam, strongly sloping
- Hixton fine sandy loam, strongly sloping
- Hixton loam, strongly sloping
- Milaca fine sandy loam, strongly sloping
- Milaca silt loam, strongly sloping

B - EXCESSIVELY DRAINED SANDY SOILS ON GENTLY ROLLING AND SLOPING TERRACES AND UNDULATING AND GENTLY ROLLING UPLANDS
- Cloquet sandy loam, undulating and gently rolling
- Chetek sandy loam, sloping
- Chetek sandy loam, gently rolling
- Omega loamy sand, sloping

C - EXCESSIVELY DRAINED SANDY SOILS ON NEARLY LEVEL AND GENTLY SLOPING TERRACES
- Burkhardt loams and sandy loams
- Chetek sandy loam, nearly level
- Chetek sandy loam, gently sloping
- Chetek sandy loam, undulating
- Chetek sandy loam, shallow, nearly level
- Chetek sandy loam, shallow, gently sloping

D - EXCESSIVELY DRAINED VERY SANDY SOILS ON NEARLY LEVEL AND GENTLY SLOPING TERRACES AND GENTLY SLOPING UPLANDS
- Boone loamy fine sand, gently sloping
- Omega loamy sand, nearly level
- Omega loamy sand, gravelly subsoil, nearly level
- Omega loamy sand, gently sloping
- Omega loamy sand, gravelly subsoil, gently sloping

E - SOMEWHAT POORLY DRAINED SILTY SOILS ON NEARLY LEVEL UPLANDS AND TERRACES
- Almena silt loam, nearly level
- Comstock silt loam
- Comstock loam
- Freer silt loam, nearly level
- Poskin silt loam

F - SOMEWHAT POORLY DRAINED MAINLY SILTY SOILS OF SLOPING UPLANDS
- Almena silt loam, sloping
- Altoona silt loam
- Freer silt loam, sloping

4 – POOR TO VERY POOR CROPLAND

A - WELL-DRAINED MAINLY LOAMY SOILS OF ROLLING TO STEEP UPLANDS AND PITTED OUTWASH
- Arland fine sandy loam, moderately steep and steep
- Hixton fine sandy loam, moderately steep
- Milaca silt loam, rolling
- Pitted outwash, rolling

B - WELL-DRAINED MAINLY SILTY SOILS OF STRONGLY SLOPING AND MODERATELY STEEP UPLANDS
- Arland silt loam, moderately steep
- Gale silt loam, strongly sloping
- Hixton loam, moderately steep
- Santiago silt loam, moderately steep

C - WELL-DRAINED ERODED SOILS ON SLOPING AND STRONGLY SLOPING UPLANDS
- Arland silt loam, eroded, strongly sloping
- Gale silt loam, eroded, sloping and strongly sloping
- Hixton loam, eroded, strongly sloping

D - WELL AND SOMEWHAT POORLY DRAINED STONY SOILS ON GENTLY SLOPING TO STRONGLY SLOPING UPLANDS
- Almena stony silt loam, gently sloping
- Freer stony silt loam, gently sloping
- Santiago stony silt loam, sloping
- Santiago stony silt loam, strongly sloping

E - POORLY AND VERY POORLY DRAINED SOILS ON MAINLY NEARLY LEVEL TOPOGRAPHY
- Adolph silt loam
- Alluvial land
- Auburndale silt loam
- Barronett silt loam
- Barronett loam
- Milaca-Cloquet-Peat complex, undulating
- Milaca-Cloquet-Peat complex, gently rolling
- Wallkill silt loam
- Warman silt loam
- Warman loamy fine sand
- Warman loamy sand, gravelly subsoil

5 – VERY POOR CROPLAND

A - WELL-DRAINED SOILS MAINLY ON HILLY AND STEEP UPLANDS AND STONY STEEP LAND
- Hixton fine sandy loam, steep
- Milaca silt loam, hilly
- Milaca silt loam, steep
- Milaca-Cloquet-Peat complex, rolling
- Milaca-Cloquet-Peat complex, hilly
- Santiago stony silt loam, steep
- Stony steep land

B - WELL-DRAINED ERODED SOILS ON STRONGLY SLOPING AND STEEP UPLANDS
- Arland fine sandy loam, eroded, strongly sloping
- Hixton fine sandy loam, eroded, strongly sloping
- Hixton fine sandy loam, eroded, steep

C - EXCESSIVELY DRAINED SANDY SOILS ON ROLLING TO STEEP SLOPES, PITTED OUTWASH, AND TERRACE ESCARPMENTS
- Boone loamy fine sand, strongly sloping
- Boone loamy fine sand, steep
- Cloquet sandy loam, rolling and hilly
- Cloquet sandy loam, hilly
- Omega loamy sand, strongly sloping
- Omega loamy sand, gravelly subsoil, sloping and strongly sloping
- Pitted outwash, hilly
- Terrace escarpment, strongly sloping
- Terrace escarpment, moderately steep

D - VERY POORLY DRAINED SOILS ON NEARLY LEVEL SLOPES
- Adolph stony silt loam
- Peat and muck
- Riverwash

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

- City or Village, Roads, Buildings, Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort
- Secondary roads, Trails
- Railroads
- Bridges, Ferry
- Railroad crossings
- Ford, Dam, Sawmill, Windmill
- Boundary lines
- School, Church, Creamery, Cemeteries
- Boundary lines
- Triangulation station, Boundary monument, Oil or Gas wells
- U. S. Township and Section lines, Recovered corners
- Forest fire station, Airway beacon, Oil or Gas tanks
- Transmission line, Oil or Gas pipe line
- Mine or Quarry, Gravel pit, Rock outcrop, Made land
- Soil boundaries; Stony, Gravelly, and Cherty areas

RELIEF
(Printed in brown or black)

- Contours, Depression contours
- Prominent hills or Mountain peaks
- Sand, Wash, Sand dunes
- Bluff, Escarpment, Mine dumps

DRAINAGE
(Printed in blue)

- Streams, Springs, Wells, Flowing wells
- Lakes, Ponds, Intermittent lakes
- Intermittent streams Crossable with farm machinery Not crossable with farm machinery
- Canals, Ditches
- Swamp, Salt marsh
- Submerged marsh, Tidal flats

DEPRESSIONS
- Easy to cultivate across
- Difficult to cultivate across

Inspection and correlation by: Iver J. Nygard, U. S. Department of Agriculture, and R. J. Muckenhirn, Wisconsin Agricultural Experiment Station.
Soils mapped 1940-47 by Glenn H. Robinson and Anton J. Vessel, in Charge, and R. A. Erickson, W. W. Carter, E. F. Nelson, S. W. Torrence, and S. E. Wilke, U. S. Department of Agriculture, and E. T. Barnes, F. J. Carlisle, M. A. Fosberg, E. J. Graul, F. D. Hole, A. J. Klingelhoets, R. J. Muckenhirn, L. B. Nelson, J. G. Ouellette, and S. Rieger, University of Wisconsin.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1956 O—386917

Map constructed by Division of Cartography, Soil Conservation Service, USDA, from 1938-39 aerial photographs.
Soils surveyed on 1938-39 aerial photographs.
Polyconic projection, 1927 North American datum.
10000-foot grid based on Wisconsin (Central) rectangular coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL MAP

BARRON COUNTY–WISCONSIN

SOUTHEASTERN SHEET

UNIVERSITY OF WISCONSIN
AGRICULTURAL EXPERIMENT STATION AND
GEOLOGICAL AND NATURAL HISTORY SURVEY

Inspection and correlation by: Iver J. Nygard, U. S. Department of Agriculture, and R. J. Muckenhirn, Wisconsin Agricultural Experiment Station.
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1:31,680

1 0 1 2 Miles

5 000 0 5 000 10 000 Feet

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☆ U. S. GOVERNMENT PRINTING OFFICE : 1956 O—380917

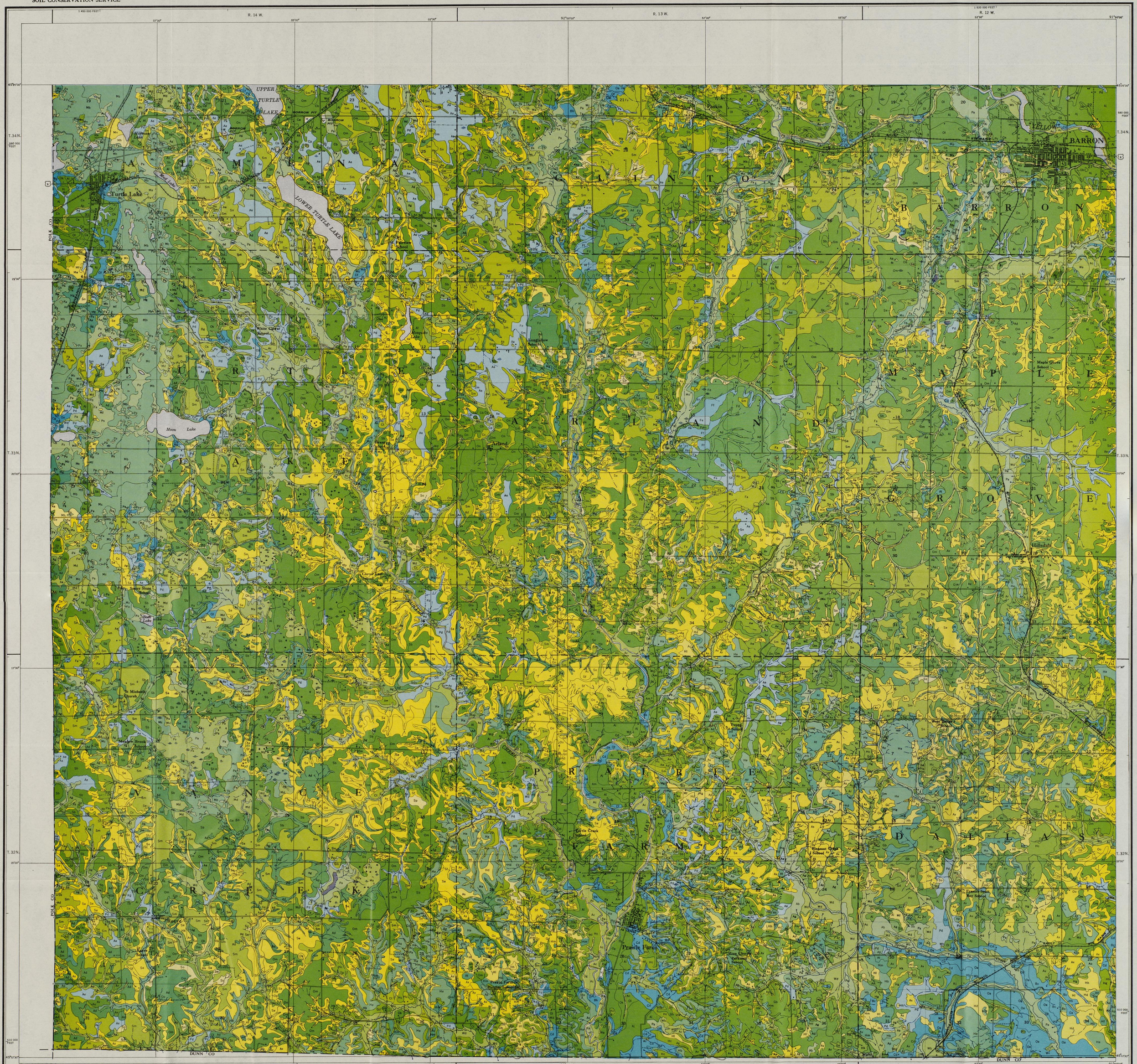
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL MAP

BARRON COUNTY–WISCONSIN

SOUTHWESTERN SHEET

UNIVERSITY OF WISCONSIN
AGRICULTURAL EXPERIMENT STATION AND
GEOLOGICAL AND NATURAL HISTORY SURVEY



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Scale 1:31,680

1 ½ 0 1 2 Miles

5 000 0 5 000 10 000 Feet

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL MAP

BARRON COUNTY–WISCONSIN

NORTHEASTERN SHEET

UNIVERSITY OF WISCONSIN
AGRICULTURAL EXPERIMENT STATION AND
GEOLOGICAL AND NATURAL HISTORY SURVEY

Inspection and correlation by: Iver J. Nygard, U. S. Department of Agriculture, and R. J. Muckenhirn, Wisconsin Agricultural Experiment Station.
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Scale 1:31,680

1 ½ 0 1 2 Miles

5000 0 5000 10 000 Feet

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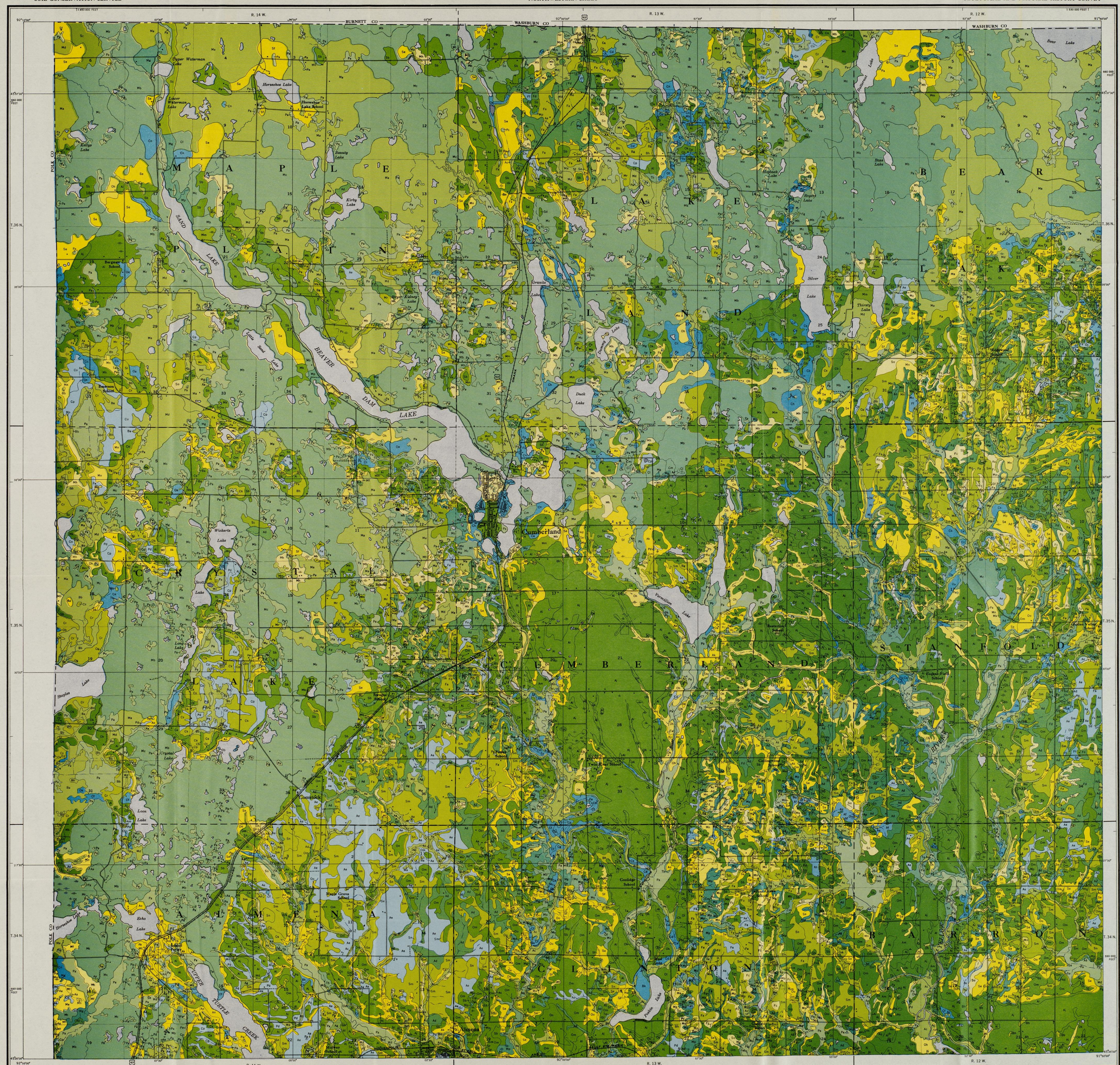
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL MAP

BARRON COUNTY—WISCONSIN

NORTHWESTERN SHEET

UNIVERSITY OF WISCONSIN
AGRICULTURAL EXPERIMENT STATION AND
GEOLOGICAL AND NATURAL HISTORY SURVEY



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1 ½ 0 1 2 Miles

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SOILS OF BARRON COUNTY, WISCONSIN: SUMMARY OF IMPORTANT CHARACTERISTICS

Soil	Map symbol	Range of slope	Surface soil	Subsoil	Parent material or substratum	Soil depth [1]	Drainage		Surface runoff	Water-holding capacity	Erosion hazard	Natural fertility	Workability	Present use	Management subgroup
							Surface soil	Subsoil							
		Percent				*Inches*									
Adolph silt loam	AA	0–2	Very dark gray to nearly black, friable, medium acid silt loam; slightly mottled in lower part.	Gray, mottled with yellowish-brown, neutral silty clay loam; moderately plastic and sticky when wet.	Reddish-brown, highly mottled, neutral gravelly sandy glacial till; often saturated with water.	33–48	Very slow	Very slow	Ponded	High	None	Moderate	Very difficult.	Marsh grasses, sedges, ash, elm, alder, and aspen.	4–E
Adolph stony silt loam	AB	0–6	Very dark gray, friable, very strongly acid stony silt loam.	Same	Same	30–40	Very slow	Very slow	Ponded	High	None	Moderate	Very difficult.	Same	5–D
Alluvial land	AC		Dark-brown to dark grayish-brown, friable, slightly acid loam, silt loam, or fine sandy loam.	Brownish-gray to grayish-brown, usually mottled, neutral, friable loam to silt loam.	Recent alluvium, which may include many small areas of various other materials.	12–30	Moderate	Moderate	Very slow	Variable	Frequent overflow.	Moderate	Very difficult.	Various grasses, ash, elm, aspen; used primarily for forest or pasture.	4–E
Almena silt loam:															
Nearly level	AE	0–2	Grayish-brown to pale-brown, medium platy, friable, moderately acid silt loam; usually mottled in the lower part.	Yellowish-brown to light yellowish-brown, mottled, moderately plastic, strongly acid silty clay loam.	Yellowish-brown silt and reddish-brown, moderately compact glacial till; thickness of silt and till ranges from 6 to 18 inches.	30–42	Slow	Slow	Very slow	High	Slight	Moderate	Moderately difficult.	Hay, oats, corn, pasture, and some forest.	3–E
Gently sloping	AD	2–6	Same	Same	Same	30–42	Slow	Slow	Slow	High	Slight	Moderate	Moderately difficult.	Same	2–I
Sloping	AF	6–10	Same	Same	Same	28–40	Slow	Slow	Medium	High	Moderate	Moderate	Moderately difficult.	Hay, oats, pasture, and forest.	3–F
Almena stony silt loam, gently sloping.	AG	0–6	Grayish-brown to pale-brown, medium platy, friable, moderately acid silt loam; usually mottled in the lower part; numerous stones and boulders on surface and throughout soil.	Same	Same	28–38	Slow	Slow	Very slow	High	Slight	Moderate	Very difficult.	Forest and some pasture	4–D
Altoona silt loam	AH	2–6	Dark-gray to brownish-gray, weak platy, friable, acid silt loam.	Dark brownish-gray to light-gray, highly mottled, moderate blocky, acid sandy clay loam.	Yellowish-brown mottled fine sand or loamy sand; profile has developed from a shallow till deposit or sediments from till, over sandstone.	24–36	Moderate	Slow	Very slow	High	Slight	Moderate	Moderately difficult.	Hay, oats, corn, pasture, and some forest.	3–F
Antigo silt loam:															
Nearly level	AJ	0–2	Brownish-gray to yellowish-brown, weak platy, strongly acid, friable silt loam.	Reddish-brown to moderate-brown medium blocky, strongly acid silty clay loam.	Moderate yellowish-brown, massive, acid, moderately friable silt loam; underlain by stratified sand and gravel.	30–42	Moderate	Moderate	Very slow	High	Slight	Moderate	Easy	Corn, oats, hay, potatoes, and some pasture.	1–A
Gently sloping	AI	2–6	Same	Same	Same	30–42	Moderate	Moderate	Slow	High	Moderate	Moderate	Easy	Same	1–B
Sloping	AO	6–10	Same	Same	Same	28–36	Moderate	Moderate	Medium	High	Moderate	Moderate	Moderately difficult.	Same	2–C
Antigo silt loam, shallow:															
Nearly level	AM	0–2	Same	Same	Moderate-brown, stratified sand and gravel.	18–30	Moderate	Moderate	Very slow	Moderate	Slight	Moderate	Easy	Same	1–B
Gently sloping	AL	2–6	Same	Same	Same	18–30	Moderate	Moderate	Slow	Moderate	Moderate	Moderate	Easy	Same	1–C
Gently rolling	AK	6–10	Same	Same	Same	18–30	Moderate	Moderate	Medium	Moderate	Moderate	Moderate	Moderately difficult.	Same	2–C
Sloping	AN	10–20	Same	Same	Same	16–28	Moderate	Moderate	Rapid	Moderate	Great	Moderate	Moderately difficult.	Same	2–D
Arland silt loam:															
Gently sloping	AV	2–6	Brownish-gray to grayish-brown, strongly acid, friable, granular silt loam.	Brown to grayish-brown, firm blocky, strongly acid, light silty clay loam; contains considerable grit.	Yellowish-red to reddish-brown glacial till over sandstone; in places the till layer is very thin but soil profile indicates its presence.	20–34	Moderate	Moderate	Slow	High	Slight	Moderate	Easy	Corn, oats, hay, and some pasture.	1–B
Sloping	AX	6–10	Same	Same	Same	20–34	Moderate	Moderate	Medium	High	Moderate	Moderate	Moderately difficult.	Same	2–C
Strongly sloping	AY	10–15	Same	Same	Same	18–32	Moderate	Moderate	Rapid	Low	Great	Moderate	Moderately difficult.	Same	2–D
Eroded, strongly sloping	AU	10–15	Grayish-brown, strongly acid silt loam; contains considerable subsoil material; very low in organic matter.	Same	Same	14–28	Low	Moderate	Very rapid	Low	Great	Low	Very difficult.	Idle land, oats, hay, and pasture	4–C
Moderately steep	AW	15–20	Brownish-gray to grayish-brown, strongly acid, granular, friable silt loam.	Same	Same	18–32	Moderate	Moderate	Very rapid	Low	Great	Moderate	Difficult	Oats, hay, pasture, and some forest.	4–B
Arland fine sandy loam:															
Gently sloping	AQ	2–6	Grayish-brown, weak granular, strongly acid fine sandy loam; low in organic matter; often contains gravel and stones.	Brown to yellowish-brown, weak blocky, strongly acid, heavy fine sandy loam to sandy clay loam.	Yellowish-red to reddish-brown glacial till over yellowish sandstone; till is often thinner and more sandy than under the Arland silt loams.	18–32	Rapid	Moderate	Slow	Moderate	Slight	Low	Easy	Corn, oats, hay, and pasture	2–A
Sloping	AS	6–10	Same	Same	Same	18–32	Rapid	Moderate	Medium	Moderate	Moderate	Low	Moderately difficult.	Same	2–B
Strongly sloping	AT	10–15	Same	Same	Same	18–32	Rapid	Moderate	Rapid	Moderate	Moderate	Low	Moderately difficult.	Same	3–A
Eroded, strongly sloping	AP	10–15	Grayish-brown to yellowish-brown, strongly acid, heavy fine sandy loam; low in organic matter; contains considerable subsoil material.	Same	Same	18–32	Moderate	Moderate	Very rapid	Low	Great	Low	Very difficult.	Idle land, hay, pasture, and forest.	5–B
Moderately steep and steep	AR	15–30	Grayish-brown, weak granular, strongly acid, fine sandy loam; low in organic matter; often contains gravel and stones.	Same	Same	18–32	Rapid	Moderate	Very rapid	Low	Great	Low	Difficult	Hay, pasture, and forest	4–A
Auburndale silt loam	AZ	0–6	Gray, slightly mottled in lower part, acid, friable silt loam; somewhat sticky when wet; tends toward a platy structure.	Gray to light brownish-gray, mottled, blocky, acid, plastic, heavy silt loam.	Grayish-brown to yellowish-red, massive, heavy silt loam; underlain by reddish-brown glacial till.	32–44	Slow	Very slow	Ponded	High	None	Moderate	Very difficult.	Pasture or forest until drained; then oats, hay, pasture, and some corn.	4–E
Barronett silt loam	BB	0–2	Very dark gray to dark-gray, friable, strongly acid silt loam; thin platy to soft crumb structure; moderately plastic.	Gray to grayish-brown, mottled with yellowish red, strongly acid, massive silt loam; moderately plastic when wet.	Gray or pinkish-gray to brown, heavy silt loam; stratified below 34 inches and calcareous below 60 inches.	34–40	Very slow	Very slow	Ponded	High	None	Moderate	Very difficult.	Forest and some pasture or hay	4–E
Barronett loam	BA	0–2	Very dark gray, strongly acid, friable loam; may be influenced by overwash of sandy material.	Same	Same	34–40	Slow	Very slow	Ponded	High	None	Moderate	Very difficult.	Forest and some pasture or hay	4–E
Boone loamy fine sand:															
Gently sloping	BC	0–6	Grayish-brown to dark yellowish-brown, friable, strongly acid loamy fine sand; weak crumb structure.	Yellowish-brown to yellowish-red, strongly acid loamy fine sand; B horizon is very weakly developed.	Very pale brown to yellowish-brown loose sand; contains many fragments of sandstone bedrock.	12–28	Rapid	Rapid	Slow	Very slow	Slight	Very low	Easy	Forest and some hay, pasture, and oats.	3–D
Strongly sloping	BE	10–15	Same	Same	Same	10–25	Rapid	Rapid	Very rapid	Very slow	Moderate	Very low	Difficult	Forest and some pasture	5–C
Steep	BD	20–30	Same	Same	Same	10–20	Rapid	Rapid	Very rapid	Very slow	Moderate	Very low	Very difficult.	Forest	5–C
Borrow and gravel pits															
Brill silt loam:															
Nearly level	BH	0–2	Dark grayish-brown, fine platy, strongly acid, friable silt loam; soil aggregates are slightly vesicular.	Brown to reddish-brown, mottled, medium blocky, strongly acid, moderately plastic silty clay loam.	Reddish-brown to yellowish-brown stratified sand and gravel; in places a transition zone of sand, silt, and clay.	30–42	Moderate	Slow	Very slow	High	None	Moderate	Moderately difficult.	Corn, oats, hay, and pasture	2–E
Gently sloping	BG	2–6	Same	Same	Same	30–42	Moderate	Slow	Slow	High	Slight	Moderate	Moderately difficult.	Same	2–G
Burkhardt loams and sandy loams.	BK	0–6	Very dark brown to dark-brown, granular, strongly acid, friable loam.	Reddish-brown to brown, weak blocky, strongly acid sandy clay loam.	Dark reddish-brown to yellowish-brown, loose, stratified sand and gravel.	12–26	Rapid	Rapid	Very slow	Low	None	Moderate	Easy	Same	3–C
Campia silt loam:															
Nearly level	CB	0–2	Gray to brownish-gray, strongly acid, friable silt loam; well-developed platy structure breaks into soft granules.	Yellowish-brown to brown, moderate blocky, strongly acid, medium plastic silty clay loam.	Yellowish-brown, moderately acid silty clay loam; stratified below 40 inches and calcareous below 7 feet.	32–44	Moderate	Moderate	Very slow	High	Slight	Moderate	Easy	Same	1–A
Gently sloping	CA	2–6	Same	Same	Same	32–44	Moderate	Moderate	Slow	High	Moderate	Moderate	Easy	Same	1–B
Chaseburg silt loam	CT	2–6	Gray to brownish-gray silt loam	Yellowish-brown friable heavy silt loam subangular structure; some mottling.	Light brownish-gray to light yellowish-brown, mottled with gray, massive silt loam.	26–36	Moderate	Moderate	Medium	High	Moderate	Moderate	Easy	Same	2–G
Chetek sandy loam:															
Nearly level	CE	0–2	Brownish-gray to brown, strongly acid, rather loose sandy loam; weak crumb structure; becomes platy in lower part.	Dark yellowish-brown to reddish-brown, weak blocky, strongly acid loam; somewhat sticky in lower part.	Dark yellowish-brown to yellowish-red stratified mixtures of water-worn gravel and sand.	20–30	Rapid	Rapid	Very slow	Low	None	Low	Easy	Same	3–C
Gently sloping	CD	2–6	Same	Same	Same	20–30	Rapid	Rapid	Slow	Low	Slight	Low	Easy	Same	3–C
Sloping	CH	6–10	Same	Same	Same	20–30	Rapid	Rapid	Medium	Low	Slight	Low	Moderately difficult.	Same	3–B
Undulating	CK	0–6	Same	Same	Same	20–30	Rapid	Rapid	Slow	Low	Slight	Low	Moderately difficult.	Same	3–C
Gently rolling	CC	6–10	Same	Same	Same	20–30	Rapid	Rapid	Medium	Low	Slight	Low	Moderately difficult.	Same	3–B
Chetek sandy loam, shallow:															
Nearly level	CG	0–2	Grayish-brown to brown, strongly acid, loose, friable sandy loam; weak crumb structure.	Brown to reddish-brown, weak blocky, strongly acid loam.	Same	12–20	Rapid	Rapid	Very slow	Very low	None	Low	Easy	Oats, hay, pasture, and some corn.	3–C
Gently sloping	CF	2–6	Same	Same	Same	12–18	Rapid	Rapid	Slow	Very low	Slight	Low	Easy	Same	3–C
Cloquet sandy loam:															
Undulating and gently rolling.	CN	2–10	Yellowish-brown to grayish-brown, strongly acid, loose, friable sandy loam; weak crumb structure.	Yellowish-brown to yellowish-red, weak very fine blocky, strongly acid sandy loam.	Dark reddish-brown massive glacial till composed of light sandy clay loam to gravelly loam.	18–30	Rapid	Rapid	Medium	Very low	Moderate	Low	Moderately difficult.	Same	3–B
Rolling and hilly	CM	10–20	Same	Same	Same	16–26	Rapid	Rapid	Very rapid	Very low	Great	Low	Difficult	Same	5–C
Hilly	CL	15–30	Same	Same	Same	16–26	Rapid	Rapid	Very rapid	Very low	Great	Low	Very difficult.	Pasture and forest	5–C
Comstock silt loam	CP	0–2	Grayish-brown to gray, mottled, medium platy, strongly acid silt loam.	Brown to light-brown, mottled, moderately developed medium blocky, strongly acid silty clay loam.	Light brownish-gray mottled silt loam that contains some very fine sand and silty clay; becomes stratified with depth and calcareous below 7 feet.	32–44	Moderate	Slow	Very slow	High	None	Moderate	Easy	Oats, hay, pasture, some corn	3–E
Comstock loam	CO	0–2	Grayish-brown to gray, mottled, strongly acid loam; weak crumb structure; has been influenced by sandy overwash.	Same	Same	32–44	Moderate	Slow	Slow	High	Slight	Moderate	Easy	Same	3–E
Crystal Lake silt loam	CS	0–2	Grayish-brown to brown, strongly acid silt loam; platy structure; breaks into soft granules.	Brown to light-brown, mottled, weak blocky, strongly acid, friable silty clay loam.	Brown to yellowish-brown, mottled silty clay, very fine sand, and silt; becomes stratified in lower part and calcareous below 7 feet.	32–44	Moderate	Slow	Very slow	High	None	Moderate	Easy	Corn, oats, hay, and pasture	2–E
Crystal Lake loam	CR	0–2	Grayish-brown to dark reddish-brown, granular, strongly acid, very friable loam.	Same	Same	32–44	Moderate	Slow	Very slow	High	None	Moderate	Easy	Same	2–F
Freeon silt loam:															
Nearly level	FB	0–2	Very dark brown to brown, thin platy, strongly acid silt loam; contains some grit.	Brown to reddish-brown, mottled, medium blocky silty clay loam; slightly plastic and sticky.	Yellowish-red to reddish-brown glacial till.	16–28	Moderate	Slow	Very slow	High	None	Moderate	Easy	Same	2–E
Gently sloping	FA	2–6	Same	Same	Same	16–28	Moderate	Slow	Slow	High	Slight	Moderate	Easy	Same	2–G
Sloping	FC	6–10	Same	Same	Same	16–28	Moderate	Slow	Medium	High	Moderate	Moderate	Moderately difficult.	Same	2–H
Freer silt loam:															
Nearly level	FE	0–2	Very dark brown to grayish-brown, mottled, thin platy, strongly acid silt loam; may contain some grit.	Light brownish-gray, highly mottled, medium blocky silty clay loam; slightly plastic and sticky.	Same	16–28	Slow	Slow	Very slow	High	None	Moderate	Moderately difficult.	Same	3–E
Gently sloping	FD	2–6	Same	Same	Same	16–28	Slow	Slow	Slow	High	Slight	Moderate	Moderately difficult.	Same	2–I
Sloping	FF	6–10	Same	Same	Same	16–28	Slow	Slow	Medium	High	Moderate	Moderate	Difficult	Same	3–F
Freer stony silt loam, gently sloping.	FG	2–6	Very dark brown to grayish-brown, mottled, strongly acid silt loam; thin platy structure; may have some grit and many stones or boulders on surface and throughout the profile.	Light brownish-gray, highly mottled, medium blocky silty clay loam; slightly plastic and sticky when wet; contains numerous stones and boulders.	Same	14–26	Slow	Slow	Slow	High	Slight	Moderate	Very difficult.	Pasture and forest	4–D
Gale silt loam:															
Gently sloping	GB	2–6	Grayish-brown to brown, strongly acid, friable silt loam; medium platy structure in place but breaks out into medium granules.	Yellowish-brown, medium blocky, strongly acid silty clay loam.	Very pale brown and yellowish-brown fine sand, with sandstone fragments.	24–30	Moderate	Moderate	Slow	Moderate	Slight	Moderate	Easy	Corn, oats, hay, and pasture	1–B
Sloping	GC	6–10	Same	Same	Same	24–30	Moderate	Moderate	Medium	Moderate	Moderate	Moderate	Moderately difficult.	Same	2–C
Strongly sloping	GD	10–15	Same	Same	Same	24–30	Moderate	Moderate	Rapid	Moderate	Moderate	Moderate	Moderately difficult.	Same	4–B
Eroded, sloping and strongly sloping.	GA	6–15	Brown to yellowish-brown, strongly acid, medium granular heavy silt loam; low in organic matter.	Same	Same	20–26	Slow	Moderate	Very rapid	Moderate	Great	Low	Difficult	Idle land, hay, and pasture	4–C

[1] Soil depth refers to the depth of soil over sand, gravel, hardpan (glacial till), or bedrock.

SOILS OF BARRON COUNTY, WISCONSIN: SUMMARY OF IMPORTANT CHARACTERISTICS—Continued

Soil	Map symbol	Range of slope	Surface soil	Subsoil	Parent material or substratum	Soil depth [1]	Drainage		Surface runoff	Water-holding capacity	Erosion hazard	Natural fertility	Workability	Present use	Management subgroup
							Surface soil	Subsoil							
Hixton loam:		*Percent*				*Inches*									
Gently sloping	HH	2–6	Grayish-brown to yellowish-brown, strongly acid loam; medium platy but breaks out into soft granules.	Brown to yellowish-brown, weak blocky, strongly acid loam to light sandy clay loam.	Yellowish-brown loose sand and partly decomposed sandstone.	20–28	Moderate	Moderate	Slow	Moderate	Slight	Moderate	Easy	Corn, oats, hay, and pasture	2-A
Sloping	HL	6–10	Same	Same	Same	20–28	Moderate	Moderate	Medium	Moderate	Moderate	Moderate	Moderately difficult.	Same	2-B
Strongly sloping	HM	10–15	Same	Same	Same	20–28	Moderate	Moderate	Rapid	Moderate	Moderate	Moderate	Moderately difficult.	Same	3-A
Eroded, strongly sloping	HG	10–20	Brown to yellowish-brown, medium granular, strongly acid loam; low in organic matter.	Same	Same	16–24	Moderate	Moderate	Very rapid	Low	Great	Low	Difficult	Idle land, hay, and pasture	4-C
Moderately steep	HK	15–30	Grayish-brown to yellowish-brown, strongly acid loam; medium platy but breaks out into soft granules.	Same	Same	18–26	Moderate	Moderate	Very rapid	Moderate	Great	Moderate	Difficult	Oats, hay, and pasture	4-B
Hixton fine sandy loam:															
Sloping	HD	2–10	Grayish-brown to yellowish-red, weak thin platy, strongly acid, friable fine sandy loam.	Yellowish-brown to reddish-brown, weak blocky, strongly acid loam.	Same	20–28	Rapid	Moderate	Slow	Moderate	Slight	Moderate	Moderately difficult.	Oats, hay, pasture, some corn	2-B
Strongly sloping	HF	10–15	Same	Same	Same	20–28	Rapid	Moderate	Medium	Moderate	Moderate	Moderate	Moderately difficult.	Same	3-A
Eroded, strongly sloping	HB	6–15	Yellowish-brown, medium granular, strongly acid fine sandy loam to loam; low in organic matter.	Same	Same	16–24	Moderate	Moderate	Rapid	Low	Great	Low	Difficult	Idle land, hay, and pasture	5-B
Moderately steep	HC	15–20	Grayish-brown to yellowish-red, weak thin platy, strongly acid, friable fine sandy loam.	Same	Same	18–26	Rapid	Moderate	Rapid	Moderate	Moderate	Moderate	Difficult	Hay and pasture	4-A
Steep	HE	20–30	Same	Same	Same	18–26	Rapid	Moderate	Very rapid	Moderate	Great	Moderate	Difficult	Hay, pasture, and forest	5-A
Eroded, steep	HA	20–30	Same	Same	Same	16–24	Moderate	Moderate	Very rapid	Low	Great	Low	Very difficult.	Idle land or forest	5-B
Milaca silt loam:															
Gently sloping	MK	2–6	Gray to pale-brown, well-developed platy, strongly acid loam; contains many roots.	Brown to reddish-brown, weak blocky, strongly acid light sandy clay loam.	Dark reddish-brown sandy clay loam glacial till; somewhat compact in place.	16–24	Moderate	Moderate	Slow	High	Slight	Moderate	Easy	Corn, oats, hay, and pasture	1-C
Sloping	MN	6–10	Same	Same	Same	16–24	Moderate	Moderate	Medium	High	Moderate	Moderate	Moderately difficult.	Same	2-B
Strongly sloping	MP	10–20	Same	Same	Same	16–24	Moderate	Moderate	Rapid	High	Moderate	Moderate	Moderately difficult.	Oats, hay, and pasture	3-A
Steep	MO	20–35	Same	Same	Same	16–24	Moderate	Moderate	Very rapid	Moderate	Great	Moderate	Difficult	Hay and pasture	5-A
Undulating	MR	0–6	Same	Same	Same	16–24	Moderate	Moderate	Slow	High	Slight	Moderate	Easy	Corn, oats, hay, and pasture	2-G
Gently rolling	MH	6–10	Same	Same	Same	16–24	Moderate	Moderate	Medium	High	Moderate	Moderate	Moderately difficult.	Same	2-H
Rolling	MM	10–15	Same	Same	Same	16–24	Moderate	Moderate	Rapid	High	Moderate	Moderate	Moderately difficult.	Hay and pasture	4-A
Hilly	ML	15–30	Same	Same	Same	16–24	Moderate	Moderate	Very rapid	High	Great	Moderate	Very difficult.	Pasture and forest	5-A
Milaca fine sandy loam:															
Gently sloping	ME	2–6	Light-gray to pale-brown, weak platy, strongly acid fine sandy loam.	Brown, blocky, strongly acid heavy loam to light sandy clay loam.	Dark reddish-brown loam to sandy clay loam glacial till; somewhat compact in place.	14–22	Rapid	Rapid	Very slow	Moderate	Slight	Low	Easy	Oats, hay, and pasture	2-A
Sloping	MF	6–10	Same	Same	Same	14–22	Rapid	Rapid	Slow	Moderate	Slight	Low	Moderately difficult.	Oats, hay, and pasture	2-B
Strongly sloping	MG	10–20	Same	Same	Same	14–22	Rapid	Rapid	Medium	Moderate	Moderate	Low	Moderately difficult.	Oats, hay, and pasture	3-A
Milaca-Cloquet-Peat complex:															
Undulating	MD	2–6	In parts of the morainic uplands small areas of Milaca, Cloquet, and Peat soils are so closely associated that they could not be separated on the scale of map used in the field. See description of each soil for details of soil characteristics.			12–30	Variable	Variable	Slow	Variable	Slight	Low	Difficult	Pasture and some oats and hay	4-E
Gently rolling	MA	6–10	Same			12–30	Variable	Variable	Medium	Variable	Moderate	Low	Difficult	Pasture and forest	4-E
Rolling	MC	10–15	Same			12–30	Variable	Variable	Rapid	Variable	Moderate	Low	Very difficult.	Pasture and forest	5-A
Hilly	MB	15–30	Same			12–30	Variable	Variable	Very rapid	Variable	Great	Low	Very difficult.	Pasture and forest	5-A
Omega loamy sand:															
Nearly level	OE	0–2	Very dark brown to brown, weakly granular, strongly acid loamy sand.	Brown to yellowish-brown strongly acid sand to loamy sand.	Yellow and yellowish-red, loose, slightly acid stratified sand.	14–20	Rapid	Rapid	Very slow	Very low	Moderate wind erosion.	Very low	Easy	Idle land, truck crops, corn, hay, oats, and pasture.	3-D
Gently sloping	OA	2–6	Same	Same	Same	14–20	Rapid	Rapid	Very slow	Very low	Moderate wind erosion.	Very low	Easy	Same	3-D
Sloping	OF	6–10	Same	Same	Same	14–20	Rapid	Rapid	Slow	Very low	Moderate wind erosion.	Very low	Easy	Same	3-D
Strongly sloping	OG	10–20	Same	Same	Same	14–20	Rapid	Rapid	Slow	Very low	Moderate wind erosion.	Very low	Moderately difficult.	Oats, hay, pasture, and forest	5-C
Omega loamy sand, gravelly subsoil:															
Nearly level	OC	0–2	Same	Same	Yellowish-red and yellow loose stratified sand and gravel.	12–18	Rapid	Rapid	Very slow	Very low	Moderate wind erosion.	Very low	Easy	Idle land, oats, hay, and pasture	3-D
Gently sloping	OB	2–6	Same	Same	Same	12–18	Rapid	Rapid	Very slow	Very low	Moderate wind erosion.	Very low	Easy	Same	3-D
Sloping and strongly sloping	OD	6–15	Same	Same	Same	12–18	Rapid	Rapid	Slow	Very low	Moderate wind erosion.	Very low	Easy	Same	5-C
Onamia loam:															
Nearly level	OL	0–2	Light-gray to pale-brown strongly acid loam; thin platy structure that breaks into soft granules.	Very pale brown to yellowish-red strongly acid sandy clay loam; contains a few pebbles and small stones.	Yellowish-red, stratified, cobbly sand and gravel composed of waterworn, noncalcareous, crystalline rocks.	24–30	Moderate	Moderate	Very slow	Moderate	None	Moderate	Easy	Corn, oats, hay, and pasture	1-C
Gently sloping	OK	2–6	Same	Same	Same	24–30	Rapid	Moderate	Slow	Moderate	Slight	Moderate	Easy	Same	1-C
Gently rolling	OH	6–10	Same	Same	Same	24–30	Rapid	Moderate	Medium	Moderate	Moderate	Moderate	Moderately difficult.	Same	2-B
Otterholt silt loam:															
Nearly level	ON	0–2	Dark-brown to grayish-brown, thin platy, strongly acid, friable silt loam; contains many roots and worm casts.	Reddish-brown, weak blocky, strongly acid silty clay loam; gray coatings often found on structural faces.	Reddish-brown massive glacial till; where silt is deeper than 30 inches, it has a horizon of friable silt between the subsoil and glacial till.	30–42	Moderate	Moderate	Very slow	High	None	Moderate	Easy	Corn, oats, hay, and pasture	1-A
Gently sloping	OM	2–6	Same	Same	Same	30–42	Moderate	Moderate	Slow	High	Slight	Moderate	Easy	Same	1-B
Sloping	OO	6–10	Same	Same	Same	30–42	Moderate	Moderate	Medium	High	Moderate	Moderate	Moderately difficult.	Same	2-C
Strongly sloping	OP	10–15	Same	Same	Same	30–42	Moderate	Moderate	Rapid	High	Moderate	Moderate	Moderately difficult.	Oats, hay, and pasture	2-D
Peat and muck	PA		Dark-brown to black peat or muck; contains many sedges, mosses, and tamarack remains in various stages of decomposition.	Brown, partly decomposed plant remains.	Glacial till, lacustrine clay, or alluvium, usually gray; saturated with water.	16–40+	Slow	Very slow	Very slow	High	None	Low	Very difficult.	Hay, pasture, and forest	5-D
Pitted outwash:															
Rolling	PC	10–15	Small intermixed areas of Chetek and Onamia soils, too small to separate on the scale of map used in the field, occurring in parts of highly pitted outwash plains. See description of the individual types for details of their characteristics.			6–18	Rapid	Rapid	Very rapid	Very low	Great	Very low	Very difficult.	Forest and some pasture	4-A
Hilly	PB	10–20	Same			6–18	Rapid	Rapid	Very rapid	Very low	Great	Very low	Very difficult.	Forest and some pasture	5-C
Poskin silt loam	PD	0–2	Dark-gray to grayish-brown, weak thin platy, strongly acid, friable silt loam.	Highly mottled, pale-brown, brownish-gray, and yellowish-red, fine blocky, strongly acid silty clay loam.	Mixtures of yellowish-brown and yellowish-red stratified sands and gravel.	30–42	Very slow	Very slow	Very slow	High	None	Moderate	Moderately difficult.	Corn, oats, hay, and pasture	3-E
Riverwash	RA		A recent deposit of mixed sand, gravel, and some fine materials in streambeds or near streams			6–24+	Rapid	Rapid	Very slow	Very low	Frequent overflow.	Very low	Very difficult.	Idle land and forest	5-D
Santiago silt loam:															
Nearly level	SD	0–2	Dark-brown to grayish-brown, thin platy, strongly acid, friable silt loam; contains roots and worm casts.	Reddish-brown, weak blocky, strongly acid, somewhat gritty silty clay loam.	Reddish-brown to dark reddish-brown massive glacial till.	18–28	Moderate	Moderate	Very slow	High	None	Moderate	Easy	Corn, oats, hay, and pasture	1-A
Gently sloping	SB	2–6	Same	Same	Same	18–28	Moderate	Moderate	Slow	High	Low	Moderate	Easy	Same	1-B
Sloping	SE	6–10	Same	Same	Same	18–28	Moderate	Moderate	Medium	High	Moderate	Moderate	Moderately difficult.	Same	2-C
Strongly sloping	SF	10–15	Same	Same	Same	18–28	Moderate	Moderate	Rapid	High	Great	Moderate	Moderately difficult.	Same	2-D
Moderately steep	SC	10–30	Same	Same	Same	16–26	Moderate	Moderate	Very rapid	High	Great	Moderate	Difficult	Oats, hay, and pasture	4-B
Eroded, sloping	SA	6–15	Grayish-brown, strongly acid, friable silt loam; low in organic matter.	Same	Same	14–26	Slow	Moderate	Rapid	Moderate	Great	Low	Difficult	Idle land, oats, hay, and pasture.	2-C
Santiago stony silt loam:															
Sloping	SG	6–10	Nearly black to dark-brown, thin platy, strongly acid, friable stony silt loam; contains many roots and worm casts.	Reddish-brown, weak blocky, strongly acid, somewhat gritty stony silty clay loam.	Same	16–26	Moderate	Moderate	Medium	High	Slight	Moderate	Very difficult.	Pasture and forest	4-D
Strongly sloping	SK	10–20	Same	Same	Same	16–26	Moderate	Moderate	Very rapid	High	Moderate	Moderate	Very difficult.	Pasture and forest	4-D
Steep	SH	20–30	Same	Same	Same	16–26	Moderate	Moderate	Very rapid	High	High	Low	Very difficult.	Forest	5-A
Scott Lake sandy loam	SL	0–2	Dark grayish-brown to yellowish-red, weak platy, strongly acid, friable sandy loam; contains many roots.	Reddish-brown, mottled with yellowish-red, medium blocky, strongly acid sandy clay loam.	Yellowish-red single-grained sand to loamy sand; stratified below 36 inches.	26–32	Moderate	Slow	Very slow	Moderate	None	Moderate	Moderately difficult.	Corn, oats, hay, and pasture	2-F
Spencer silt loam:															
Nearly level	SN	0–2	Dark-gray to brown, strongly acid, friable, granular silt loam; thin platy structure in place.	Pale-brown to brown, mottled, strongly acid, silty clay loam; medium blocky structure; gray coating on structural faces.	Dark reddish-brown massive glacial till; where silt is deeper than 30 inches a horizon of friable silt lies between subsoil and glacial till.	30–42	Moderate	Slow	Very slow	High	None	Moderate	Easy	Same	2-E
Gently sloping	SM	2–6	Same	Same	Same	30–42	Moderate	Slow	Slow	High	Slight	Moderate	Easy	Same	2-G
Sloping	SO	6–10	Same	Same	Same	30–42	Moderate	Slow	Medium	High	Moderate	Moderate	Moderately difficult.	Same	2-H
Stony steep land	SP	20–45	Rough stony areas of rock outcrops, talus slopes, or many loose stones with some finer soil material; deposits of soil may be rather deep between stones and in cracks in the bedrock.			4–12	Moderate	Moderate	Rapid	Low	Low	Low	Very difficult.	Forest	5-A
Terrace escarpment:															
Strongly sloping	TB	10–20	Brownish-gray, acid, loose sandy loam to gravelly sandy loam; low in organic matter; weak crumb structure.	The B horizon is usually absent	Stratified, yellowish-brown, loose sand and gravel.	6–12	Rapid	Rapid	Very rapid	Very low	Great	Very low	Very difficult.	Forest, idle land, and pasture	5-C
Moderately steep	TA	15–30	Same	Same	Same	6–12	Rapid	Rapid	Very rapid	Very low	Great	Very low	Very difficult.	Forest, idle land, and pasture	5-C
Wallkill silt loam	WA	0–2	Dark-gray, granular, acid silt loam; contains many roots.	Dark-brown to very dark brown muck.	Glacial till, lacustrine clays, or alluvial materials.	12–24	Moderate	Slow to very slow.	Very slow	High	None	Moderate	Very difficult.	Hay, pasture, and forest	4-E
Warman silt loam	WD	0–2	Dark-gray, thin platy, strongly acid, friable silt loam; rather high in organic matter.	Gray to grayish-brown, mottled, massive, strongly acid, heavy silt loam.	Yellowish-brown to yellowish-red acid, waterlogged, stratified sand and gravel.	24–32	Very slow	Very slow	Ponded	High	None	Moderate	Very difficult.	Forest, idle land, and pasture	4-E
Warman loamy sand, gravelly subsoil.	WC	0–2	Gray to dark-gray, weakly granular, strongly acid loamy sand; often has some black mucky material on surface.	Mottled yellowish-red and gray, single-grained, acid loamy sand; contains few roots.	Same	22–32	Slow	Slow	Ponded	Low	None	Low	Very difficult.	Forest, idle land, and pasture	4-E
Warman loamy fine sand	WB	0–2	Brownish-gray to gray, weakly granular, strongly acid loamy fine sand; high in organic matter.	Mottled yellowish-red and gray, single-grained, acid loamy fine sand.	Same	20–26	Slow	Slow	Ponded	Low	None	Low	Difficult	Hay, pasture, and forest	4-E

[1] Soil depth refers to the depth of soil over sand, gravel, hardpan (glacial till), or bedrock.

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