United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
the Research Division of
the College of Agricultural
and Life Sciences,
University of Wisconsin

Soil Survey of Florence County, Wisconsin

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How To Use This Soil Survey

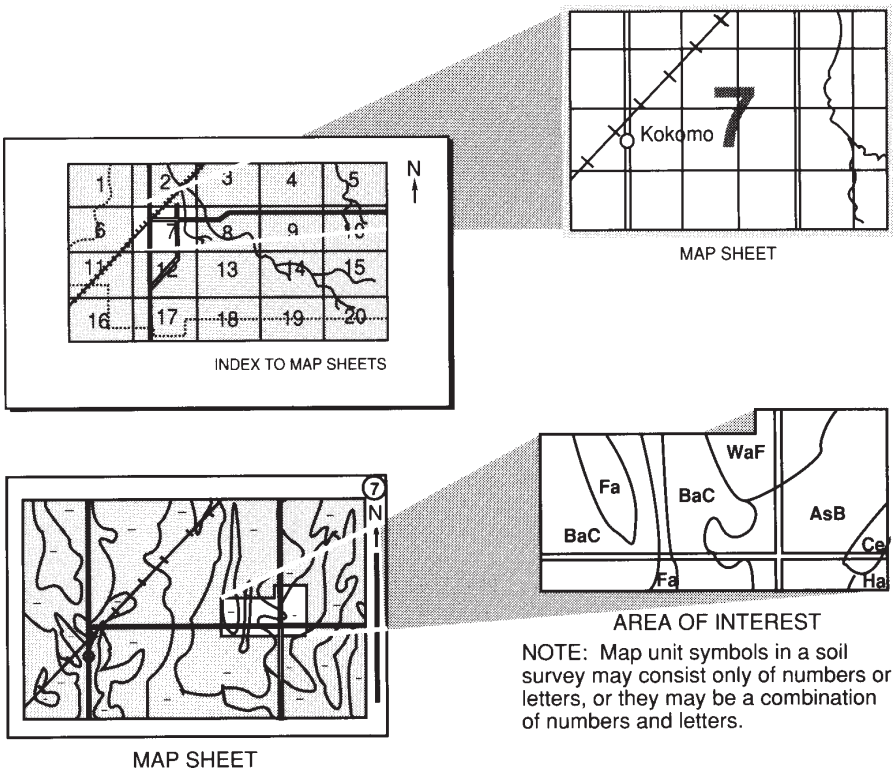
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1995. Soil names and descriptions were approved in 1995. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1995. This survey was made cooperatively by the Natural Resources Conservation Service; the Forest Service; and the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin. The survey is part of the technical assistance furnished to the Florence County Land Conservation Committee, which also helped finance the fieldwork for the survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Cover: LaSalle Falls on the Pine River in an area of Rock outcrop-Metonga-Sarona complex, 15 to 35 percent slopes. The amber color of the water is caused by organic materials derived from wetland vegetation.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov.

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Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Foresters, farmers, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described, and information on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service, the Cooperative Extension Service, or private soil science consultants.

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Soil Survey of
Florence County, Wisconsin

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United States Department of Agriculture, Natural Resources Conservation Service and Forest Service,
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Florence County is in the extreme northeastern part of Wisconsin (fig. 1). It is bound on the north and along most of its eastern border by the Brule and Menominee Rivers, which form the Wisconsin-Michigan boundary; on the west and south by Forest County; and on the south and east by Marinette County. Florence County has a total area of 318,215 acres. In 1990, the county had a population of 4,590. Florence, the county seat, is unincorporated. Recreation, tourism, agriculture, logging, lumbering, manufacturing, and retail trade industries are important in the county.

A reconnaissance soil survey of Florence County was made prior to 1916 by the Soil Survey Division, Wisconsin Geological and Natural History Survey, State of Wisconsin, in cooperation with the U.S. Department of Agriculture, Bureau of Soils (Whitson and others, 1916). That survey is part of a report on northeastern Wisconsin published by the State of Wisconsin in 1916. Another soil survey of Florence County was made during the period 1958 to 1961 by the Soil Survey Division, Wisconsin Geological and Natural History Survey, State of Wisconsin, in cooperation with the Soils Department, College of Agriculture, University of Wisconsin, and the U.S. Department of Agriculture, Soil Conservation Service (Hole and others, 1962). That survey was published in 1962 by the State of Wisconsin. The current survey updates the two earlier surveys. It provides more interpretive information and has larger maps, which show the soils in greater detail.

Figure 1.—Location of Florence County in Wisconsin.

General Nature of the County

This section provides general information about the county. It describes physiography, relief, and drainage; climate; water supply; history and development; and transportation facilities and industry.

Physiography, Relief, and Drainage

Florence County is in the Northern Highland physiographic region of Wisconsin. Elevations range from about 1,033 feet above sea level at the eastern edge of the county to about 1,732 feet in the northwest (Clayton, 1986).

Landforms in Florence County are mostly of glacial origin. In the eastern part of the county, however, a considerable degree of bedrock-controlled topography is evident. The majority of Florence County is an outwash plain, much of which is pitted as the result of melting of buried ice blocks. The most extensive areas of drumlins occur in the northwestern part of the county and extend into neighboring Forest County. The general flow of ice was from northeast to southwest, as indicated by the orientation of the drumlins. Ground moraines are most numerous in the central part of the county, and end moraines occur in the southeastern and eastern parts. Esker and esker-like ridges occur mostly in the western half of the county. Glacial lake plains are most common in Homestead Township in the southeastern part of Florence County. Although flood plains, bogs, and other depressional areas where organic soils have formed are scattered throughout the county, they are most common in the western half.

Most of Florence County is drained by the Brule, Pine, Popple, Little Popple, and Pemebonwon Rivers and their tributaries eastward to the Menominee River, which empties into Green Bay of Lake Michigan in the St. Lawrence River drainage system. A small portion of Florence County is drained by KC Creek southeastward into the Pike River system in Marinette County. This system empties into the Menominee River about 20 miles southeast of Florence County.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Brule Island, Wisconsin, in the period 1951 to 1984. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 13 degrees F and the average daily minimum temperature is 2 degrees. The lowest temperature on record, which occurred on February 17, 1979, is -48 degrees. In summer, the average temperature is 63 degrees and the average daily maximum temperature is 77 degrees. The highest recorded temperature, which occurred on July 19, 1977, is 102 degrees.

Growing degree days are shown in table 1. They are equivalent to “heat units.” During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 30.42 inches. Of this total, 21.29 inches, or about 70 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 3.74 inches on August 16, 1972. Thunderstorms occur on about 34 days each year.

The average seasonal snowfall is 59 inches. The greatest snow depth at any one time during the period of record was 43 inches. On the average, 84 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in spring.

Water Supply

Thomas J. Alvarez and Michael T. McCawly, geologists, Natural Resources Conservation Service, helped prepare this section.

Florence County has many streams, lakes, and rivers that furnish a good supply of surface water. Ground water is available in quantities that are adequate to meet present and anticipated future needs for domestic, agricultural, municipal, and industrial needs because only a small part of the total potential is being utilized. Areas of large-scale pumpage are relatively few, and the population density is low. The availability of ground water differs locally, however, and detailed studies are needed to guide the development of ground-water resources, especially in present and anticipated pumpage centers.

Sand and gravel aquifers are the most productive in Florence County. These aquifers occur mainly in the

western and northeastern parts of the county. Wells in these areas generally yield 100 to 500 gallons of water per minute (Oakes and Hamilton, 1973). The greatest yields occur where the saturated glacial deposits are at least 50 feet thick. In the central and southeastern parts of the county, the sand and gravel aquifers are typically isolated, shallow, and less permeable. Wells in these areas generally yield 10 to 100 gallons per minute.

The bedrock aquifers in Florence County generally are not very productive. More than half of the wells in this aquifer yield less than 5 gallons per minute. The bedrock aquifers are typically small, are limited to the fractured or decomposed portions of the bedrock, and typically depend on nearby glacial deposits for recharge. Bedrock aquifers are utilized wherever glacial deposits are small, thin, isolated, or impermeable.

The ground water in Florence County generally is of good quality. The least mineralized water is from the sand and gravel aquifers. This water has moved along relatively short flow paths, typically through sand and gravel with rapid or very rapid permeability, and there has been relatively little contact time between the water and soluble minerals. The mineralization of the sand and gravel aquifer is higher in areas near ground moraines and glacial lake plains and lower in areas near end moraines and outwash plains. The total mineralization in the sand and gravel aquifers in Florence County is less than 300 milligrams per liter. Water in the bedrock aquifers has had the longest contact time with soluble minerals and may have a high concentration of calcium magnesium bicarbonate, calcium magnesium sulfate, or sodium chloride. Data for the bedrock aquifers in Florence County are insufficient to measure water quality. A deep well drilled in the Florence iron pit in 1910 struck stagnant, saline water that had an artesian flow (Carlson and others, 1971).

Minor water use problems in Florence County are caused by hardness and, in some areas, by high concentrations of iron.

Florence County has a total of 261 lakes and impoundments and 165 rivers and streams (Carlson and others, 1971). Natural lakes account for 79 percent of the lake area, and five impoundments make up 21 percent of the lake surface area. Lakes smaller than 10 acres make up 63 percent of the total number of lakes but only 5 percent of the lake acreage. Only 16 lakes are 100 acres or larger; however, these lakes make up 57 percent of the lake acreage. Fifty-one percent of the lakes are less than 8 feet deep, but these shallow lakes make up only 10 percent of the total lake acreage. Natural lake depths range from less than 1 foot in several spring ponds to a maximum of 82 feet in Sealion Lake. Some iron mine shafts, now filled with water, are as much as 147 feet deep. Twin Falls Flowage is the largest body of water in the county (681.7 acres).

Pollution of the Brule and Menominee Rivers by effluent and mining spoil has been identified as a concern. Recently, the Wisconsin Department of Natural Resources and the Wisconsin Division of Health have identified the Brule River (at the Paint River Pond) and Emily Lake, Sand Lake, and Sealion Lake as habitat where high concentrations of mercury can occur in some fish. Other pollution problems in Florence County are minor; in lakeshore areas, however, where the development of cottages and homes is dense, lakes may be affected by effluent from sewage disposal facilities. The results are pollution of the water and excessive growth of undesirable weeds and algae. Overall, Florence County, with its extensive forest land and limited development, has relatively few problems resulting from human influences on surface waters. In the future, however, a policy that prevents pollution and shoreland damage will be needed if the present high quality of water is to be maintained.

History and Development

Florence County is one of the few counties in Wisconsin in which the early pioneering era is still fairly recent. The area was undoubtedly visited by early French voyageurs and missionaries from the Green Bay region. The first European to leave any description of his journey along the Menominee and Brule Rivers was Captain Thomas Jefferson Cram, who surveyed the northwest boundary of Wisconsin in 1840-41 (Carlson and others, 1971). Cram surveyed the Brule River, which forms part of the boundary with Michigan, and reported many Chippewa and Menominee Indians there.

Florence County was created in 1882 from territory that included parts of Marinette and Oconto Counties. The county was named for Florence Hulst, the wife of N.P. Hulst, who discovered a number of iron mines in the area.

Florence County was a hunting and trapping region until iron ore was discovered in 1877. Three years earlier, iron had been discovered on the Michigan side of the border. Mining operations began during the winter of 1879-80, and peak production was reached in 1920. The population of the area that became Florence County increased from fewer than 300 in 1880 to 2,604 in 1890, only 8 years after the county was organized.

The logging and lumbering in Florence County are associated with those industries in Marinette and Oconto Counties. The first sawmill in the territory was built in what is now Marinette County by William Farnsworth and Charles N. Bush in 1832. Although this date marked the beginning of lumbering in the territory, very little lumbering was done in the survey area prior to 1865. The primary timber in the early logging period was eastern white pine; a limited amount of red pine also was logged. By 1898, most of the eastern white pine had been cut. In the early 20th century, when the pine was gone, the logging of eastern hemlock and hardwoods was begun.

Farming in Florence County had its origin in the need for agricultural products by the lumber companies. In 1890, there were 90 farms in the county. Farm numbers increased to 349 farms in 1920 and 580 farms in 1935. After this period, the number of farms in Florence County declined with the failing of small family farms and the growth of larger commercial farms. In 1959, Florence County had a total of 185 farms and an average of 185.5 acres per farm. In 1990, Florence County had a total of 90 farms and an average of 255.6 acres per farm (Wisconsin Agricultural Statistics Service, 1991).

Transportation Facilities and Industry

Florence County is served by U.S. Highway 2-141, which crosses the northeastern part of the county. The major north-south routes are State Highways 101 and 139. State Highway 70 is the principal east-west route. Florence County is also served by six county highways, which are mainly in the eastern half of the county. Commercial air transportation is available at Ford Airport near Iron Mountain, Michigan. An abandoned rail line runs north and south in the western part of Florence County.

The recreation and tourism industry is an important part of the local economy. This industry includes restaurants, taverns, hotels, motels, resorts, campgrounds, sporting goods stores, and amusement and recreation establishments. Fishing, boating, camping, hunting, skiing, swimming, hiking, snowmobiling, auto touring, and other sports as well as the natural beauty of the county attract many vacationers and make recreation and tourism a year-round industry. The county-owned Keyes Peak ski hill offers downhill skiing. The many lakes, rivers, and streams and the surrounding forest land provide excellent opportunities for expanding the recreation and tourism industry in Florence County.

Manufacturing and retail trade industries also are significant parts of the Florence County economy. In Florence, the 114-acre In-Comm Center industrial park, which was created in 1986, includes several manufacturing firms. Some light industry is also in Aurora.

The logging industry is an important part of the economy in the county. Forest products include sawtimber, poletimber, pulpwood, and veneer logs. A number of sawmills are located near Tipler and Long Lake in western Florence County. The production of maple syrup is a seasonal enterprise of local importance.

Hay, corn, and oats are the main crops grown in Florence County. Potatoes, a specialty crop, also are grown. Dairy farming and beef production are important parts of the county's agriculture.

Presently, excavation for minerals is of minor extent in the county. Minerals mined include sand and gravel. Recently, some of the finer textured soils in the eastern part of the county have been identified as suitable for use as landfill liner. Also, some topsoil is being removed for construction and landscaping purposes. Some mineral exploration has taken place in Florence County.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the

kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in the surveys of Forest and Marinette Counties, Wisconsin. The differences are a result of variations in the extent of the soils in the counties. The Brule and Menominee Rivers form the boundary with Dickinson and Iron Counties, Michigan.

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Vilas loamy sand, 0 to 6 percent slopes, is a phase of the Vilas series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Pence-Vilas complex, 6 to 15 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use

and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

AnB—Annalake fine sandy loam, 0 to 6 percent slopes

Setting

Landform: Outwash plains, glacial lake plains, and moraines
Landscape position: Linear and slightly concave toeslopes
Shape of areas: Irregular
Size of areas: 10 to 70 acres

Representative Profile

Surface layer:
0 to 3 inches—very dark gray, friable fine sandy loam

Subsurface layer:
3 to 6 inches—brown, friable fine sandy loam

Subsoil:
6 to 31 inches—dark brown, brown, and dark yellowish brown, friable fine sandy loam
31 to 39 inches—brown, mottled, friable sandy loam

Substratum:
39 to 60 inches—brown, mottled, friable, stratified fine sand, very fine sand, loamy very fine sand, very fine sandy loam, and silt loam

Composition

Annalake soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Padus and moderately well drained Tipler soils, which are underlain by sandy or sandy and gravelly glacial outwash
- The somewhat poorly drained Robago soils in depressions and drainageways
- The well drained Rousseau soils, which formed in sandy glacial outwash or lacustrine deposits; in slightly convex areas
- Soils that have layers of clay loam or silty clay loam in the subsoil and substratum
- Areas of well drained soils
- Soils that have stones or boulders on the surface
- Sloping areas of Annalake soils

Similar inclusions:
- Areas of soils in which the upper layers are silt loam, very fine sandy loam, sandy loam, or loamy sand
- Areas of eroded soils
- Soils that have an apparent seasonal high water table

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss, poor tilth
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
- Grassed waterways, diversions, and grade-

stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are somewhat limited during dry years by the restricted available water capacity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Well suited
Major management concerns: Water erosion, soil blowing
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.

Dwellings with basements

Suitability: Moderately well suited
Major management concerns: Wetness, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM

AnC—Annalake fine sandy loam, 6 to 15 percent slopes

Setting

Landform: Outwash plains, glacial lake plains, and moraines
Landscape position: Side slopes
Shape of areas: Irregular
Size of areas: 8 to 40 acres

Representative Profile

Surface layer:
0 to 2 inches—very dark gray, friable fine sandy loam

Subsurface layer:
2 to 4 inches—grayish brown, friable fine sandy loam

Subsoil:
4 to 24 inches—dark brown and brown, friable fine sandy loam
24 to 30 inches—brown, friable sandy loam

Substratum:
30 to 60 inches—yellowish brown, mottled, friable, stratified fine sand, very fine sand, loamy very fine sand, very fine sandy loam, and silt loam

Composition

Annalake soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Padus soils, which are underlain by sandy or sandy and gravelly glacial outwash
- The well drained Rousseau soils, which formed in sandy glacial outwash or lacustrine deposits
- The excessively drained Vilas soils, which formed in sandy glacial outwash
- Soils that have layers of clay loam or silty clay loam in the subsoil and substratum
- Areas of well drained soils
- Soils that have stones and boulders on the surface
- Areas of wet soils in depressions
- Gently sloping or moderately steep areas of Annalake soils

Similar inclusions:
- Areas of soils in which the upper layers are silt loam, very fine sandy loam, sandy loam, or loamy sand
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss, poor tilth
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are somewhat limited during dry years by the restricted available water capacity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe

Major restrictive features: Restricted permeability, wetness, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Dwellings with basements

Suitability: Moderately well suited
Major management concerns: Wetness, slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM

Au—Au Gres loamy sand, 0 to 2 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 30 acres

Representative Profile

Organic layer:
0 to 2 inches—black, very friable muck

Mineral surface layer:
2 to 7 inches—grayish brown, very friable loamy sand

Subsoil:
7 to 17 inches—dark brown, mottled, very friable loamy sand
17 to 26 inches—strong brown, mottled, very friable sand

Substratum:
26 to 62 inches—dark yellowish brown, mottled, loose sand

Composition

Au Gres soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Beseman, Cathro, Dawson, and Markey soils, which have organic layers 16 to 51 inches thick
• The moderately well drained Croswell soils in slightly convex areas
• The poorly drained Kinross soils in the lower depressions and drainageways
• Areas of stratified sandy, loamy, and silty deposits

Similar inclusions:
• Areas of soils in which the upper layers are sand, loamy fine sand, sandy loam, or fine sandy loam
• Areas of soils that are fine sand or very fine sand throughout
• Soils that have a substratum of gravelly sand
• Soils that have a perched seasonal high water table

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 1.5 feet below the surface
Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Very high in the organic layer; moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Poorly suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss, wetness
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• If the water table is lowered, crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
• Proper irrigation scheduling helps to minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.
• The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.

Pasture

Suitability: Moderately well suited
Major management concerns: Soil blowing, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Dwellings without basements—wetness, soil blowing; dwellings with basements—wetness, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 6W (quaking aspen)
Primary forest habitat type: TMC

Ca—Capitola muck, 0 to 2 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 90 acres

Representative Profile

Surface layer:
0 to 5 inches—black, very friable muck

Subsoil:
5 to 20 inches—dark grayish brown, mottled, friable silt loam
20 to 34 inches—brown, mottled, friable sandy loam

Substratum:
34 to 60 inches—brown, mottled, friable sandy loam

Composition

Capitola soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Cathro, Lupton, and Markey soils, which have organic layers 16 to more than 51 inches thick
- The somewhat poorly drained Mudlake soils in the higher landscape positions
- Areas of Capitola soils that are not stony or that are bouldery
- Soils that have bedrock within a depth of 60 inches

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, fine sandy loam, or loam
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have a substratum of sand or gravelly sand
- Soils in which the lower part of the subsoil and the substratum are loam, clay loam, or gravelly loam

Soil Properties and Qualities

Drainage class: Poorly drained
Seasonal high water table: Perched, above or near the surface
Depth class: Very deep
Permeability: Moderate or moderately slow in the upper part; moderately slow in the lower part
Available water capacity: Moderate or high
Organic matter content: Very high in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wetland wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
- Wetness and low soil strength generally limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick. Reforestation is generally limited to natural regeneration or hand planting.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
- Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Wetland wildlife habitat

Suitability: Suited in undrained areas
Major management concerns: Excessive sedimentation, chemical and nutrient pollution
Management considerations:
- Undrained areas of this soil can provide wetland wildlife habitat, provide for water purification and ground-water recharge, and minimize runoff and sedimentation.
- Maintaining a saturated condition, controlling sedimentation, and following recommended nutrient and chemical management practices on adjacent land help to protect wetland areas.
- In cultivated areas, providing adjacent nesting cover can enhance the habitat.

Pasture

Suitability: Poorly suited
Major management concerns: Soil blowing, wetness, ponding, rock fragments, low strength

Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
- Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
- The number of suitable forage plants is limited by the seasonal high water table.
- Establishing or maintaining an improved pasture is difficult because of the ponding.
- Stones on the surface may interfere with the use of machinery.
- Low strength restricts the use of machinery. Livestock hooves cut the soil and damage the plant cover.

Cropland

Suitability: Generally unsuited because of excessive wetness, ponding, surface stones, a severe frost hazard, and low strength

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness, ponding
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Poorly suited
Major management concerns: Wetness, ponding, soil blowing
Management considerations:
- Onsite investigation is needed.
- Providing surface drainage, installing a subsurface drainage system, and adding fill material to raise the elevation of the site can help to overcome the wetness and the ponding.
- Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Generally unsuited because of ponding

Interpretive Groups

Land capability classification: VIIw in very stony areas; VIw in areas that are not stony
Woodland ordination symbol: 7W (balsam fir)
Primary forest habitat type: Not assigned

CoA—Crossett silt loam, 0 to 3 percent slopes

Setting

Landform: Moraines
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 30 acres

Representative Profile

Surface layer:
0 to 7 inches—dark grayish brown, friable silt loam

Next layer:
7 to 13 inches—brown, mottled, friable silt loam and reddish brown, mottled, firm silty clay loam

Subsoil:
13 to 30 inches—reddish brown, mottled, firm silty clay loam
30 to 80 inches—dark reddish brown, firm silty clay loam

Composition

Crossett soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- Au Gres soils, which are sandy throughout
- The moderately well drained Ellwood soils in slightly convex areas
- Iosco soils, which have sandy upper layers
- Poorly drained soils in the lower depressions and drainageways
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have stones or boulders on the surface
- Soils that have bedrock within a depth of 60 inches

Similar inclusions:
- Areas of soils in which the upper layers are fine sandy loam, very fine sandy loam, sandy loam, or loam
- Soils that have a subsoil of silt loam, loam, clay loam, silty clay, or clay
- Areas of Crossett soils on glacial lake plains

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, 0.5 foot to 2.5 feet below the surface
Depth class: Very deep

Permeability: Moderately slow
Available water capacity: high
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—cropland, pasture; other uses—woodland, wildlife habitat

Cropland

Suitability: Well suited
Major management concerns: Wetness, poor tilth, low strength
Management considerations:
• The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.
• Leaving crop residue on the surface, adding other organic material to the soil, minimizing tillage, tilling and harvesting at the proper soil moisture content, and including grasses and legumes in the cropping sequence help to prevent excessive compaction, minimize crusting, and maintain good tilth.
• Low soil strength limits the use of farm equipment to periods when the soil is not wet.

Pasture

Suitability: Well suited
Major management concerns: Low strength
Management considerations:
• Low strength restricts the use of machinery.

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Wetness, shrink-swell potential
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Adding coarse textured material under and around the foundation and properly reinforcing the foundation help to prevent the structural damage caused by shrinking and swelling.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W (red maple)
Primary forest habitat type: TMC
Secondary forest habitat type: ATD

CrA—Croswell loamy sand, 0 to 3 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, toeslopes, and footslopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 40 acres

Representative Profile

Organic layer:
0 to 2 inches—black, very friable muck

Mineral surface layer:
2 to 5 inches—brown, very friable loamy sand

Subsoil:
5 to 12 inches—dark brown, very friable loamy sand

12 to 27 inches—brown and strong brown, very friable sand

Substratum:
27 to 62 inches—yellowish brown, mottled, loose sand

Composition

Croswell soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils in depressions and drainageways
- Cublake soils, which are underlain by stratified lacustrine deposits
- The excessively drained Vilas soils in slightly convex areas
- Areas of Croswell soils that have slopes of 3 to 6 percent

Similar inclusions:
- Areas of soils in which the upper layers are sand, loamy fine sand, sandy loam, or fine sandy loam
- Areas of soils that are fine sand or very fine sand throughout
- Soils that have a substratum of gravelly sand
- Soils that have a perched seasonal high water table

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Apparent, 2.0 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Very high in the organic layer; low or moderately low in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Windthrow hazard, plant competition
Management considerations:
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Poorly suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
- Proper irrigation scheduling helps to minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
- Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Moderately well suited
Major management concerns: Wetness, soil blowing
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Poorly suited
Major management concerns: Wetness, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 5S (quaking aspen)
Primary forest habitat type: AQV
Secondary forest habitat type: PMV

CuA—Cublake loamy sand, 0 to 3 percent slopes

Setting

Landform: Outwash plains, stream terraces, and glacial lake plains
Landscape position: Linear areas, toeslopes, and footslopes
Shape of areas: Irregular
Size of areas: 10 to 120 acres

Representative Profile

Surface layer:
0 to 3 inches—black, very friable loamy sand

Subsurface layer:
3 to 4 inches—brown, very friable loamy sand

Subsoil:
4 to 23 inches—dark brown and brown, very friable loamy sand
23 to 32 inches—dark yellowish brown, loose sand

Substratum:
32 to 40 inches—yellowish brown, mottled, loose sand
40 to 48 inches—yellowish brown, mottled, very friable fine sand with thin strata of very fine sand
48 to 60 inches—brown, mottled, friable, stratified very fine sandy loam and silt loam with a few thin strata of very fine sand

Composition

Cublake soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Annalake soils, which formed in primarily loamy deposits underlain by stratified lacustrine deposits
• The somewhat poorly drained Au Gres soils in depressions and drainageways
• Croswell soils, which are sandy throughout
• The excessively drained Vilas soils, which are sandy throughout; in slightly convex areas
• Areas of Cublake soils that have slopes of 3 to 6 percent

Similar inclusions:
• Areas of soils in which the upper layers are sand, loamy fine sand, or sandy loam
• Soils that have a substratum of gravelly sandy loam, gravelly loamy sand, clay loam, or silty clay loam
• Areas of soils in which the stratified sandy, loamy, and silty deposits are at a depth of less than 40 inches
• Soils that have an apparent seasonal high water table

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.0 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderately rapid or rapid in the upper part; moderate or moderately slow in the lower part
Available water capacity: Low
Organic matter content: Moderately low in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Windthrow hazard, plant competition
Management considerations:
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Poorly suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
• Proper irrigation scheduling helps to minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Moderately well suited
Major management concerns: Wetness, soil blowing
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Poorly suited
Major management concerns: Wetness, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 7S (red pine)
Primary forest habitat type: AQV
Secondary forest habitat type: PMV

EdB—Ellwood silt loam, 1 to 6 percent slopes

Setting

Landform: Moraines
Landscape position: Shoulders and linear and slightly convex summits
Shape of areas: Irregular
Size of areas: 5 to 250 acres

Representative Profile

Surface layer:
0 to 7 inches—very dark grayish brown, friable silt loam

Subsurface layer:
7 to 10 inches—reddish gray, friable silt loam

Subsoil:
10 to 15 inches—dark reddish brown, mottled, firm silty clay loam and reddish gray, friable silt loam
15 to 80 inches—dark reddish brown, firm silty clay loam

Composition

Ellwood soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Crossett soils in depressions and drainageways
- The somewhat poorly drained Iosco and Morganlake soils, which have sandy upper layers
- Poorly drained soils in depressions and drainageways
- Soils that have bedrock within a depth of 60 inches
- Areas of stratified sandy, loamy, and silty deposits
- Areas of well drained soils
- Soils that have stones or boulders on the surface
- Sloping areas of Ellwood soils

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
- Areas of soils in which the lower part of the subsoil is silt loam, loam, clay loam, silty clay, or clay
- Areas of eroded soils
- Areas of Ellwood soils on glacial lake plains

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Perched, 1.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—cropland, pasture; other uses—woodland, wildlife habitat

Cropland

Suitability: Well suited
Major management concerns: Water erosion, nutrient and pesticide loss, poor tilth
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
- Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition
Management considerations:
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Septic tank absorption fields

Severity of soil limitations: Severe

Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Dwellings without basements—moderately well suited; dwellings with basements—poorly suited
Major management concerns: Wetness, shrink-swell potential, water erosion
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Adding coarse textured material under and around the foundation and properly reinforcing the foundation help to prevent the structural damage caused by shrinking and swelling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD

EdC—Ellwood silt loam, 6 to 15 percent slopes

Setting

Landform: Moraines
Landscape position: Side slopes
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Representative Profile

Surface layer:
0 to 7 inches—dark brown, friable silt loam

Subsoil:
7 to 14 inches—dark reddish brown, firm silty clay loam and reddish gray, mottled, friable silt loam
14 to 80 inches—dark reddish brown, firm silty clay loam

Composition

Ellwood soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Morganlake soils, which have sandy upper layers
• Soils that have bedrock within a depth of 60 inches
• Areas of wet soils in depressions
• Areas of stratified sandy, loamy, and silty deposits
• Areas of well drained soils
• Soils that have stones or boulders on the surface
• Gently sloping or moderately steep areas of Ellwood soils

Similar inclusions:
• Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
• Areas of soils in which the lower part of the subsoil is silt loam, loam, clay loam, silty clay, or clay
• Areas of eroded soils
• Areas of Ellwood soils on glacial lake plains

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Perched, 1.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—cropland, pasture; other uses—woodland, wildlife habitat

Cropland

Suitability: Moderately well suited
Major management concerns: Water erosion, nutrient and pesticide loss, poor tilth
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly

adding other organic material helps to maintain fertility and good tilth and minimizes crusting.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Dwellings without basements—moderately well suited; dwellings with basements—poorly suited
Major management concerns: Wetness, slope, shrink-swell potential, water erosion
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Adding coarse textured material under and around the foundation and properly reinforcing the foundation help to prevent the structural damage caused by shrinking and swelling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD

ElB—Ellwood-Crossett silt loams, 0 to 6 percent slopes

Setting

Landform: Moraines
Landscape position: Ellwood—shoulders and linear and slightly convex summits; Crossett—depressions and drainageways
Slope range: Ellwood—1 to 6 percent; Crossett—0 to 3 percent
Shape of areas: Irregular
Size of areas: 20 to 600 acres

Representative Profile

Ellwood

Surface layer:
0 to 8 inches—dark brown, friable silt loam

Subsoil:
8 to 15 inches—dark reddish brown, mottled, firm clay loam and reddish brown, friable silt loam
15 to 25 inches—dark reddish brown, mottled, firm clay loam
25 to 80 inches—dark reddish brown, firm silty clay loam

Crossett

Surface layer:
0 to 9 inches—brown, friable silt loam

Next layer:
9 to 19 inches—brown, mottled, friable silt loam and reddish brown, firm silty clay loam

Subsoil:
19 to 38 inches—dark reddish brown, mottled, firm silty clay loam

38 to 80 inches—dark reddish brown, firm silty clay loam

Composition

Ellwood soil and similar inclusions: 40 to 50 percent
Crossett soil and similar inclusions: 30 to 40 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Iosco soils and the moderately well drained Morganlake soils, which have sandy upper layers
- Poorly drained soils in the lower depressions and drainageways
- Soils that have bedrock within a depth of 60 inches
- Soils that have stones or boulders on the surface
- Areas of stratified sandy, loamy, and silty deposits
- Areas of Ellwood soils that are well drained
- Sloping areas of Ellwood soils

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
- Areas of soils in which the lower part of the subsoil is silt loam, loam, clay loam, silty clay, or clay
- Areas of Ellwood and Crossett soils on glacial lake plains
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Ellwood—moderately well drained; Crossett—somewhat poorly drained
Seasonal high water table: Ellwood—perched, 1.5 to 3.5 feet below the surface; Crossett—perched, 0.5 foot to 2.5 feet below the surface
Depth class: Very deep
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—cropland, pasture; other uses—woodland, wildlife habitat

Cropland

Suitability: Well suited
Major management concerns: Ellwood—water erosion, nutrient and pesticide loss, poor tilth; Crossett—wetness, poor tilth, low strength
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas of the Ellwood soil.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Ellwood soil by reducing runoff losses to lakes and streams.
- In areas of the Crossett soil, the seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
- Open ditches and tile drains remove excess surface water and improve internal drainage.
- Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.
- Leaving crop residue on the surface, adding other organic material to the soil, minimizing tillage, tilling and harvesting at the proper soil moisture content, and including grasses and legumes in the cropping sequence help to prevent excessive compaction, minimize crusting, and maintain good tilth.
- In areas of the Crossett soil, low soil strength limits the use of farm equipment to periods when the soil is not wet.

Pasture

Suitability: Well suited
Major management concerns: Ellwood—water erosion, nutrient and pesticide loss; Crossett—low strength
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion in areas of the Ellwood soil.
- Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Ellwood soil by reducing runoff losses to lakes and streams.
- In areas of the Ellwood soil, low strength restricts the use of machinery.

Woodland

Suitability: Suited
Major management concerns: Ellwood—equipment limitation, windthrow hazard, plant competition; Crossett—equipment limitation, windthrow hazard, plant competition, seedling mortality

Management considerations:
- In areas of the Crossett soil, wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
- Seedling mortality on the Crossett soil can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Ellwood—moderately well suited; Crossett—poorly suited
Major management concerns: Ellwood—wetness, shrink-swell potential, water erosion; Crossett—wetness, shrink-swell potential
Management considerations:
- Onsite investigation is needed.
- Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
- Adding coarse textured material under and around the foundation and properly reinforcing the foundation help to prevent the structural damage caused by shrinking and swelling (fig. 2).
- Seeding and mulching exposed areas can help to control water erosion in areas of the Ellwood soil during and after construction.

Dwellings with basements

Suitability: Poorly suited
Major management concerns: Ellwood—wetness, shrink-swell potential, water erosion; Crossett—wetness, shrink-swell potential
Management considerations:
- Onsite investigation is needed.
- Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
- Adding coarse textured material under and around the foundation and properly reinforcing the foundation help to prevent the structural damage caused by shrinking and swelling.
- Seeding and mulching exposed areas can help to control water erosion in areas of the Ellwood soil during and after construction.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: Ellwood—3L (sugar maple); Crossett—3W (red maple)
Primary forest habitat type: ATD
Secondary forest habitat type: TMC

EmB—Ellwood-Iosco-Morganlake complex, 0 to 6 percent slopes

Setting

Landform: Moraines
Landscape position: Ellwood and Morganlake—shoulders and linear and slightly convex summits; Iosco—depressions and drainageways
Slope range: Ellwood—1 to 6 percent; Iosco—0 to 3 percent; Morganlake—0 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 250 acres

Representative Profile

Ellwood

Surface layer:
0 to 8 inches—dark brown, friable silt loam

Subsoil:
8 to 15 inches—dark reddish brown, mottled, firm silty clay loam and reddish brown, friable silt loam
15 to 80 inches—dark reddish brown, firm silty clay loam

Iosco

Surface layer:
0 to 9 inches—dark brown, very friable loamy fine sand

Subsurface layer:
9 to 10 inches—brown, very friable loamy fine sand

Subsoil:
10 to 27 inches—dark reddish brown and brown, mottled, very friable loamy sand

Figure 2.—Structural damage caused by shrinking and swelling in an area of Ellwood-Crossett silt loams, 0 to 6 percent slopes.

27 to 40 inches—reddish brown, mottled, firm silty clay loam

Substratum:

40 to 60 inches—reddish brown, firm silty clay loam

Morganlake

Surface layer:

0 to 9 inches—dark brown, friable loamy fine sand

Subsurface layer:

9 to 10 inches—brown, very friable loamy fine sand

Subsoil:

10 to 20 inches—dark brown and brown, very friable loamy fine sand

20 to 23 inches—brown, very friable loamy fine sand

23 to 31 inches—reddish brown, very friable fine sandy loam and reddish brown, mottled, firm silty clay loam

31 to 37 inches—reddish brown, firm silty clay loam

Substratum:

37 to 60 inches—reddish brown, firm silty clay loam

Composition

Ellwood soil and similar inclusions: 45 to 55 percent
Iosco soil and similar inclusions: 15 to 25 percent
Morganlake soil and similar inclusions: 15 to 25 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Crossett soils, which are silt loam in the upper layers
- The somewhat poorly drained Au Gres soils, the moderately well drained Croswell soils, and the excessively drained Vilas soils, which are sandy throughout
- Poorly drained soils in the lower depressions and drainageways
- Soils that have bedrock within a depth of 60 inches
- Soils that have stones or boulders on the surface
- Areas of stratified sandy, loamy, and silty deposits
- Areas of Ellwood and Morganlake soils that are well drained
- Sloping areas of Ellwood and Morganlake soils

Similar inclusions:
- Areas of soils in which the upper layers are fine sandy loam, sandy loam, very fine sandy loam, or loam
- Areas of soils in which the lower layer is silt loam, loam, clay loam, silty clay, or clay
- Areas of Ellwood, Iosco, and Morganlake soils on glacial lake plains
- Areas of eroded soils
- Iosco soils that have a perched seasonal high water table

Soil Properties and Qualities

Drainage class: Ellwood and Morganlake—moderately well drained; Iosco—somewhat poorly drained
Seasonal high water table: Ellwood—perched, 1.5 to 3.5 feet below the surface; Iosco—apparent, 0.5 foot to 1.5 feet below the surface; Morganlake—perched, 1.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Ellwood—moderately slow; Iosco—rapid in the upper part and moderately slow in the lower part; Morganlake—moderately rapid or rapid in the upper part and moderately slow in the lower part
Available water capacity: Ellwood—high; Iosco and Morganlake—low or moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—cropland, pasture; other uses—woodland, wildlife habitat

Cropland

Suitability: Well suited
Major management concerns: Ellwood—water erosion, nutrient and pesticide loss, poor tilth; Iosco—soil blowing, droughtiness, nutrient and pesticide loss, wetness; Morganlake—soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas of the Ellwood soil.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing in areas of the Iosco and Morganlake soils and prevent damage to plants caused by windblown sand.
- In areas of the Morganlake soil, crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- If the water table is lowered in areas of the Iosco soil, crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soils and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Ellwood soil by reducing runoff losses to lakes and streams.
- Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses in areas of the Iosco and Morganlake soils and protect the quality of ground water.
- Proper irrigation scheduling helps to minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.
- In areas of the Iosco soil, the seasonal high water

table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting in areas of the Ellwood soil.

Pasture

Suitability: Well suited
Major management concerns: Ellwood—water erosion, nutrient and pesticide loss; Iosco—soil blowing, nutrient and pesticide loss; Morganlake—soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes reduces the hazard of water erosion in areas of the Ellwood soil and helps to control soil blowing in areas of the Iosco and Morganlake soils.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• In areas of the Morganlake soil, forage yields are limited during most years. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates reduce leaching losses in areas of the Iosco and Morganlake soils and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Ellwood soil by reducing runoff losses to lakes and streams.

Woodland

Suitability: Suited
Major management concerns: Ellwood—equipment limitation, windthrow hazard, plant competition; Iosco—equipment limitation, windthrow hazard, plant competition, seedling mortality; Morganlake—windthrow hazard, plant competition
Management considerations:
• In areas of the Iosco soil, wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• Ruts form easily on unsurfaced roads in areas of Ellwood and Iosco soils during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• In areas of the Iosco soil, seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Ellwood—restricted permeability, wetness; Iosco and Morganlake—poor filtering capacity, restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Ellwood—moderately well suited; Iosco—poorly suited; Morganlake—moderately well suited
Major management concerns: Ellwood—wetness, shrink-swell potential, water erosion; Iosco—wetness, soil blowing; Morganlake—wetness, soil blowing
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Adding coarse textured material under and around the foundation and properly reinforcing the foundation help to prevent the structural damage caused by shrinking and swelling in areas of the Ellwood soil.
• Seeding and mulching exposed areas can help to control water erosion on the Ellwood soil and soil blowing on the Iosco and Morganlake soils during and after construction.

Dwellings with basements

Suitability: Poorly suited
Major management concerns: Ellwood—wetness, shrink-swell potential, water erosion; Iosco and Morganlake—wetness, shrink-swell potential, soil blowing, caving of cutbanks

Management considerations:
- Onsite investigation is needed.
- Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
- Adding coarse textured material under and around the foundation and properly reinforcing the foundation help to prevent the structural damage caused by shrinking and swelling.
- Seeding and mulching exposed areas can help to control water erosion on the Ellwood soil and soil blowing on the Iosco and Morganlake soils during and after construction.
- In excavated or cut and fill areas of the Iosco and Morganlake soils, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: Ellwood—3L (sugar maple); Iosco—5W (quaking aspen); Morganlake—6S (quaking aspen)
Primary forest habitat type: ATD

EnC—Ellwood-Iosco-Vilas complex, 0 to 15 percent slopes

Setting

Landform: Moraines
Landscape position: Ellwood and Vilas—side slopes; Iosco—depressions and drainageways
Slope range: Ellwood and Vilas—6 to 15 percent; Iosco—0 to 3 percent
Shape of areas: Irregular
Size of areas: 10 to 200 acres

Representative Profile

Ellwood

Surface layer:
0 to 3 inches—dark brown, friable silt loam

Subsurface layer:
3 to 6 inches—brown, friable silt loam

Subsoil:
6 to 19 inches—dark reddish brown, mottled, firm silty clay loam and reddish brown, friable silt loam
19 to 80 inches—dark reddish brown, firm silty clay loam

Iosco

Surface layer:
0 to 3 inches—dark brown, very friable loamy sand

Subsurface layer:
3 to 5 inches—brown, mottled, very friable loamy sand

Subsoil:
5 to 29 inches—dark reddish brown, reddish brown, and brown, mottled, very friable loamy sand
29 to 35 inches—dark reddish brown, mottled, firm silty clay loam

Substratum:
35 to 60 inches—dark reddish brown, firm silty clay loam

Vilas

Surface layer:
0 to 3 inches—black, very friable loamy sand

Subsurface layer:
3 to 5 inches—brown, very friable loamy sand

Subsoil:
5 to 17 inches—dark reddish brown and brown, friable loamy sand
17 to 29 inches—strong brown, very friable sand

Substratum:
29 to 60 inches—brown, loose sand

Composition

Ellwood soil and similar inclusions: 45 to 55 percent
Iosco soil and similar inclusions: 15 to 25 percent
Vilas soil and similar inclusions: 15 to 25 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Crossett soils, which are silt loam in the upper layers and are underlain by loamy, silty, or clayey glacial till
- The somewhat poorly drained Au Gres soils, which are sandy throughout
- The well drained Padus and somewhat excessively drained Pence soils, which have loamy upper layers underlain by sandy or sandy and gravelly glacial outwash
- Soils that have bedrock within a depth of 60 inches
- Poorly drained soils in the lower depressions and drainageways

- Soils that have stones or boulders on the surface
- Areas of stratified sandy, loamy, and silty deposits
- Areas of Ellwood soils that are well drained
- Gently sloping or moderately steep areas of Ellwood and Vilas soils

Similar inclusions:
- Areas of soils in which the upper layers are loamy fine sand, sandy loam, fine sandy loam, very fine sandy loam, or loam
- Areas of Ellwood and Iosco soils in which the lower layer is silt loam, loam, clay loam, silty clay, or clay
- Areas of eroded soils
- Areas of Iosco soils that have a perched seasonal high water table

Soil Properties and Qualities

Drainage class: Ellwood—moderately well drained; Iosco—somewhat poorly drained; Vilas—excessively drained

Seasonal high water table: Ellwood—perched, 1.5 to 3.5 feet below the surface; Iosco—apparent, 0.5 foot to 1.5 feet below the surface

Depth class: Very deep

Permeability: Ellwood—moderately slow; Iosco—rapid in the upper part and moderately slow in the lower part; Vilas—rapid

Available water capacity: Ellwood—high; Iosco—low or moderate; Vilas—low

Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited

Major management concerns: Ellwood—equipment limitation, windthrow hazard, plant competition; Iosco—equipment limitation, windthrow hazard, plant competition, seedling mortality; Vilas—equipment limitation

Management considerations:
- In areas of the Iosco soil, wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
- The slope limits the selection of log landing sites in areas of the Ellwood and Vilas soils. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Ruts form easily on unsurfaced roads in areas of the Ellwood and Iosco soils during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow in areas of the Ellwood and Iosco soils can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition in areas of the Ellwood and Iosco soils can be controlled by mechanical site preparation or by limited use of herbicides.
- In areas of the Iosco soil, seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Moderately well suited

Major management concerns: Ellwood—water erosion, nutrient and pesticide loss, poor tilth; Iosco—soil blowing, droughtiness, nutrient and pesticide loss, wetness; Vilas—water erosion, soil blowing, droughtiness, nutrient and pesticide loss

Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in areas of the Ellwood and Vilas soils.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing in areas of the Iosco and Vilas soils and prevent damage to plants caused by windblown sand.
- In areas of the Vilas soil, crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- If the water table is lowered in areas of the Iosco soil, crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soils and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Ellwood and Vilas soils by reducing runoff losses to lakes and streams.
- Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season reduce leaching

losses in areas of the Iosco and Vilas soils and protect the quality of ground water.
• Proper irrigation scheduling helps to minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.
• In areas of the Iosco soil, the seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting in areas of the Ellwood soil.

Pasture

Suitability: Well suited
Major management concerns: Ellwood—water erosion, nutrient and pesticide loss; Iosco—soil blowing, nutrient and pesticide loss; Vilas—water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes reduces the hazard of water erosion in areas of the Ellwood and Vilas soils and helps to control soil blowing in areas of the Iosco and Vilas soils.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields in areas of the Vilas soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates reduce leaching losses in areas of the Iosco and Vilas soils and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Ellwood and Vilas soils by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Ellwood—restricted permeability, wetness, slope; Iosco—poor filtering capacity, restricted permeability, wetness; Vilas—poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Ellwood and Vilas—moderately well suited; Iosco—poorly suited
Major management concerns: Ellwood—wetness, slope, shrink-swell potential, water erosion; Iosco—wetness, soil blowing; Vilas—slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness in areas of the Ellwood and Iosco soils.
• In areas of the Ellwood and Vilas soils, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Adding coarse textured material under and around the foundation and properly reinforcing the foundation help to prevent the structural damage caused by shrinking and swelling in areas of the Ellwood soil.
• Seeding and mulching exposed areas can help to control water erosion on the Ellwood and Vilas soils and soil blowing on the Iosco and Vilas soils during and after construction.
• In excavated or cut and fill areas of the Vilas soil, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Dwellings with basements

Suitability: Ellwood and Iosco—poorly suited; Vilas—moderately well suited
Major management concerns: Ellwood—wetness, slope, shrink-swell potential, water erosion; Iosco—wetness, shrink-swell potential, soil blowing, caving of cutbanks; Vilas—slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness in areas of the Ellwood and Iosco soils.
• In areas of the Ellwood and Vilas soils, buildings can be designed so that they conform to the natural slope

of the land. The slope can be modified by cutting and filling.
• Adding coarse textured material under and around the foundation and properly reinforcing the foundation help to prevent the structural damage caused by shrinking and swelling in areas of the Ellwood and Iosco soils.
• Seeding and mulching exposed areas can help to control water erosion on the Ellwood and Vilas soils and soil blowing on the Iosco and Vilas soils during and after construction.
• In excavated or cut and fill areas of the Iosco and Vilas soils, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: Ellwood—3L (sugar maple); Iosco—5W (quaking aspen); Vilas—6A (red pine)
Primary forest habitat type: ATD

EoD—Ellwood-Vilas-Padus complex, 10 to 30 percent slopes

Setting

Landform: Moraines
Landscape position: Side slopes
Slope range: Ellwood—10 to 15 percent; Vilas and Padus—15 to 30 percent
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 120 acres

Representative Profile

Ellwood

Surface layer:
0 to 6 inches—dark reddish brown, friable silt loam

Subsoil:
6 to 11 inches—reddish brown, mottled, firm silty clay loam and brown, mottled, friable silt loam
11 to 80 inches—reddish brown, firm silty clay loam

Vilas

Surface layer:
0 to 2 inches—black, very friable loamy sand

Subsurface layer:
2 to 3 inches—brown, very friable loamy sand

Subsoil:
3 to 19 inches—dark brown and brown, very friable loamy sand
19 to 30 inches—strong brown, very friable sand

Substratum:
30 to 60 inches—brown, loose sand

Padus

Surface layer:
0 to 4 inches—very dark grayish brown, friable sandy loam

Subsurface layer:
4 to 5 inches—grayish brown, friable sandy loam

Subsoil:
5 to 20 inches—dark brown, friable sandy loam
20 to 27 inches—brown, friable sandy loam
27 to 30 inches—brown, very friable gravelly loamy sand

Substratum:
30 to 60 inches—brown, stratified sand and gravelly coarse sand

Composition

Ellwood soil and similar inclusions: 45 to 55 percent
Vilas soil and similar inclusions: 15 to 25 percent
Padus soil and similar inclusions: 15 to 25 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Pence soils, which have loamy upper layers less than 20 inches thick over sandy and gravelly glacial outwash
• Areas of wet soils in depressions
• Soils that have stones or boulders on the surface
• Areas of stratified sandy, loamy, and silty deposits
• Areas of Ellwood soils that are well drained
• Soils that have bedrock within a depth of 60 inches
• Gently sloping or sloping areas of Padus and Vilas soils
• Gently sloping or moderately steep areas of Ellwood soils

Similar inclusions:
• Areas of soils in which the upper layers are loamy fine sand, fine sandy loam, very fine sandy loam, or loam
• Areas of Ellwood soils in which the lower layer is silt loam, loam, clay loam, silty clay, or clay
• Areas of eroded soils

Soil Properties and Qualities

Drainage class: Ellwood—moderately well drained; Vilas—excessively drained; Padus—well drained
Seasonal high water table: Ellwood—perched, 1.5 to 3.5 feet below the surface; Vilas and Padus—more than 6 feet below the surface
Depth class: Very deep
Permeability: Ellwood—moderately slow; Vilas—rapid; Padus—moderate in the upper part and rapid or very rapid in the substratum
Available water capacity: Ellwood—high; Vilas—low; Padus—low or moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Ellwood—equipment limitation, windthrow hazard, plant competition; Vilas—equipment limitation, erosion hazard; Padus—equipment limitation, erosion hazard, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable or planting seedlings by hand, may be needed in areas of the Padus and Vilas soils.
• In areas of the Padus and Vilas soils, carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
• In areas of the Ellwood and Padus soils, ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion in areas of the Padus and Vilas soils.
• In areas of the Ellwood soil, windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced.
• Plant competition in areas of the Ellwood and Padus soils can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Moderately well suited
Major management concerns: Ellwood—water erosion, nutrient and pesticide loss; Vilas and Padus—water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• The steeper areas of the Padus and Vilas soils are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• In areas of the Vilas soil and in areas of the Padus soil where the available water capacity is low, forage yields are limited during most years. Drought-tolerant species are best suited to these soils.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates reduce leaching losses in areas of the Vilas soil and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the slope and the hazard of water erosion in areas of the Padus and Vilas soils and because of the droughtiness in areas of the Vilas soil

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Ellwood—restricted permeability, wetness, slope; Vilas and Padus—poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Ellwood—moderately well suited; Vilas and Padus—poorly suited in the less sloping areas and generally unsuited in other areas
Major management concerns: Ellwood—wetness, slope, shrink-swell potential, water erosion; Vilas and Padus—slope, water erosion, soil blowing, caving of cutbanks

Management considerations:
- Onsite investigation is needed.
- Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness in areas of the Ellwood soil.
- In areas of the Ellwood soil and in the less sloping areas of the Padus and Vilas soils, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
- In areas of the Ellwood soil, adding coarse textured material under and around the foundation and properly reinforcing the foundation help to prevent the structural damage caused by shrinking and swelling.
- Seeding and mulching exposed areas help to control water erosion and soil blowing during and after construction.
- In excavated or cut and fill areas of the Padus and Vilas soils, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Dwellings with basements

Suitability: Ellwood—poorly suited; Vilas and Padus—poorly suited in the less sloping areas and generally unsuited in other areas
Major management concerns: Ellwood—wetness, slope, shrink-swell potential, water erosion; Vilas and Padus—slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
- Onsite investigation is needed.
- Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness in areas of the Ellwood soil.
- In areas of the Ellwood soil and in the less sloping areas of the Padus and Vilas soils, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
- In areas of the Ellwood soil, adding coarse textured material under and around the foundation and properly reinforcing the foundation help to prevent the structural damage caused by shrinking and swelling.
- Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
- In excavated or cut and fill areas of the Padus and Vilas soils, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: Ellwood—3L (sugar maple); Vilas—6R (red pine); Padus—3R (sugar maple)
Primary forest habitat type: ATD

Ep—Epiaquents and Epiaquods, nearly level

Setting

Landform: Moraines and glacial lake plains
Landscape position: Depressions and drainageways
Slope range: 0 to 2 percent
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 50 acres

Representative Profile

Epiaquents

The texture, color, thickness, and other properties of the individual soil layers are highly variable. Most profiles have a surface layer, subsurface layer, and substratum. Typically, the surface layer is 8 inches of very dark grayish brown to black muck. The subsurface layer is 3 inches of very dark brown or black loamy sand, sandy loam, fine sandy loam, very fine sandy loam, loam, or silt loam or the mucky analogs of these textures. The substratum is light yellowish brown to very dark gray sand, loamy sand, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, clay loam, or silty clay loam.

Epiaquods

The texture, color, thickness, and other properties of the individual soil layers are highly variable. Most profiles have a surface layer, subsurface layer, subsoil, and substratum. Typically, the surface layer is 8 inches of very dark grayish brown to black muck. The subsurface layer is 4 inches of light brownish gray to dark gray, mottled sand, loamy sand, loamy fine sand, loamy very fine sand, sandy loam, fine sandy loam, very fine sandy loam, or loam. The subsoil is 11 inches of dark brown to very dusky red, mottled sand, loamy sand, loamy fine sand, loamy very fine sand, sandy loam, fine sandy loam, very fine sandy loam, or loam. The substratum is light yellowish brown to very dark gray, mottled sand, loamy sand, sandy loam, or loam or the gravelly analogs of these textures.

Composition

The composition of individual delineations of this map unit is variable. Some areas are 60 to 90 percent Epiaquents and similar inclusions and 0 to 30 percent Epiaquods and similar inclusions; other areas are 60 to 90 percent Epiaquods and similar inclusions and 0

to 30 percent Epiaquents and similar inclusions; and some areas are 30 to 45 percent Epiaquents and similar inclusions and 30 to 45 percent Epiaquods and similar inclusions. Contrasting inclusions make up 10 to 25 percent of the map unit.

Inclusions

Contrasting inclusions:
- The very poorly drained Cathro and Markey soils, which have organic layers 16 to 51 inches thick
- Somewhat poorly drained soils in the higher convex areas
- Soils that have stones or boulders on the surface

Similar inclusions:
- Areas of Epiaquents that have a substratum of silty clay or clay
- Soils that have an apparent seasonal high water table

Soil Properties and Qualities

Drainage class: Poorly drained
Seasonal high water table: Perched, above or near the surface
Depth class: Very deep
Permeability: Epiaquents—moderate or moderately rapid in the upper part and moderately slow to rapid in the lower part; Epiaquods—moderate to rapid
Available water capacity: Low to high
Organic matter content: Very high in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wetland wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
- Wetness and low soil strength generally limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick. Reforestation is generally limited to natural regeneration or hand planting.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
- Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Wetland wildlife habitat

Suitability: Suited in undrained areas
Major management concerns: Excessive sedimentation, chemical and nutrient pollution
Management considerations:
- Undrained areas of these soils can provide wetland wildlife habitat, provide for water purification and ground-water recharge, and minimize runoff and sedimentation.
- Maintaining a saturated condition, controlling sedimentation, and following recommended nutrient and chemical management practices on adjacent land help to protect wetland areas.
- In cultivated areas, providing adjacent nesting cover can enhance the habitat.

Pasture

Suitability: Poorly suited
Major management concerns: Soil blowing, nutrient and pesticide loss, wetness, ponding, low strength
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
- Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
- The number of suitable forage plants is limited by the seasonal high water table.
- Establishing or maintaining an improved pasture is difficult because of the ponding.
- Low strength restricts the use of machinery. Livestock hooves cut the soil and damage the plant cover.

Cropland

Suitability: Generally unsuited because of excessive wetness, ponding, a severe frost hazard, and low strength

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability, wetness, ponding
Management considerations:
- Onsite investigation is needed. The design of

absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Poorly suited
Major management concerns: Wetness, ponding, soil blowing
Management considerations:
• Onsite investigation is needed.
• Providing surface drainage, installing a subsurface drainage system, and adding fill material to raise the elevation of the site can help to overcome the wetness and the ponding.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Generally unsuited because of ponding

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 2W (red maple)
Primary forest habitat type: Not assigned

FeB—Fence silt loam, 0 to 6 percent slopes

Setting

Landform: Outwash plains, glacial lake plains, and moraines
Landscape position: Linear and slightly concave toeslopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 40 acres

Representative Profile

Surface layer:
0 to 2 inches—dark brown, friable silt loam

Subsurface layer:
2 to 6 inches—brown, friable silt loam

Subsoil:
6 to 14 inches—dark brown, friable silt loam
14 to 25 inches—brown and reddish brown, friable silt loam
25 to 42 inches—reddish brown and brown, mottled, friable silt loam

Substratum:
42 to 60 inches—brown, mottled, stratified silt loam and very fine sandy loam

Composition

Fence soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Gastrow soils in depressions and drainageways
• Goodwit soils, which are underlain by sandy or loamy glacial till or glacial mudflow sediment; in slightly convex areas
• Tipler and Vanzile soils, which are underlain by sandy or sandy and gravelly glacial outwash
• Soils that have a substratum of silty clay loam or clay loam
• Areas of well drained soils
• Soils that have stones or boulders on the surface
• Sloping areas of Fence soils

Similar inclusions:
• Areas of soils in which the upper layers are fine sandy loam, very fine sandy loam, loam, or silt
• Areas of eroded soils
• Soils that have an apparent seasonal high water table

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderate in the upper part and moderately slow in the substratum
Available water capacity: High
Organic matter content: Moderately low in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited
Major management concerns: Water erosion, nutrient and pesticide loss, poor tilth, low strength

Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
• Low soil strength limits the use of farm equipment to periods when the soil is not wet.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, nutrient and pesticide loss, low strength
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Low strength restricts the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Well suited
Major management concerns: Water erosion
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.

Dwellings with basements

Suitability: Moderately well suited
Major management concerns: Wetness, water erosion, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO

Fm—Fordum loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Shape of areas: Long and narrow
Size of areas: 10 to 120 acres

Representative Profile

Surface layer:
0 to 9 inches—black, friable loam

Substratum:
9 to 15 inches—dark gray, mottled, very friable very fine sandy loam
15 to 17 inches—black, very friable muck
17 to 29 inches—dark gray, mottled, friable fine sandy loam
29 to 60 inches—dark gray, loose sand

Composition

Fordum soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Cathro, Lupton, and Markey soils, which have organic layers 16 to more than 51 inches thick; in depressions and drainageways
• Moderately well drained or somewhat poorly drained soils in slightly convex areas
• Areas of water
• Areas along rivers where rocks, sand, and gravel are exposed

Similar inclusions:
• Areas of soils in which the surface layer is muck,

silty clay, silty clay loam, silt loam, very fine sandy loam, fine sandy loam, sandy loam, or loamy sand
- Soils that have strata of gravel throughout
- Soils that are sandy throughout
- Soils that have sand at a depth of more than 60 inches

Soil Properties and Qualities

Drainage class: Poorly drained
Seasonal high water table: Apparent, above or near the surface
Depth class: Very deep
Permeability: Moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low or moderate
Organic matter content: High or very high in the surface layer
Flooding: Frequent for brief or long periods

Use and Management

Land uses: Dominant uses—woodland, wetland wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
- Wetness and low soil strength generally limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick. Reforestation is generally limited to natural regeneration or hand planting.
- Planting and harvesting operations are limited during periods of flooding. Seedling mortality may be high unless protection from flooding is provided.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
- Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Wetland wildlife habitat

Suitability: Suited in undrained areas
Major management concerns: Excessive sedimentation, chemical and nutrient pollution
Management considerations:
- Undrained areas of this soil can provide wetland wildlife habitat, provide for water purification and ground-water recharge, and minimize runoff and sedimentation.
- Maintaining a saturated condition, controlling sedimentation, and following recommended nutrient and chemical management practices on adjacent land help to protect wetland areas.
- In cultivated areas, providing adjacent nesting cover can enhance the habitat.

Pasture

Suitability: Poorly suited
Major management concerns: Nutrient and pesticide loss, wetness, ponding, flooding, low strength
Management considerations:
- Providing flooding protection, reducing chemical applications, and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- The number of suitable forage plants is limited by the seasonal high water table.
- Establishing or maintaining an improved pasture is difficult because of the ponding and flooding.
- Low strength restricts the use of machinery.

Cropland

Suitability: Generally unsuited because of excessive wetness, ponding, frequent flooding, a severe frost hazard, and low strength

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness, ponding, flooding
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Generally unsuited because of the flooding and ponding

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 2W (silver maple)
Primary forest habitat type: Not assigned

GaA—Gastrow silt loam, 0 to 3 percent slopes

Setting

Landform: Outwash plains, glacial lake plains, and moraines
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Representative Profile

Surface layer:
0 to 3 inches—very dark gray, friable silt loam

Subsurface layer:
3 to 6 inches—dark grayish brown, mottled, friable silt loam

Subsoil:
6 to 31 inches—brown, mottled, friable silt loam
31 to 37 inches—dark brown, mottled, friable fine sandy loam

Substratum:
37 to 60 inches—brown and yellowish brown, mottled, friable, stratified fine sand, fine sandy loam, very fine sandy loam, and silt loam

Composition

Gastrow soil and similar inclusions: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Annalake soils, which formed in primarily loamy deposits underlain by stratified lacustrine deposits; in slightly convex areas
- The moderately well drained Fence soils in slightly convex areas
- Areas of poorly drained soils in the lower depressions and drainageways
- Soils that have stones or boulders on the surface

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
- Soils that have a substratum of sand, gravelly sand, clay loam, or silty clay loam
- Soils that have a perched seasonal high water table

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 2.0 feet below the surface
Depth class: Very deep
Permeability: Moderate
Available water capacity: High
Organic matter content: Moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
- Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
- Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Well suited
Major management concerns: Wetness, poor tilth, low strength
Management considerations:
- The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
- Open ditches and tile drains remove excess surface water and improve internal drainage.
- Loose sand enters the tile lines unless a suitable filter covers the tile.
- Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.
- Leaving crop residue on the surface, adding other organic material to the soil, minimizing tillage, tilling and harvesting at the proper soil moisture content, and including grasses and legumes in the cropping sequence help to prevent excessive compaction, minimize crusting, and maintain good tilth.
- Low soil strength limits the use of farm equipment to periods when the soil is not wet.

Pasture

Suitability: Well suited
Major management concerns: Low strength
Management considerations:
• Low strength restricts the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Dwellings without basements—wetness; dwellings with basements—wetness, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: AViO or TMC

GmC—Goodman silt loam, 6 to 15 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 8 to 40 acres

Representative Profile

Organic layer:
0 to 2 inches—black, very friable muck

Mineral surface layer:
2 to 4 inches—grayish brown, friable silt loam

Subsoil:
4 to 31 inches—brown, friable silt loam
31 to 35 inches—brown, friable sandy loam

Substratum:
35 to 62 inches—brown gravelly sandy loam

Composition

Goodman soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Fence soils, which are underlain by stratified lacustrine deposits
• The moderately well drained Goodwit soils
• Padus and Stambaugh soils, which are underlain by sandy or sandy and gravelly glacial outwash
• Areas of wet soils in depressions
• Areas of Goodman soils that are not stony or that are bouldery
• Gently sloping or moderately steep areas of Goodman soils

Similar inclusions:
• Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
• Areas of soils in which the lower part of the subsoil and the substratum are loam, clay loam, or gravelly loam
• Soils that have a substratum of sandy loam, loamy sand, or gravelly loamy sand
• Areas in which the silty deposits are as much as 60 inches thick

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate in the upper part and moderate or moderately rapid in the lower part
Available water capacity: Moderate or high
Organic matter content: Very high in the organic layer; moderate in the mineral surface layer
Percent of surface covered by stones: About 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Ruts form easily on unsurfaced roads during wet

periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited in areas where surface stones have been removed; generally unsuited in other areas
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Crop yields are somewhat limited during dry years in areas where the available water capacity is moderate.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
• Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, nutrient and pesticide loss, rock fragments
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Stones on the surface may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Moderate
Major restrictive features: Restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs in very stony areas; IIIe in areas that are not stony
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO

GmD—Goodman silt loam, 15 to 25 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 30 acres

Representative Profile

Surface layer:
0 to 1 inch—dark brown, friable silt loam

Subsurface layer:
1 to 2 inches—brown, friable silt loam

Subsoil:
2 to 5 inches—dark brown, friable silt loam
5 to 38 inches—brown, friable silt loam

Substratum:
38 to 60 inches—brown gravelly sandy loam

Composition

Goodman soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Fence soils, which are underlain by stratified lacustrine deposits
- The moderately well drained Goodwit soils
- Padus and Stambaugh soils, which are underlain by sandy or sandy and gravelly glacial outwash
- Areas of wet soils in depressions
- Areas of Goodman soils that are not stony or that are bouldery
- Gently sloping, sloping, or steep areas of Goodman soils

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
- Areas of soils in which the lower part of the subsoil and the substratum are loam, clay loam, or gravelly loam
- Soils that have a substratum of sandy loam, loamy sand, or gravelly loamy sand
- Areas in which the silty deposits are as much as 60 inches thick

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate in the upper part and moderate or moderately rapid in the lower part
Available water capacity: Moderate or high
Organic matter content: Moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard, plant competition
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
- Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Poorly suited
Major management concerns: Water erosion, nutrient and pesticide loss, rock fragments
Management considerations:
- The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazard of water erosion.
- Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Stones on the surface may interfere with the use of machinery.

Cropland

Suitability: Generally unsuited because of surface stones, the slope, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, slope
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Slope, water erosion, caving of cutbanks
Management considerations:
- Onsite investigation is needed.
- Buildings can be designed so that they conform to

the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe in very stony areas; VIe in areas that are not stony
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: AViO

GwB—Goodwit silt loam, 1 to 6 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Shoulders and linear and slightly convex summits
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 1,000 acres

Representative Profile

Organic layer:
0 to 2 inches—very dark grayish brown mucky peat

Mineral surface layer:
2 to 5 inches—dark brown, friable silt loam

Subsurface layer:
5 to 6 inches—brown, friable silt loam

Subsoil:
6 to 21 inches—brown, friable silt loam
21 to 40 inches—brown, mottled, friable silt loam
40 to 47 inches—reddish brown, friable sandy loam

Substratum:
47 to 62 inches—reddish brown, friable gravelly sandy loam

Composition

Goodwit soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Fence soils, which are underlain by stratified lacustrine deposits
• The well drained Goodman soils
• The somewhat poorly drained Mudlake soils and the poorly drained Capitola soils in depressions
• The well drained Stambaugh and Vanzile soils, which are underlain by sandy or sandy and gravelly glacial outwash
• Areas of Goodwit soils that are not stony or that are bouldery
• Sloping areas of Goodwit soils

Similar inclusions:
• Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
• Areas of soils in which the lower part of the subsoil and the substratum are loam, clay loam, or gravelly loam
• Soils that have a substratum of sandy loam, loamy sand, or gravelly loamy sand
• Areas in which the silty deposits are as much as 60 inches thick

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate or high
Organic matter content: Very high in the organic layer; moderate in the mineral surface layer
Percent of surface covered by stones: About 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited in areas where surface stones have been removed; poorly suited in other areas
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments

Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Crop yields are somewhat limited during dry years in areas where the available water capacity is moderate.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
- Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Rock fragments
Management considerations:
- Stones on the surface may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Well suited
Major management concerns: Water erosion
Management considerations:
- Onsite investigation is needed.
- Seeding and mulching exposed areas can help to control water erosion during and after construction.

Dwellings with basements

Suitability: Moderately well suited
Major management concerns: Wetness, water erosion, caving of cutbanks
Management considerations:
- Onsite investigation is needed.
- Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
- Seeding and mulching exposed areas can help to control water erosion during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs in very stony areas; IIe in areas that are not stony
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO

IsA—Iosco loamy fine sand, 0 to 3 percent slopes

Setting

Landform: Moraines
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Round, irregular, or long and narrow
Size of areas: 10 to 250 acres

Representative Profile

Surface layer:
0 to 9 inches—dark brown, very friable loamy fine sand

Subsurface layer:
9 to 11 inches—brown, very friable loamy fine sand

Subsoil:
11 to 33 inches—dark reddish brown and reddish brown, mottled, very friable loamy sand
33 to 44 inches—reddish brown, mottled, firm silty clay loam

Substratum:
44 to 60 inches—reddish brown, firm silty clay loam

Composition

Iosco soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- Au Gres soils, which are sandy throughout
- Crossett soils, which are silt loam in the upper layers

- The moderately well drained Morganlake soils in the higher landscape positions
- Areas of poorly drained soils in the lower depressions and drainageways
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have stones or boulders on the surface

Similar inclusions:
- Areas of soils in which the upper layers are loamy sand, sandy loam, or fine sandy loam
- Areas of soils in which the lower part of the subsoil and the substratum are silt loam, loam, clay loam, silty clay, or clay
- Areas of Iosco soils on glacial lake plains
- Soils that have a perched seasonal high water table
- Areas in which the silty deposits are at a depth of 40 to 60 inches

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 1.5 feet below the surface
Depth class: Very deep
Permeability: Rapid in the upper part and moderately slow in the lower part
Available water capacity: Low or moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—cropland, pasture; other uses—woodland, wildlife habitat

Cropland

Suitability: Moderately well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss, wetness
Management considerations:
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- If the water table is lowered, crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
- Proper irrigation scheduling helps to minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.
- The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
- Open ditches and tile drains remove excess surface water and improve internal drainage.
- Loose sand enters the tile lines unless a suitable filter covers the tile.
- Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.

Pasture

Suitability: Well suited
Major management concerns: Soil blowing, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
- Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
- Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
- Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability, wetness

Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Dwellings without basements—wetness, soil blowing; dwellings with basements—wetness, shrink-swell potential, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Adding coarse textured material under and around the foundation and properly reinforcing the foundation help to prevent the structural damage caused by shrinking and swelling.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 5W (quaking aspen)
Primary forest habitat type: TMC

Kr—Kinross muck, 0 to 2 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Round, irregular, or long and narrow
Size of areas: 5 to 25 acres

Representative Profile

Surface layer:
0 to 2 inches—black, very friable muck

Subsurface layer:
2 to 9 inches—brown, very friable sand

Subsoil:
9 to 39 inches—dark reddish brown, dark brown, and brown, mottled, very friable sand

Substratum:
39 to 60 inches—dark yellowish brown, loose sand

Composition

Kinross soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils in slightly convex areas
• The very poorly drained Beseman, Cathro, Dawson, and Markey soils, which have organic layers 16 to 51 inches thick

Similar inclusions:
• Areas of soils in which the upper layers are loamy sand, fine sand, loamy fine sand, sandy loam, or fine sandy loam
• Soils that have strata of gravel throughout
• Soils that have cemented layers in the subsoil
• Areas of stratified sandy, loamy, and silty deposits

Soil Properties and Qualities

Drainage class: Poorly drained
Seasonal high water table: Apparent, above or near the surface
Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Very high in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wetland wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength generally limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick. Reforestation is generally limited to natural regeneration or hand planting.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• The sandy soil can interfere with the traction of wheeled equipment, especially during dry periods.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.

• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality can be minimized by using harvest methods that leave some mature trees to provide shade and protection and by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Wetland wildlife habitat

Suitability: Suited in undrained areas
Major management concerns: Excessive sedimentation, chemical and nutrient pollution
Management considerations:
• Undrained areas of this soil can provide wetland wildlife habitat, provide for water purification and ground-water recharge, and minimize runoff and sedimentation.
• Maintaining a saturated condition, controlling sedimentation, and following recommended nutrient and chemical management practices on adjacent land help to protect wetland areas.
• In cultivated areas, providing adjacent nesting cover can enhance the habitat.

Pasture

Suitability: Poorly suited
Major management concerns: Soil blowing, nutrient and pesticide loss, wetness, ponding
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• The number of suitable forage plants is limited by the seasonal high water table.
• Establishing or maintaining an improved pasture is difficult because of the ponding.

Cropland

Suitability: Generally unsuited because of excessive wetness, ponding, and a severe frost hazard

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness, ponding
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Poorly suited
Major management concerns: Wetness, ponding, soil blowing
Management considerations:
• Onsite investigation is needed.
• Providing surface drainage, installing a subsurface drainage system, and adding fill material to raise the elevation of the site can help to overcome the wetness and the ponding.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Generally unsuited because of ponding

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 2W (quaking aspen)
Primary forest habitat type: Not assigned

Lo—Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes

Setting

Landform: Outwash plains, glacial lake plains, and moraines
Landscape position: Depressions and basins
Shape of areas: Round, irregular, or long and narrow
Size of areas: 5 to 240 acres

Representative Profile

Loxley

Surface layer:
0 to 9 inches—dark reddish brown, very friable peat

Next layer:
9 to 60 inches—dark reddish brown and black, very friable muck

Beseman

Surface layer:
0 to 12 inches—dark brown, very friable peat

Next layer:
12 to 36 inches—dark reddish brown and black, friable muck

Substratum:
36 to 60 inches—dark gray, friable silt loam

Dawson

Surface layer:
0 to 10 inches—dark reddish brown, very friable peat

Next layer:
10 to 44 inches—dark reddish brown, very friable muck

Substratum:
44 to 60 inches—brown, loose sand

Composition

The composition of individual delineations of this map unit is variable. Some areas are 50 to 60 percent Loxley soil and similar inclusions, 0 to 15 percent Beseman soil and similar inclusions, and 10 to 20 percent Dawson soil and similar inclusions; other areas are 0 to 20 percent Loxley soil and similar inclusions, 50 to 65 percent Beseman soil and similar inclusions, and 5 to 15 percent Dawson soil and similar inclusions; and some areas are 0 to 15 percent Loxley soil and similar inclusions, 0 to 15 percent Beseman soil and similar inclusions, and 50 to 60 percent Dawson soil and similar inclusions. Contrasting inclusions make up 10 to 25 percent of the map unit.

Inclusions

Contrasting inclusions:
- Areas where the soils are less acid and support trees of merchantable size and quality
- Areas of poorly drained to excessively drained soils in the higher landscape positions
- Areas of water
- Areas that are inundated throughout most of the year

Similar inclusions:
- Soils that have a surface layer of muck or mucky peat
- Areas of Beseman soils that have a substratum of sandy loam, gravelly sandy loam, fine sandy loam, or loam
- Areas of Dawson soils that have a substratum of fine sand, loamy fine sand, loamy sand, gravelly loamy sand, or gravelly sand

Soil Properties and Qualities

Drainage class: Very poorly drained
Seasonal high water table: Apparent, above or near the surface
Depth class: Very deep
Permeability: Loxley—moderately slow to moderately rapid; Beseman—moderate or moderately rapid in the organic material and moderately slow in the substratum; Dawson—moderately slow to moderately rapid in the organic material and rapid in the substratum
Available water capacity: Very high
Organic matter content: Very high in the surface layer

Use and Management

Land uses: Dominant use—wetland wildlife habitat

Wetland wildlife habitat

Suitability: Suited in undrained areas
Major management concerns: Excessive sedimentation, chemical and nutrient pollution
Management considerations:
- Undrained areas of these soils can provide wetland wildlife habitat, provide for water purification and ground-water recharge, and minimize runoff and sedimentation.
- Maintaining a saturated condition, controlling sedimentation, and following recommended nutrient and chemical management practices on adjacent land help to protect wetland areas.
- In cultivated areas, providing adjacent nesting cover can enhance the habitat.

Woodland

Suitability: Generally unsuited because of excessive wetness, ponding, extreme acidity, and low strength. These soils do not support trees of merchantable size or quality.

Cropland or pasture

Suitability: Generally unsuited because of excessive wetness, ponding, a scarcity of suitable drainage outlets, extreme acidity, a severe frost hazard, and low strength

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness, ponding, subsidence
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Generally unsuited because of wetness, ponding, subsidence, and low strength

Interpretive Groups

Land capability classification: VIIw

Woodland ordination symbol: Not assigned
Primary forest habitat type: Not assigned

Lu—Lupton, Cathro, and Markey mucks, 0 to 1 percent slopes

Setting

Landform: Outwash plains, glacial lake plains, and moraines
Landscape position: Depressions and drainageways
Shape of areas: Round, irregular, or long and narrow
Size of areas: 10 to 600 acres

Representative Profile

Lupton

Surface layer:
0 to 6 inches—black, very friable muck

Next layer:
6 to 60 inches—black, very friable muck

Cathro

Surface layer:
0 to 8 inches—black, very friable muck

Next layer:
8 to 30 inches—black, very friable muck

Substratum:
30 to 37 inches—gray, friable silt loam
37 to 60 inches—grayish brown and brown, mottled, friable sandy loam

Markey

Surface layer:
0 to 17 inches—black, very friable muck

Next layers:
17 to 21 inches—black, very friable mucky peat
21 to 36 inches—black, very friable muck

Substratum:
36 to 60 inches—grayish brown, loose sand

Composition

The composition of individual delineations of this map unit is variable. Some areas are 50 to 60 percent Lupton soil and similar inclusions, 0 to 15 percent Cathro soil and similar inclusions, and 10 to 20 percent Markey soil and similar inclusions; other areas are 0 to 20 percent Lupton soil and similar inclusions, 50 to 65 percent Cathro soil and similar inclusions, and 5 to 15 percent Markey soil and similar inclusions; and some areas are 0 to 15 percent Lupton soil and similar inclusions, 0 to 15 percent Cathro soil and similar inclusions, and 50 to 60 percent Markey soil and similar inclusions. Contrasting inclusions make up 10 to 25 percent of the map unit.

Inclusions

Contrasting inclusions:
- The poorly drained Fordum soils, which formed in primarily loamy alluvium underlain by sandy or sandy and gravelly deposits; on flood plains
- Areas where the soils are more acid and do not support trees of merchantable size and quality
- Areas of poorly drained to excessively drained soils in the higher landscape positions
- Areas of water
- Areas that are inundated throughout most of the year
- Soils that have stones and boulders on the surface

Similar inclusions:
- Soils that have a surface layer of mucky peat or peat
- Areas of Markey soils that have a substratum of gravelly sand, fine sand, loamy sand, gravelly loamy sand, or loamy fine sand
- Areas of Cathro soils that have a substratum of fine sandy loam, very fine sandy loam, loam, silty clay loam, or clay loam

Soil Properties and Qualities

Drainage class: Very poorly drained
Seasonal high water table: Apparent, above or near the surface
Depth class: Very deep
Permeability: Lupton—moderately slow to moderately rapid; Cathro—moderately slow to moderately rapid in the organic material and moderately slow or moderate in the substratum; Markey—moderately slow to moderately rapid in the organic material and very rapid in the substratum
Available water capacity: Very high
Organic matter content: Very high in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wetland wildlife habitat

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
- Wetness and low soil strength generally limit access by machinery to periods when the soil is frozen or snow cover is thick. Reforestation is generally limited to natural regeneration.
- Windthrow can be minimized by using harvest

methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.

- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Wetland wildlife habitat

Suitability: Suited in undrained areas
Major management concerns: Excessive sedimentation, chemical and nutrient pollution
Management considerations:

- Undrained areas of these soils can provide wetland wildlife habitat, provide for water purification and ground-water recharge, and minimize runoff and sedimentation (fig. 3).
- Maintaining a saturated condition, controlling sedimentation, and following recommended nutrient and chemical management practices on adjacent land help to protect wetland areas.
- In cultivated areas, providing adjacent nesting cover can enhance the habitat.

Cropland

Suitability: Generally unsuited because of excessive wetness, ponding, a scarcity of suitable drainage outlets, low strength, a severe frost hazard, and low strength

Pasture

Suitability: Poorly suited
Major management concerns: Soil blowing, nutrient and pesticide loss, wetness, ponding, low strength
Management considerations:

- Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
- Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.

Figure 3.—Wetland wildlife habitat consisting of grasses, sedges, reeds, shrubs, and trees in an area of Lupton, Cathro, and Markey mucks, 0 to 1 percent slopes, adjacent to a small stream.

• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• The number of suitable forage plants is limited by the seasonal high water table.
• Establishing or maintaining an improved pasture is difficult because of the ponding.
• Low strength restricts the use of machinery. Livestock hooves cut the soil and damage the plant cover.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Lupton—restricted permeability, wetness, ponding, subsidence; Cathro—restricted permeability, wetness, ponding; Markey—poor filtering capacity, restricted permeability, wetness, ponding, subsidence
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Generally unsuited because of wetness, ponding, subsidence, and low strength

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: Lupton—6W (balsam fir); Cathro—5W (balsam fir); Markey—7W (balsam fir)
Primary forest habitat type: Not assigned

MaA—Manitowish sandy loam, 0 to 3 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, toeslopes, and footslopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 30 acres

Representative Profile

Organic layer:
0 to 2 inches—very dark grayish brown, very friable peat

Mineral surface layer:
2 to 4 inches—brown, very friable sandy loam

Subsoil:
4 to 13 inches—dark brown, very friable sandy loam
13 to 18 inches—brown, very friable loamy sand
18 to 29 inches—strong brown, loose gravelly sand

Substratum:
29 to 62 inches—strong brown, mottled, loose, stratified sand and gravelly sand

Composition

Manitowish soil and similar inclusions: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils, which are sandy throughout; in depressions and drainageways
• The well drained Padus and Tipler soils, which are deeper than the Manitowish soil over sandy or sandy and gravelly glacial outwash
• The somewhat excessively drained Pence soils in slightly convex areas
• The somewhat poorly drained Worcester soils, which are deeper than the Manitowish soil over sandy or sandy and gravelly glacial outwash; in depressions and drainageways
• Soils that have stones or boulders on the surface
• Areas of stratified sandy, loamy, and silty deposits
• Areas of Manitowish soils that have slopes of 3 to 6 percent

Similar inclusions:
• Areas of soils in which the upper layers are loamy sand, fine sandy loam, or loam
• Soils that have a substratum of sand, gravelly coarse sand, or stratified sand and gravelly coarse sand

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Apparent, 2.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Organic matter content: Very high in the organic layer; moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Plant competition
Management considerations:
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
• Proper irrigation scheduling helps to minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.

Pasture

Suitability: Well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Well suited
Major management concerns: Soil blowing
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Moderately well suited
Major management concerns: Wetness, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3A (sugar maple)
Primary forest habitat type: ATM
Secondary forest habitat type: TMC

Mn—Minocqua muck, 0 to 2 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Round, irregular, or long and narrow
Size of areas: 5 to 40 acres

Representative Profile

Surface layer:
0 to 5 inches—black, very friable muck

Subsurface layer:
5 to 13 inches—grayish brown, friable fine sandy loam

Subsoil:
13 to 21 inches—gray, mottled, friable fine sandy loam
21 to 25 inches—olive gray, mottled, very friable gravelly loamy coarse sand

Substratum:
25 to 60 inches—grayish brown, mottled, loose sand

Composition

Minocqua soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Lupton, Cathro, and Markey soils, which have organic layers 16 to more than 51 inches thick
- The somewhat poorly drained Worcester soils in the slightly higher landscape positions
- Soils that have stones or boulders on the surface

Similar inclusions:
- Areas of soils in which the upper layers are silt loam, loam, sandy loam, or loamy sand
- Soils in which the depth to sandy or sandy and gravelly glacial outwash is less than 20 inches or more than 40 inches
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have a substratum of coarse sand, gravelly coarse sand, very gravelly coarse sand, stratified sand and gravelly coarse sand, or stratified sand and very gravelly coarse sand

Soil Properties and Qualities

Drainage class: Poorly drained
Seasonal high water table: Apparent, above or near the surface
Depth class: Very deep
Permeability: Moderate in the upper part and rapid or very rapid in the lower part
Available water capacity: Low or moderate
Organic matter content: Very high in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wetland wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
- Wetness and low soil strength generally limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick. Reforestation is generally limited to natural regeneration or hand planting.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
- Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Wetland wildlife habitat

Suitability: Suited in undrained areas
Major management concerns: Excessive sedimentation, chemical and nutrient pollution
Management considerations:
- Undrained areas of this soil can provide wetland wildlife habitat, provide for water purification and ground-water recharge, and minimize runoff and sedimentation.
- Maintaining a saturated condition, controlling sedimentation, and following recommended nutrient and chemical management practices on adjacent land help to protect wetland areas.
- In cultivated areas, providing adjacent nesting cover can enhance the habitat.

Pasture

Suitability: Poorly suited
Major management concerns: Soil blowing, nutrient and pesticide loss, wetness, ponding, low strength
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
- Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

• The number of suitable forage plants is limited by the seasonal high water table.
• Establishing or maintaining an improved pasture is difficult because of the ponding.
• Low strength restricts the use of machinery. Livestock hooves cut the soil and damage the plant cover.

Cropland

Suitability: Generally unsuited because of excessive wetness, ponding, a severe frost hazard, and low strength

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness, ponding
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Poorly suited
Major management concerns: Wetness, ponding, soil blowing
Management considerations:
• Onsite investigation is needed.
• Providing surface drainage, installing a subsurface drainage system, and adding fill material to raise the elevation of the site can help to overcome the wetness and the ponding.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Generally unsuited because of ponding

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 7W (balsam fir)
Primary forest habitat type: Not assigned

MrB—Morganlake loamy fine sand, 0 to 6 percent slopes

Setting

Landform: Moraines
Landscape position: Linear and slightly convex summits, shoulders, footslopes, and toeslopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 100 acres

Representative Profile

Surface layer:
0 to 7 inches—dark brown, very friable loamy fine sand

Subsurface layer:
7 to 8 inches—brown, very friable loamy fine sand

Subsoil:
8 to 26 inches—dark brown and brown, very friable loamy fine sand
26 to 31 inches—strong brown, mottled, very friable loamy fine sand
31 to 40 inches—dark reddish brown, firm silty clay loam and brown, mottled, friable silt loam

Substratum:
40 to 60 inches—dark reddish brown, firm silty clay loam

Composition

Morganlake soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils, which are sandy throughout; in depressions and drainageways
• The somewhat poorly drained Iosco soils in depressions and drainageways
• The well drained Rousseau soils and the excessively drained Vilas soils, which are sandy throughout
• Ellwood soils, which are silt loam in the upper layers
• Areas of stratified sandy, loamy, and silty deposits
• Areas of well drained soils
• Soils that have stones or boulders on the surface
• Sloping areas of Morganlake soils

Similar inclusions:
• Areas of soils in which the upper layers are sandy loam, fine sandy loam, or loamy sand
• Areas where the silty deposits are at a depth of 40 to 60 inches
• Areas of soils in which the lower part of the subsoil and the substratum are silt loam, loam, clay loam, silty clay, or clay
• Areas of eroded soils
• Areas of Morganlake soils on glacial lake plains

Soil Properties and Qualities

Drainage class: Moderately well drained

Seasonal high water table: Perched, 1.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderately rapid or rapid in the upper part and moderately slow in the lower part
Available water capacity: Low or moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—cropland, pasture; other uses—woodland, wildlife habitat

Cropland

Suitability: Moderately well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
- Proper irrigation scheduling helps to minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.

Pasture

Suitability: Well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
- Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years in areas where the available water capacity is low. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Woodland

Suitability: Suited
Major management concerns: Windthrow hazard, plant competition
Management considerations:
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability, wetness
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Moderately well suited
Major management concerns: Wetness, soil blowing
Management considerations:
- Onsite investigation is needed.
- Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
- Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Poorly suited
Major management concerns: Wetness, shrink-swell potential, soil blowing, caving of cutbanks
Management considerations:
- Onsite investigation is needed.
- Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
- Adding coarse textured material under and around the foundation and properly reinforcing the foundation help to prevent the structural damage caused by shrinking and swelling.
- Seeding and mulching exposed areas can help to control soil blowing during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 6S (quaking aspen)
Primary forest habitat type: ATM
Secondary forest habitat type: AQVib

MuB—Mudlake silt loam, 1 to 6 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Depressions, drainageways, toeslopes, and footslopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 100 acres

Representative Profile

Surface layer:
0 to 4 inches—very dark gray, very friable silt loam

Subsurface layer:
4 to 5 inches—brown, friable silt loam

Subsoil:
5 to 34 inches—brown, mottled, friable silt loam
34 to 43 inches—reddish brown, mottled, friable sandy loam

Substratum:
43 to 70 inches—reddish brown, friable sandy loam

Composition

Mudlake soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The poorly drained Capitola soils in the lower depressions and drainageways
- Gastrow soils, which are underlain by stratified lacustrine deposits
- The moderately well drained Goodwit, Wabeno, and Wakefield soils and the well drained Sarona soils in slightly convex areas
- Areas of Mudlake soils that are not stony or that are bouldery
- Areas of Mudlake soils that have slopes of 6 to 10 percent
- Soils that have bedrock within a depth of 60 inches

Similar inclusions:
- Areas of soils in which the upper layers are loam, very fine sandy loam, fine sandy loam, or sandy loam
- Soils that have an apparent seasonal high water table
- Soils that have a substratum of sand or gravelly sand
- Areas of soils in which the lower layers are loam, gravelly loam, clay loam, gravelly sandy loam, loamy sand, gravelly loamy sand, cobbly sandy loam, or cobbly loamy sand

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, 0.5 foot to 2.0 feet below the surface
Depth class: Very deep
Permeability: Moderate in the upper part and moderate or moderately rapid in the lower part
Available water capacity: Moderate or high
Organic matter content: Moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
- Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
- Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Well suited in areas where surface stones have been removed; poorly suited in other areas
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, wetness, poor tilth, rock fragments, low strength

Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• If the water table is lowered, crop yields are somewhat limited during dry years in areas where the available water capacity is moderate.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.
• Leaving crop residue on the surface, adding other organic material to the soil, minimizing tillage, tilling and harvesting at the proper soil moisture content, and including grasses and legumes in the cropping sequence help to prevent excessive compaction, minimize crusting, and maintain good tilth.
• Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.
• Low soil strength limits the use of farm equipment to periods when the soil is not wet.

Pasture

Suitability: Moderately well suited
Major management concerns: Rock fragments, low strength
Management considerations:
• Stones on the surface may interfere with the use of machinery.
• Low strength restricts the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Dwellings without basements—wetness, water erosion; dwellings with basements—wetness, water erosion, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs in very stony areas; IIe in areas that are not stony
Woodland ordination symbol: 3W (red maple)
Primary forest habitat type: ATD
Secondary forest habitat type: AViO

M-W—Miscellaneous water

Setting

Landform: Mostly outwash plains and glacial lake plains
Shape of areas: Rectangular
Size of areas: 5 to 15 acres

General Description

• This map unit occurs as small manmade areas of water and spoil consisting of excavated soil material. Typically, these areas contain water most of the year. The spoil is partially revegetated with grasses and weeds.

Composition

Miscellaneous water and similar inclusions: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
- Access roads and walkways

Similar inclusions:
- Areas of sandy, loamy, or silty soil material between areas of the excavated spoil material

Use and Management

Land uses: Dominant uses—industrial, sanitary, or mining applications; other use—wetland wildlife habitat

Interpretive Groups

Land capability classification: Not assigned
Woodland ordination symbol: Not assigned
Primary forest habitat type: Not assigned

PaB—Padus sandy loam, 0 to 6 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Toeslopes, side slopes, and linear and slightly convex summits
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Representative Profile

Surface layer:
0 to 2 inches—dark brown, friable sandy loam

Subsurface layer:
2 to 3 inches—pinkish gray, very friable sandy loam

Subsoil:
3 to 19 inches—dark brown and brown, friable sandy loam
19 to 38 inches—brown, friable sandy loam

Substratum:
38 to 60 inches—yellowish brown, loose, stratified sand and gravelly coarse sand

Composition

Padus soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Manitowish soils and the somewhat excessively drained Pence soils, which have thinner loamy deposits than those of the Padus soil
- The moderately well drained Tipler soils
- The somewhat poorly drained Worcester soils in depressions
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have stones or boulders on the surface
- Soils that have pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand in the substratum
- Sloping areas of Padus soils

Similar inclusions:
- Areas of soils in which the upper layers are loamy sand, fine sandy loam, very fine sandy loam, loam, or silt loam
- Soils that have a substratum of sand or coarse sand or the gravelly, very gravelly, cobbly, or very cobbly analogs of these textures
- Soils that have a substratum at a depth of more than 40 inches
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate in the upper part and rapid or very rapid in the substratum
Available water capacity: Low or moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- A conservation tillage system that leaves crop

residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years in areas where the available water capacity is low. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—water erosion, soil blowing; dwellings with basements—water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM

PaC—Padus sandy loam, 6 to 15 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 200 acres

Representative Profile

Organic layer:
0 to 1 inch—very dark grayish brown, very friable mucky peat

Mineral surface layer:
1 to 2 inches—very dark brown, friable sandy loam

Subsurface layer:
2 to 3 inches—grayish brown, friable sandy loam

Subsoil:
3 to 30 inches—dark brown and brown, friable sandy loam
30 to 36 inches—brown, very friable gravelly loamy sand

Substratum:
36 to 61 inches—yellowish brown, loose, stratified sand and gravelly coarse sand

Composition

Padus soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Pence soils, which have thinner loamy deposits than those of the Padus soil
- The excessively drained Sayner soils, which are sandy throughout
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have stones or boulders on the surface
- Areas of wet soils in depressions
- Soils that have pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand in the substratum
- Gently sloping or moderately steep areas of Padus soils

Similar inclusions:
- Areas of soils in which the upper layers are fine sandy loam, very fine sandy loam, loam, or silt loam
- Soils that have a substratum of sand or coarse sand or the gravelly, very gravelly, cobbly, or very cobbly analogs of these textures
- Soils that have a substratum at a depth of more than 40 inches
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate in the upper part and rapid or very rapid in the substratum
Available water capacity: Low or moderate
Organic matter content: Very high in the organic layer; moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years in areas where the available water capacity is low. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM

PaD—Padus sandy loam, 15 to 35 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 50 acres

Representative Profile

Surface layer:
0 to 2 inches—very dark brown, friable sandy loam

Subsurface layer:
2 to 3 inches—brown, friable sandy loam

Subsoil:
3 to 29 inches—dark brown and brown, friable sandy loam
29 to 34 inches—brown, very friable gravelly loamy sand

Substratum:
34 to 60 inches—yellowish brown and light yellowish brown, loose, stratified sand and gravelly coarse sand

Composition

Padus soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Pence soils, which have thinner loamy deposits than those of the Padus soil
• The excessively drained Sayner soils, which are sandy throughout
• Areas of stratified sandy, loamy, and silty deposits
• Soils that have stones or boulders on the surface
• Soils that have pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand in the substratum
• Areas of wet soils in depressions
• Gently sloping or sloping areas of Padus soils or areas of Padus soils that have slopes of more than 35 percent

Similar inclusions:
• Areas of soils in which the upper layers are fine sandy loam, very fine sandy loam, loam, or silt loam
• Soils that have a substratum of sand or coarse sand or the gravelly, very gravelly, cobbly, or very cobbly analogs of these textures
• Soils that have a substratum at a depth of more than 40 inches
• Areas of eroded soils

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate in the upper part and rapid or very rapid in the substratum
Available water capacity: Low or moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard, plant competition

Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years in areas where the available water capacity is low. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the slope and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM

PeB—Padus-Pence sandy loams, 0 to 6 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Toeslopes, side slopes, and linear and slightly convex summits
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 300 acres

Representative Profile

Padus

Surface layer:
0 to 3 inches—dark brown, friable sandy loam

Subsurface layer:
3 to 5 inches—brown, friable sandy loam

Subsoil:
5 to 17 inches—dark brown and brown, friable sandy loam
17 to 35 inches—brown, friable sandy loam

Substratum:
35 to 60 inches—yellowish brown, loose, stratified sand and gravelly coarse sand

Pence

Surface layer:
0 to 3 inches—black, friable sandy loam

Subsurface layer:
3 to 6 inches—brown, friable sandy loam

Subsoil:
6 to 18 inches—dark brown and brown, friable sandy loam
18 to 30 inches—strong brown, very friable gravelly loamy sand

Substratum:
30 to 60 inches—yellowish brown, loose, stratified sand and gravelly coarse sand

Composition

Padus soil and similar inclusions: 65 to 75 percent
Pence soil and similar inclusions: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Manitowish and Tipler soils
- The well drained Rousseau soils and the excessively drained Sayner and Vilas soils, which are sandy throughout
- The somewhat poorly drained Worcester soils in depressions
- Soils that have stones or boulders on the surface
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand in the substratum
- Sloping areas of Padus and Pence soils

Similar inclusions:
- Areas of soils in which the upper layers are fine sandy loam, loam, very fine sandy loam, or silt loam
- Soils that have a substratum of sand or coarse sand or the gravelly, very gravelly, cobbly, or very cobbly analogs of these textures
- Soils that have a substratum at a depth of more than 40 inches
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Padus—well drained; Pence—somewhat excessively drained
Depth class: Very deep
Permeability: Padus—moderate in the upper part and rapid or very rapid in the substratum; Pence—moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Padus—low or moderate; Pence—low
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Padus—equipment limitation, plant competition; Pence—no major soil limitations or hazards
Major management concerns:
- In areas of the Padus soil, ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition in areas of the Padus soil can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season reduce leaching losses in areas of the Pence soil and protect the quality of ground water.

Pasture

Suitability: Well suited

Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years in areas where the available water capacity is low. Drought-tolerant species are best suited to these soils.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates reduce leaching losses in areas of the Pence soil and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—water erosion, soil blowing; dwellings with basements—water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: Padus—3L (sugar maple); Pence—3A (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: PMV or ATM

PeC—Padus-Pence sandy loams, 6 to 15 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 250 acres

Representative Profile

Padus

Surface layer:
0 to 2 inches—dark brown, friable sandy loam

Subsurface layer:
2 to 4 inches—brown, friable sandy loam

Subsoil:
4 to 20 inches—dark brown and brown, friable sandy loam
20 to 33 inches—brown, friable sandy loam

Substratum:
33 to 60 inches—brown and yellowish brown, loose, stratified sand and gravelly coarse sand

Pence

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 3 inches—very dark gray, friable sandy loam

Subsurface layer:
3 to 5 inches—brown, friable sandy loam

Subsoil:
5 to 16 inches—reddish brown and dark brown, friable sandy loam
16 to 27 inches—strong brown, very friable gravelly loamy sand

Substratum:
27 to 61 inches—brown, loose, stratified sand and gravelly coarse sand

Composition

Padus soil and similar inclusions: 60 to 70 percent
Pence soil and similar inclusions: 20 to 30 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The excessively drained Sayner and Vilas soils, which are sandy throughout

- Soils that have stones or boulders on the surface
- Areas of wet soils in depressions
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand in the substratum
- Gently sloping or moderately steep areas of Padus and Pence soils

Similar inclusions:
- Areas of soils in which the upper layers are fine sandy loam, loam, very fine sandy loam, or silt loam
- Soils that have a substratum of sand or coarse sand or the gravelly, very gravelly, cobbly, or very cobbly analogs of these textures
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Padus—well drained; Pence—somewhat excessively drained
Depth class: Very deep
Permeability: Padus—moderate in the upper part and rapid or very rapid in the substratum; Pence—moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Padus—low or moderate; Pence—low
Organic matter content: Padus—moderately low or moderate in the surface layer; Pence—very high in the organic layer and moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Padus—equipment limitation, plant competition; Pence—equipment limitation
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- In areas of the Padus soil, ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition in areas of the Padus soil can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season reduce leaching losses in areas of the Pence soil and protect the quality of ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years in areas where the available water capacity is low. Drought-tolerant species are best suited to these soils.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates reduce leaching losses in areas of the Pence soil and protect the quality of ground water.
- Reducing chemical applications and applying

phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
- Onsite investigation is needed.
- Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
- Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: Padus—3L (sugar maple); Pence—3A (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: PMV or ATM

PeD—Padus-Pence sandy loams, 15 to 35 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 300 acres

Representative Profile

Padus

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 3 inches—grayish brown, friable sandy loam

Subsoil:
3 to 30 inches—dark brown and brown, friable sandy loam

Substratum:
30 to 61 inches—yellowish brown, loose, stratified sand and gravelly coarse sand

Pence

Surface layer:
0 to 1 inch—very dark brown, friable sandy loam

Subsurface layer:
1 to 2 inches—brown, friable sandy loam

Subsoil:
2 to 16 inches—dark brown and brown, friable sandy loam
16 to 28 inches—strong brown, friable gravelly loamy sand

Substratum:
28 to 60 inches—yellowish brown, loose, stratified sand and gravelly coarse sand

Composition

Padus soil and similar inclusions: 55 to 65 percent
Pence soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
- The excessively drained Sayner and Vilas soils, which are sandy throughout
- Soils that have stones or boulders on the surface
- Areas of wet soils in depressions
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand in the substratum
- Gently sloping or sloping areas of Padus and Pence soils or areas of Padus and Pence soils that have slopes of more than 35 percent

Similar inclusions:
- Areas of soils in which the upper layers are loamy fine sandy loam, loam, very fine sandy loam, or silt loam
- Soils that have a substratum of sand or coarse sand or the gravelly, very gravelly, cobbly, or very cobbly analogs of these textures
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Padus—well drained; Pence—somewhat excessively drained

Depth class: Very deep
Permeability: Padus—moderate in the upper part and rapid or very rapid in the substratum; Pence—moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Padus—low or moderate; Pence—low
Organic matter content: Padus—very high in the organic layer and moderately low or moderate in the mineral surface layer; Pence—moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Padus—equipment limitation, erosion hazard, plant competition; Pence—equipment limitation, erosion hazard
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
• In areas of the Padus soil, ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
• Plant competition in areas of the Padus soil can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years in areas where the available water capacity is low. Drought-tolerant species are best suited to these soils.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates reduce leaching losses in areas of the Pence soil and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the slope and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: PMV or ATM

PnB—Pence sandy loam, 0 to 6 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Toeslopes, side slopes, and linear and slightly convex summits
Shape of areas: Irregular
Size of areas: 10 to 500 acres

Representative Profile

Surface layer:
0 to 3 inches—black, very friable sandy loam

Subsurface layer:
3 to 4 inches—brown, very friable sandy loam

Subsoil:
4 to 15 inches—dark brown and brown, very friable sandy loam
15 to 31 inches—strong brown, very friable gravelly coarse sand

Substratum:
31 to 60 inches—brown, loose, stratified sand and gravelly coarse sand

Composition

Pence soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Manitowish soils
- The well drained Padus soils and the moderately well drained Tipler soils, which are deeper than the Pence soil over sandy or sandy and gravelly glacial outwash
- The excessively drained Sayner and Vilas soils, which are sandy throughout
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand in the substratum
- Soils that have stones or boulders on the surface
- Sloping areas of Pence soils

Similar inclusions:
- Areas of soils in which the upper layers are fine sandy loam or loam
- Areas of eroded soils
- Soils that have a substratum of sand or coarse sand or the gravelly, very gravelly, cobbly, or very cobbly analogs of these textures

Soil Properties and Qualities

Drainage class: Somewhat excessively drained
Depth class: Very deep
Permeability: Moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: No major soil limitations or hazards

Cropland

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—water erosion, soil blowing; dwellings with basements—water erosion, soil blowing, caving of cutbanks
Management considerations:
- Onsite investigation is needed.
- Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3A (sugar maple)
Primary forest habitat type: ATM
Secondary forest habitat type: PMV

PnC—Pence sandy loam, 6 to 15 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 250 acres

Representative Profile

Organic layer:
0 to 1 inch—very dark brown, very friable mucky peat

Mineral surface layer:
1 to 3 inches—black, very friable sandy loam

Subsurface layer:
3 to 5 inches—brown, very friable sandy loam

Subsoil:
5 to 14 inches—dark reddish brown and brown, very friable sandy loam
14 to 26 inches—strong brown, very friable gravelly coarse sand

Substratum:
26 to 61 inches—brown, loose, stratified sand and gravelly coarse sand

Composition

Pence soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Padus soils, which are deeper than the Pence soil over sandy or sandy and gravelly glacial outwash
- The excessively drained Sayner and Vilas soils, which are sandy throughout
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand in the substratum
- Soils that have stones or boulders on the surface
- Areas of wet soils in depressions
- Gently sloping or moderately steep areas of Pence soils

Similar inclusions:
- Areas of soils in which the upper layers are fine sandy loam or loam
- Areas of eroded soils
- Soils that have a substratum of sand or coarse sand

or the gravelly, very gravelly, cobbly, or very cobbly analogs of these textures

Soil Properties and Qualities

Drainage class: Somewhat excessively drained
Depth class: Very deep
Permeability: Moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Organic matter content: Very high in the organic layer; moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.

Cropland

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3A (sugar maple)
Primary forest habitat type: ATM
Secondary forest habitat type: PMV

PnD—Pence sandy loam, 15 to 35 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 100 acres

Representative Profile

Surface layer:
0 to 1 inch—black, very friable sandy loam

Subsurface layer:
1 to 2 inches—brown, very friable sandy loam

Subsoil:
2 to 15 inches—dark brown and brown, very friable sandy loam
15 to 22 inches—strong brown, very friable gravelly coarse sand

Substratum:
22 to 60 inches—light brown, loose, stratified sand and gravelly coarse sand

Composition

Pence soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Padus soils, which are deeper than the Pence soil over sandy or sandy and gravelly glacial outwash
- The excessively drained Sayner and Vilas soils, which are sandy throughout
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand in the substratum
- Soils that have stones or boulders on the surface
- Areas of wet soils in depressions
- Gently sloping or sloping areas of Pence soils or areas of Pence soils that have slopes of more than 35 percent

Similar inclusions:
- Areas of soils in which the upper layers are fine sandy loam or loam
- Areas of eroded soils
- Soils that have a substratum of sand or coarse sand or the gravelly, very gravelly, cobbly, or very cobbly analogs of these textures

Soil Properties and Qualities

Drainage class: Somewhat excessively drained
Depth class: Very deep
Permeability: Moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
- Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
- Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.

Pasture

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants reduces the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.

• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the slope and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: ATM
Secondary forest habitat type: PMV

PsB—Pence-Vilas complex, 0 to 6 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Toeslopes, side slopes, and linear and slightly convex summits
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 40 acres

Representative Profile

Pence

Surface layer:
0 to 2 inches—black, very friable sandy loam

Subsurface layer:
2 to 4 inches—brown, very friable sandy loam

Subsoil:
4 to 16 inches—dark brown and brown, very friable sandy loam
16 to 29 inches—brown, very friable gravelly loamy sand

Substratum:
29 to 60 inches—yellowish brown, loose, stratified sand and gravelly coarse sand

Vilas

Organic layer:
0 to 1 inch—black, very friable mucky peat

Mineral surface layer:
1 to 3 inches—brown, very friable loamy sand

Subsoil:
3 to 21 inches—dark brown and brown, very friable loamy sand
21 to 29 inches—yellowish brown, very friable sand

Substratum:
29 to 61 inches—brownish yellow and light yellowish brown, loose sand

Composition

Pence soil and similar inclusions: 55 to 65 percent
Vilas soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell and Manitowish soils in the lower landscape positions
• The well drained Padus soils, which have loamy upper layers 24 to 40 inches thick
• Areas of stratified sandy, loamy, and silty deposits
• Soils that have stones or boulders on the surface
• Sloping areas of Pence and Vilas soils

Similar inclusions:
- Areas of soils in which the upper layers are sand, loamy fine sand, fine sandy loam, or loam
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Pence—somewhat excessively drained; Vilas—excessively drained
Depth class: Very deep
Permeability: Pence—moderate or moderately rapid in the upper part and rapid or very rapid in the lower part; Vilas—rapid
Available water capacity: Low
Organic matter content: Pence—moderately low or moderate in the surface layer; Vilas—very high in the organic layer and moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: No major soil limitations or hazards

Cropland

Suitability: Poorly suited
Major management concerns: Pence—water erosion, soil blowing, droughtiness, nutrient and pesticide loss; Vilas—soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas of the Pence soil
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Pence soil by reducing runoff losses to lakes and streams.
- Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Pence—water erosion, soil blowing, droughtiness, nutrient and pesticide loss; Vilas—soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to these soils.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Pence soil by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Well suited
Major management concerns: Pence—water erosion, soil blowing; Vilas—soil blowing
Management considerations:
- Onsite investigation is needed.
- Seeding and mulching exposed areas can help to

control water erosion and soil blowing during and after construction.

Dwellings with basements

Suitability: Well suited
Major management concerns: Pence—water erosion, soil blowing, caving of cutbanks; Vilas—soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: Pence—3A (sugar maple); Vilas—6A (red pine)
Primary forest habitat type: ATM
Secondary forest habitat type: PMV

PsC—Pence-Vilas complex, 6 to 15 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 300 acres

Representative Profile

Pence

Surface layer:
0 to 2 inches—very dark brown, friable sandy loam

Subsurface layer:
2 to 3 inches—brown, friable sandy loam

Subsoil:
3 to 16 inches—dark brown and brown, friable sandy loam
16 to 29 inches—strong brown, very friable gravelly loamy sand

Substratum:
29 to 60 inches—yellowish brown, loose, stratified sand and gravelly coarse sand

Vilas

Organic layer:
0 to 1 inch—very dark brown, very friable muck

Mineral surface layer:
1 to 2 inches—dark brown, very friable loamy sand

Subsurface layer:
2 to 3 inches—brown, very friable loamy sand

Subsoil:
3 to 18 inches—dark brown and brown, very friable loamy sand
18 to 28 inches—strong brown, very friable sand

Substratum:
28 to 61 inches—yellowish brown, loose sand

Composition

Pence soil and similar inclusions: 50 to 60 percent
Vilas soil and similar inclusions: 30 to 40 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Padus soils, which have loamy upper layers 24 to 40 inches thick
• Areas of stratified sandy, loamy, and silty deposits
• Areas of wet soils in depressions
• Soils that have stones or boulders on the surface
• Gently sloping or moderately steep areas of Pence and Vilas soils

Similar inclusions:
• Areas of soils in which the upper layers are sand, loamy fine sand, fine sandy loam, or loam
• Areas of eroded soils

Soil Properties and Qualities

Drainage class: Pence—somewhat excessively drained; Vilas—excessively drained
Depth class: Very deep
Permeability: Pence—moderate or moderately rapid in the upper part and rapid or very rapid in the lower part; Vilas—rapid
Available water capacity: Low
Organic matter content: Pence—moderately low or moderate in the surface layer; Vilas—very high in the organic layer and moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.

Cropland

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to these soils.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: Pence—3A (sugar maple); Vilas—6A (red pine)
Primary forest habitat type: ATM
Secondary forest habitat type: PMV

PsD—Pence-Vilas complex, 15 to 35 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 400 acres

Representative Profile

Pence

Surface layer:
0 to 1 inch—black, friable sandy loam

Subsurface layer:
1 to 2 inches—brown, friable sandy loam

Subsoil:
2 to 16 inches—dark brown and brown, friable sandy loam
16 to 28 inches—strong brown, very friable gravelly loamy sand

Substratum:
28 to 60 inches—brown, loose, stratified sand and gravelly coarse sand

Vilas

Surface layer:
0 to 1 inch—very dark brown, very friable loamy sand

Subsurface layer:
1 to 2 inches—brown, very friable loamy sand

Subsoil:
2 to 14 inches—dark brown and brown, very friable loamy sand
14 to 24 inches—strong brown, very friable sand

Substratum:
24 to 60 inches—yellowish brown, loose sand

Composition

Pence soil and similar inclusions: 45 to 55 percent
Vilas soil and similar inclusions: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Padus soils, which have loamy upper layers 24 to 40 inches thick
- Areas of stratified sandy, loamy, and silty deposits
- Areas of wet soils in depressions
- Soils that have stones or boulders on the surface
- Gently sloping or sloping areas of Pence and Vilas soils or areas of Pence and Vilas soils that have slopes of more than 35 percent

Similar inclusions:
- Areas of soils in which the upper layers are sand, loamy fine sand, fine sandy loam, or loam
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Pence—somewhat excessively drained; Vilas—excessively drained
Depth class: Very deep
Permeability: Pence—moderate or moderately rapid in the upper part and rapid or very rapid in the lower part; Vilas—rapid
Available water capacity: Low
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
- Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
- Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.

Pasture

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants reduces the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to these soils.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.

• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the slope, droughtiness, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Pence—3R (sugar maple); Vilas—6R (red pine)
Primary forest habitat type: ATM
Secondary forest habitat type: PMV

Pt—Pits, gravel

Setting

Landform: Mostly outwash plains, stream terraces, eskers, kames, drumlins, and moraines
Shape of areas: Irregular, round, or oblong
Size of areas: 5 to 15 acres

General Description

• This map unit consists of pits where sand, sand and gravel, glacial till, or glacial drift has been removed to a depth of at least several feet and includes adjacent areas where sand, sand and gravel, or other soil material has been stockpiled. Typically, the actively mined pits are not vegetated. Abandoned pits are covered with trees, brush, and weeds. The material remaining on the bottom and side walls of the pits is sand, sand and gravel, or sandy or loamy glacial till or glacial drift.

Composition

Pits and similar inclusions: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• Areas of water
• Access roads and buildings
• Areas of wet soils on the bottom of the pits
• Piles of discarded nonsoil material, such as old machinery or stones and boulders that are too large to be crushed

Similar inclusions:
• Pits where silty soil material has been removed for use as fill material

Use and Management

Land uses:
• This unit is used dominantly as actively excavated gravel pits. Some pits have been abandoned and are covered with trees, brush, and weeds, which provide good wildlife habitat. A few abandoned pits are used for dirt bike trails or as firing ranges, and some are used as sanitary landfills.
• Because of the variable nature of this map unit, onsite investigation is needed to determine the suitability for proposed uses. Land shaping and the addition of suitable topsoil are commonly required before a plant cover can be established.

Interpretive Groups

Land capability classification: Not assigned
Woodland ordination symbol: Not assigned
Primary forest habitat type: Not assigned

Px—Pits, mine

Setting

Landform: Mostly moraines underlain by metamorphic bedrock

Shape of areas: Irregular
Size of areas: 15 to 30 acres

General Description

• This map unit consists of pits where soil and metamorphic bedrock have been excavated during past open-pit iron mining operations (fig. 4). It includes adjacent areas where spoil has been piled. The spoil consists of angular and flat or irregularly shaped pieces of bedrock and soil material pushed from the site before excavation. Typically, the sidewalls of the pits are metamorphic bedrock. The bottom of the pits is covered with water. The spoil piles have been partially revegetated with trees, brush, and weeds.

Composition

Pits and similar inclusions: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• Access roads

Figure 4.—An area of Pits, mine. The sidewalls of the pit are metamorphic bedrock, and the bottom is covered with water.

• Piles of discarded nonsoil material, such as old machinery

Similar inclusions:
• Areas of sandy, loamy, or silty soil material between the piles of spoil material

Use and Management

Land uses:
• Areas of this map unit have been abandoned. Some pits are filled with water and are used for swimming or could be stocked with fish if the pH is suitable. Some of the spoil piles could be used as a source of fill material.
• Because of the variable nature of this map unit, onsite investigation is needed to determine the suitability for proposed uses.

Interpretive Groups

Land capability classification: Not assigned
Woodland ordination symbol: Not assigned
Primary forest habitat type: Not assigned

Rb—Robago fine sandy loam, 0 to 2 percent slopes

Setting

Landform: Outwash plains, glacial lake plains, and moraines
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Representative Profile

Organic layer:
0 to 2 inches—black, very friable muck

Mineral surface layer:
2 to 7 inches—grayish brown, friable fine sandy loam

Subsoil:
7 to 17 inches—dark brown and brown, mottled, friable fine sandy loam
17 to 38 inches—brown, mottled, friable fine sandy loam

Substratum:
38 to 62 inches—dark yellowish brown, mottled, friable, stratified very fine sandy loam and silt loam with thin strata of very fine sand and fine sand

Composition

Robago soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Annalake soils in slightly convex areas
• Au Gres soils, which are sandy throughout
• Areas of poorly drained soils in the lower depressions and drainageways
• Soils that have stones or boulders on the surface

Similar inclusions:
• Areas of soils in which the upper layers are loamy sand, loamy fine sand, sandy loam, loam, very fine sandy loam, or silt loam
• Soils that have a substratum of sand, gravelly sand, clay loam, or silty clay loam
• Soils that have a perched seasonal high water table

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 2.0 feet below the surface
Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate
Organic matter content: Very high in the organic layer; moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

• Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Well suited
Major management concerns: Soil blowing, droughtiness, wetness, poor tilth, low strength
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• If the water table is lowered, crop yields are somewhat limited during dry years by the restricted available water capacity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
• Low soil strength limits the use of farm equipment to periods when the soil is not wet.

Pasture

Suitability: Well suited
Major management concerns: Soil blowing, low strength
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Low strength restricts the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Poorly suited
Major management concerns: Wetness, soil blowing
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Poorly suited
Major management concerns: Wetness, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W (sugar maple)
Primary forest habitat type: TMC
Secondary forest habitat type: ATD

RkC—Rock outcrop-Ishpeming-Vilas complex, 1 to 15 percent slopes

Setting

Landform: Outwash plains and moraines
Landscape position: Convex summits and side slopes
Shape of areas: Round, long and narrow, or irregular
Size of areas: 5 to 100 acres

Representative Profile

Rock outcrop

Type of material: Exposed schist bedrock

Ishpeming

Organic layer:
0 to 1 inch—dark brown, very friable mucky peat

Mineral surface layer:
1 to 4 inches—brown, very friable loamy sand

Subsoil:
4 to 16 inches—dark reddish brown and brown, very friable loamy sand
16 to 32 inches—strong brown, very friable sand

Bedrock:
32 inches—schist

Vilas

Organic layer:
0 to 2 inches—black, very friable muck

Mineral surface layer:
2 to 4 inches—brown, very friable loamy sand

Subsoil:
4 to 18 inches—dark brown and brown, very friable loamy sand
18 to 35 inches—strong brown, very friable sand

Substratum:
35 to 62 inches—brown, loose sand

Composition

Rock outcrop: 35 to 45 percent
Ishpeming soil and similar inclusions: 25 to 35 percent
Vilas soil and similar inclusions: 15 to 25 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
- Areas of stratified sandy, loamy, and silty deposits
- Areas of wet soils in depressions
- Areas that do not have rock outcrops
- Areas of nearly vertical bedrock escarpments
- Moderately steep or steep areas of Ishpeming and Vilas soils

Similar inclusions:
- Areas of soils in which the upper layers are sand, loamy fine sand, sandy loam, or fine sandy loam
- Areas where the bedrock is igneous rock or metamorphic rock other than schist
- Soils that have gravelly bands in the subsoil or substratum
- Soils that have bedrock at a depth of less than 20 inches or between depths of 40 and 60 inches

Soil Properties and Qualities

Drainage class: Ishpeming—somewhat excessively drained; Vilas—excessively drained
Depth class: Ishpeming—moderately deep to hard igneous or metamorphic bedrock; Vilas—very deep
Permeability: Ishpeming—rapid in the upper part of the soil and very slow to rapid in the bedrock; Vilas—rapid
Available water capacity: Ishpeming—very low; Vilas—low
Organic matter content: Ishpeming—very high in the organic layer and moderately low in the mineral surface layer; Vilas—very high in the organic layer and moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Rock outcrop—generally unsuited; Ishpeming and Vilas—suited
Major management concerns: Ishpeming—equipment limitation, windthrow hazard; Vilas—equipment limitation
Management considerations:
- The selection of log landing sites is limited in areas of the Ishpeming and Vilas soils that have slopes of more than about 6 percent. Landings can be established in the less sloping areas or on suitable nearly level or gently sloping adjacent or included soils.
- In areas of the Ishpeming soil, hard bedrock limits the depth of cuts and interferes with the construction of haul roads and log landings.
- Bedrock outcrops and escarpments severely restrict the movement of logging equipment. The careful location of logging roads is necessary.
- Windthrow in areas of the Ishpeming soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced.

Pasture

Suitability: Rock outcrop—unsuited; Ishpeming and Vilas—moderately well suited
Major management concerns: Ishpeming and Vilas—water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes on the Ishpeming and Vilas soils reduces the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Forage yields in areas of the Ishpeming and Vilas soils are limited by the restricted available water

capacity. Drought-tolerant species are best suited to these soils.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates reduce leaching losses in areas of the Ishpeming and Vilas soils and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Ishpeming and Vilas soils by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of droughtiness and the rock outcrops

Septic tank absorption fields

Severity of soil limitations or suitability: Rock outcrop—unsuited; Ishpeming and Vilas—severe
Major restrictive features: Ishpeming—poor filtering capacity, slope, depth to rock; Vilas—poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Rock outcrop—unsuited; Ishpeming and Vilas—moderately well suited
Major management concerns: Ishpeming—slope, depth to rock, water erosion, soil blowing, caving of cutbanks; Vilas—slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In areas of the Ishpeming and Vilas soils, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling. The underlying hard bedrock, however, limits the depth of cuts in areas of the Ishpeming soil. The bedrock can be excavated by blasting or using suitable power equipment.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Dwellings with basements

Suitability: Rock outcrop—unsuited; Ishpeming—poorly suited; Vilas—moderately well suited
Major management concerns: Ishpeming—slope, depth to rock, water erosion, soil blowing, caving of cutbanks; Vilas—slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In areas of the Ishpeming and Vilas soils, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling. The underlying hard bedrock, however, limits the depth of cuts in areas of the Ishpeming soil. The bedrock can be excavated by blasting or using suitable power equipment.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: Rock outcrop—not assigned; Ishpeming—5D (quaking aspen); Vilas—6A (red pine)
Primary forest habitat type: AQV
Secondary forest habitat type: PMV

RkD—Rock outcrop-Ishpeming-Vilas complex, 15 to 35 percent slopes

Setting

Landform: Outwash plains and moraines
Landscape position: Convex summits and side slopes
Shape of areas: Round, long and narrow, or irregular
Size of areas: 10 to 30 acres

Representative Profile

Rock outcrop

Type of material: Exposed schist bedrock

Ishpeming

Surface layer:
0 to 1 inch—dark brown, very friable loamy sand

Subsurface layer:
1 to 2 inches—brown, very friable loamy sand

Subsoil:
2 to 28 inches—dark brown, brown, and strong brown, very friable loamy sand

Bedrock:
28 inches—schist

Vilas

Surface layer:
0 to 2 inches—black, very friable loamy sand

Subsurface layer:
2 to 3 inches—brown, very friable loamy sand

Subsoil:
3 to 19 inches—dark brown and brown, very friable loamy sand
19 to 30 inches—strong brown, very friable sand

Substratum:
30 to 60 inches—brown, loose sand

Composition

Rock outcrop: 35 to 45 percent
Ishpeming soil and similar inclusions: 25 to 35 percent
Vilas soil and similar inclusions: 15 to 25 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
- Areas of stratified sandy, loamy, and silty deposits
- Areas of wet soils in depressions
- Areas that do not have rock outcrops
- Areas of nearly vertical bedrock escarpments
- Gently sloping or sloping areas of Ishpeming and Vilas soils or areas of Ishpeming and Vilas soils that have slopes of more than 35 percent

Similar inclusions:
- Areas of soils in which the upper layers are sand, loamy fine sand, sandy loam, or fine sandy loam
- Areas where the bedrock is igneous rock or metamorphic rock other than schist
- Soils that have gravelly bands in the subsoil or substratum
- Soils that have bedrock at a depth of less than 20 inches or between depths of 40 and 60 inches

Soil Properties and Qualities

Drainage class: Ishpeming—somewhat excessively drained; Vilas—excessively drained
Depth class: Ishpeming—moderately deep to hard igneous or metamorphic bedrock; Vilas—very deep
Permeability: Ishpeming—rapid in the upper part of the soil and very slow to rapid in the bedrock; Vilas—rapid
Available water capacity: Ishpeming—very low; Vilas—low
Organic matter content: Ishpeming—moderately low in the surface layer; Vilas—moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Rock outcrop—generally unsuited; Ishpeming and Vilas—suited
Major management concerns: Ishpeming—equipment limitation, erosion hazard, windthrow hazard; Vilas—equipment limitation, erosion hazard
Management considerations:
- In areas of the Ishpeming and Vilas soils, the slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed in areas of the Ishpeming and Vilas soils.
- Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
- In areas of the Ishpeming soil, hard bedrock limits the depth of cuts and interferes with the construction of haul roads and log landings.
- Bedrock outcrops and escarpments severely restrict the movement of logging equipment. The careful location of logging roads is necessary.
- Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion in areas of the Ishpeming and Vilas soils.
- Windthrow in areas of the Ishpeming soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.

Pasture

Suitability: Rock outcrop—unsuited; Ishpeming and Vilas—poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- The steeper areas of the Ishpeming and Vilas soils are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture

plants reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields on the Ishpeming and Vilas soils are limited by the restricted available water capacity. Drought-tolerant species are best suited to these soils.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates reduce leaching losses in areas of the Ishpeming and Vilas soils and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Ishpeming and Vilas soils by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the rock outcrops, the slope, droughtiness, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations or suitability: Rock outcrop—unsuited; Ishpeming and Vilas—severe
Major restrictive features: Ishpeming—poor filtering capacity, slope, depth to rock; Vilas—poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Rock outcrop—unsuited; Ishpeming and Vilas—poorly suited in the less sloping areas and generally unsuited in other areas
Major management concerns: Ishpeming—slope, depth to rock, water erosion, soil blowing, caving of cutbanks; Vilas—slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas of the Ishpeming and Vilas soils, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling. The underlying hard bedrock, however, limits the depth of cuts in areas of the Ishpeming soil. The bedrock can be excavated by blasting or using suitable power equipment.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Dwellings with basements

Suitability: Rock outcrop—unsuited; Ishpeming—generally unsuited because of the slope and the depth to rock; Vilas—poorly suited in the less sloping areas and generally unsuited in other areas
Major management concerns: Vilas—slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas of the Vilas soil, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: Rock outcrop—not assigned; Ishpeming—5R (quaking aspen); Vilas—6R (red pine)
Primary forest habitat type: AQV
Secondary forest habitat type: PMV

RmC—Rock outcrop-Metonga-Sarona complex, 1 to 15 percent slopes

Setting

Landform: Moraines
Landscape position: Convex summits and side slopes
Shape of areas: Round, long and narrow, or irregular
Size of areas: 10 to 200 acres

Representative Profile

Rock outcrop

Type of material: Exposed granite bedrock

Metonga

Organic layer:
0 to 1 inch—dark brown, very friable mucky peat

Mineral surface layer:
1 to 2 inches—black, very friable fine sandy loam

Subsurface layer:
2 to 4 inches—brown, very friable fine sandy loam

Subsoil:
4 to 17 inches—dark reddish brown and brown, friable fine sandy loam
17 to 39 inches—dark reddish brown, friable gravelly sandy loam

Bedrock:
39 inches—granite

Sarona

Surface layer:
0 to 1 inch—black, very friable fine sandy loam

Subsurface layer:
1 to 3 inches—brown, very friable fine sandy loam

Subsoil:
3 to 6 inches—dark reddish brown, friable fine sandy loam
6 to 16 inches—brown, friable fine sandy loam
16 to 41 inches—brown, friable sandy loam

Substratum:
41 to 60 inches—brown, friable gravelly sandy loam

Composition

Rock outcrop: 35 to 45 percent
Metonga soil and similar inclusions: 25 to 35 percent
Sarona soil and similar inclusions: 15 to 25 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Ellwood soils and the somewhat poorly drained Crossett soils, which have silty upper layers underlain by loamy, silty, or clayey glacial till
- Padus soils and the somewhat excessively drained Pence soils, which are underlain by sandy or sandy and gravelly glacial outwash
- Rousseau soils and the excessively drained Vilas soils, which are sandy throughout
- Areas of stratified sandy, loamy, and silty deposits
- Areas of wet soils in depressions
- Soils that have stones or boulders on the surface
- Areas where the bedrock is weathered and can be excavated with hand tools
- Areas of nearly vertical bedrock escarpments
- Areas that do not have rock outcrops
- Moderately steep and steep areas of Metonga and Sarona soils

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, very fine sandy loam, loam, or silt loam
- Areas of soils in which the lower layers are loam, loamy sand, gravelly loam, or gravelly loamy sand or the very channery or very flaggy analogs of loamy sand or sandy loam
- Areas where the bedrock is metamorphic rock
- Soils that have bedrock at a depth of less than 20 inches or between depths of 40 and 60 inches

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Metonga—moderately deep to hard igneous or metamorphic bedrock; Sarona—very deep
Permeability: Metonga—moderate in the upper part of the soil and very slow to rapid in the bedrock; Sarona—moderate or moderately rapid
Available water capacity: Metonga—low; Sarona—moderate
Organic matter content: Metonga—very high in the organic layer and moderately low or moderate in the mineral surface layer; Sarona—moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Rock outcrop—generally unsuited; Metonga and Sarona—suited
Major management concerns: Metonga—equipment limitation, windthrow hazard, plant competition; Sarona—equipment limitation, plant competition
Management considerations:
- The selection of log landing sites is limited in areas of the Metonga and Sarona soils that have slopes of more than about 6 percent. Landings can be established in the less sloping areas or on suitable nearly level or gently sloping adjacent or included soils.
- In areas of the Metonga soil, hard bedrock limits the depth of cuts and interferes with the construction of haul roads and log landings.

• Bedrock outcrops and escarpments severely restrict the movement of logging equipment. The careful location of logging roads is necessary.
• In areas of the Metonga and Sarona soils, ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow in areas of the Metonga soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition in areas of the Metonga and Sarona soils can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Rock outcrop—unsuited; Metonga—moderately well suited; Sarona—well suited
Major management concerns: Metonga—water erosion, soil blowing, droughtiness, nutrient and pesticide loss; Sarona—water erosion, soil blowing, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing in areas of the Metonga and Sarona soils.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields on the Metonga soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Metonga and Sarona soils by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the rock outcrops

Septic tank absorption fields

Severity of soil limitations or suitability: Rock outcrop—unsuited; Metonga—severe; Sarona—moderate
Major restrictive features: Metonga—restricted permeability, slope, depth to rock; Sarona—restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Rock outcrop—unsuited; Metonga and Sarona—moderately well suited
Major management concerns: Metonga—slope, depth to rock, water erosion, soil blowing; Sarona—slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In areas of the Metonga and Sarona soils, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling. The underlying hard bedrock, however, limits the depth of cuts in areas of the Metonga soil. The bedrock can be excavated by blasting or using suitable power equipment.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas of the Sarona soil, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Dwellings with basements

Suitability: Rock outcrop—unsuited; Metonga—poorly suited; Sarona—moderately well suited
Major management concerns: Metonga—slope, depth to rock, water erosion, soil blowing; Sarona—slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In areas of the Metonga and Sarona soils, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling. The underlying hard bedrock, however, limits the depth of cuts in areas of the Metonga soil. The bedrock can be excavated by blasting or using suitable power equipment.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas of the Sarona soil, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: Rock outcrop—not assigned; Metonga—3D (sugar maple); Sarona—3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: AQVib or AVVib

RmD—Rock outcrop-Metonga-Sarona complex, 15 to 35 percent slopes

Setting

Landform: Moraines
Landscape position: Convex summits and side slopes
Shape of areas: Round, long and narrow, or irregular
Size of areas: 10 to 200 acres

Representative Profile

Rock outcrop

Type of material: Exposed granite bedrock

Metonga

Surface layer:
0 to 1 inch—dark brown, very friable fine sandy loam

Subsurface layer:
1 to 2 inches—brown, very friable fine sandy loam

Subsoil:
2 to 15 inches—dark reddish brown and reddish brown, friable fine sandy loam
15 to 35 inches—brown, friable gravelly sandy loam

Bedrock:
35 inches—granite

Sarona

Organic layer:
0 to 1 inch—black, very friable mucky peat

Mineral surface layer:
1 to 2 inches—dark brown, very friable fine sandy loam

Subsurface layer:
2 to 3 inches—brown, very friable fine sandy loam

Subsoil:
3 to 16 inches—dark reddish brown and reddish brown, very friable fine sandy loam
16 to 40 inches—brown, friable sandy loam

Substratum:
40 to 60 inches—dark brown, friable gravelly sandy loam

Composition

Rock outcrop: 35 to 45 percent
Metonga soil and similar inclusions: 25 to 35 percent
Sarona soil and similar inclusions: 15 to 25 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Ellwood soils, which have silty upper layers underlain by loamy, silty, or clayey glacial till
- Padus soils and the somewhat excessively drained Pence soils, which are underlain by sandy or sandy and gravelly glacial outwash
- Rousseau soils and the excessively drained Vilas soils, which are sandy throughout
- Areas of stratified sandy, loamy, and silty deposits
- Areas of wet soils in depressions
- Soils that have stones or boulders on the surface
- Areas where the bedrock is weathered and can be excavated with hand tools
- Areas of nearly vertical bedrock escarpments
- Areas that do not have rock outcrops
- Gently sloping or sloping areas of Metonga and Sarona soils or areas of Metonga and Sarona soils that have slopes of more than 35 percent

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, very fine sandy loam, loam, or silt loam
- Areas of soils in which the lower layers are loam, loamy sand, gravelly loam, gravelly loamy sand, or the very channery or very flaggy analogs of sandy loam or loamy sand
- Areas where the bedrock is metamorphic rock
- Soils that have bedrock at a depth of less than 20 inches or between depths of 40 and 60 inches

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Metonga—moderately deep to hard igneous or metamorphic bedrock; Sarona—very deep
Permeability: Metonga—moderate in the upper part of the soil and very slow to rapid in the bedrock; Sarona—moderate or moderately rapid
Available water capacity: Metonga—low; Sarona—moderate
Organic matter content: Metonga—moderately low or moderate in the surface layer; Sarona—very high in the organic layer and moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Rock outcrop—generally unsuited; Metonga and Sarona—suited

Major management concerns: Metonga—equipment limitation, erosion hazard, windthrow hazard, plant competition; Sarona—equipment limitation, erosion hazard, plant competition

Management considerations:

• The selection of log landing sites is limited in areas of the Metonga and Sarona soils. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.

• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed in areas of the Metonga and Sarona soils.

• Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.

• In areas of the Metonga soil, hard bedrock limits the depth of cuts and interferes with the construction of haul roads and log landings.

• Bedrock outcrops and escarpments severely restrict the movement of logging equipment. The careful location of logging roads is necessary.

• In areas of the Metonga and Sarona soils, ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.

• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion in areas of the Metonga and Sarona soils.

• Windthrow in areas of the Metonga soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.

• Plant competition in areas of the Metonga and Sarona soils can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Rock outcrop—unsuited; Metonga—poorly suited; Sarona—moderately well suited

Major management concerns: Metonga—water erosion, soil blowing, droughtiness, nutrient and pesticide loss; Sarona—water erosion, soil blowing, nutrient and pesticide loss

Management considerations:

• The steeper areas of the Metonga and Sarona soils generally are limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants reduces the hazards of water erosion and soil blowing.

• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.

• Forage yields on the Metonga soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.

• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.

• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Metonga and Sarona soils by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the rock outcrops, the slope, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations or suitability: Rock outcrop—unsuited; Metonga and Sarona—severe

Major restrictive features: Metonga—restricted permeability, slope, depth to rock; Sarona—restricted permeability, slope

Management considerations:

• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Rock outcrop—unsuited; Metonga and Sarona—poorly suited in the less sloping areas and generally unsuited in other areas

Major management concerns: Metonga—slope, depth to rock, water erosion, soil blowing; Sarona—slope, water erosion, soil blowing, caving of cutbanks

Management considerations:

• Onsite investigation is needed.

• In the less sloping areas of the Metonga and Sarona soils, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling. The underlying hard bedrock, however, limits the depth of cuts in areas of the Metonga soil. The bedrock can be excavated by blasting or using suitable power equipment.

• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.

• In excavated or cut and fill areas of the Sarona soil, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Dwellings with basements

Suitability: Rock outcrop—unsuited; Metonga—generally unsuited because of the slope and the depth to rock; Sarona—poorly suited in the less sloping areas and generally unsuited in other areas
Major management concerns: Sarona—slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas of the Sarona soil, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas of the Sarona soil, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: Rock outcrop—not assigned; Metonga and Sarona—3R (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: AQVib or AVVib

RsB—Rousseau loamy fine sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, moraines, and glacial lake plains
Landscape position: Toeslopes, side slopes, and linear and slightly convex summits
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Representative Profile

Surface layer:
0 to 3 inches—very dark gray, very friable loamy fine sand

Subsurface layer:
3 to 6 inches—brown, very friable loamy fine sand

Subsoil:
6 to 12 inches—dark brown, very friable loamy fine sand
12 to 36 inches—brown, very friable fine sand

Substratum:
36 to 60 inches—yellowish brown, loose fine sand

Composition

Rousseau soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Annalake soils, which have more silt and clay than the Rousseau soil
• The moderately well drained Croswell soils in the lower landscape positions
• The excessively drained Vilas soils
• Soils that have stratified sandy, loamy, and silty deposits in the subsoil and substratum
• Areas of moderately well drained soils
• Sloping areas of Rousseau soils

Similar inclusions:
• Areas of soils in which the upper layers are fine sand, very fine sand, loamy sand, loamy very fine sand, or fine sandy loam
• Soils that have a substratum of sand or stratified sand and gravelly sand
• Areas of eroded soils

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Moderately low in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Plant competition
Management considerations:
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.

• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
• Proper irrigation scheduling helps to minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.

Pasture

Suitability: Well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—soil blowing; dwellings with basements—soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 5A (quaking aspen)
Primary forest habitat type: PMV
Secondary forest habitat type: AQV

RsC—Rousseau loamy fine sand, 6 to 15 percent slopes

Setting

Landform: Outwash plains, moraines, and glacial lake plains
Landscape position: Side slopes
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Representative Profile

Surface layer:
0 to 3 inches—black, very friable loamy fine sand

Subsurface layer:
3 to 7 inches—brown, very friable loamy fine sand

Subsoil:
7 to 10 inches—dark brown, very friable loamy fine sand
10 to 27 inches—brown and strong brown, very friable fine sand

Substratum:
27 to 60 inches—brown, loose fine sand

Composition

Rousseau soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Annalake soils, which have more silt and clay than the Rousseau soil
• The excessively drained Vilas soils
• Soils that have stratified sandy, loamy, and silty deposits in the subsoil and substratum
• Areas of moderately well drained soils
• Areas of wet soils in depressions
• Gently sloping or moderately steep areas of Rousseau soils

Similar inclusions:
• Areas of soils in which the upper layers are fine sand, very fine sand, loamy sand, loamy very fine sand, or fine sandy loam

- Soils that have a substratum of sand or stratified sand and gravelly sand
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Moderately low in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
- Onsite investigation is needed.
- Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
- Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
- In excavated or cut and fill areas, stabilizing or

sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 5A (quaking aspen)
Primary forest habitat type: PMV
Secondary forest habitat type: AQV

SaB—Sarona fine sandy loam, 1 to 6 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Shoulders and linear and slightly convex summits
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 1,000 acres

Representative Profile

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 3 inches—brown, friable fine sandy loam

Subsoil:
3 to 17 inches—brown, friable fine sandy loam
17 to 29 inches—brown, friable fine sandy loam and brown, friable sandy loam
29 to 66 inches—dark reddish brown, friable gravelly sandy loam and brown, friable gravelly loamy sand

Substratum:
66 to 73 inches—reddish brown, friable gravelly sandy loam

Composition

Sarona soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Padus soils and the somewhat excessively drained Pence soils, which are underlain by sandy or sandy and gravelly glacial outwash
• The excessively drained Sayner and Vilas soils, which are sandy throughout
• Somewhat poorly drained areas in depressions and drainageways
• Areas of moderately well drained soils
• Areas of soils in which the lower layers are clay loam or silty clay loam
• Areas of stratified sandy, loamy, and silty deposits
• Soils that have firm layers in the subsoil
• Soils that have bedrock within a depth of 60 inches
• Areas of Sarona soils that are not stony or that are bouldery
• Sloping areas of Sarona soils

Similar inclusions:
• Areas of soils in which the upper layers are sandy loam, very fine sandy loam, loam, silt loam, or loamy fine sand
• Areas of soils in which the lower layers are loamy sand, sandy loam, loam, or gravelly loam

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate or moderately rapid
Available water capacity: Moderate
Organic matter content: Very high in the organic layer; moderately low or moderate in the mineral surface layer
Percent of surface covered by stones: About 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited in areas where surface stones have been removed; poorly suited in other areas
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of

soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are somewhat limited during dry years by the restricted available water capacity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
• Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Soil blowing, rock fragments
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Stones on the surface may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Moderate
Major restrictive features: Restricted permeability
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—water erosion, soil blowing; dwellings with basements—water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs in very stony areas; IIe in areas that are not stony
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: AQVib or AVVib

SaC—Sarona fine sandy loam, 6 to 15 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 200 acres

Representative Profile

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 2 inches—black, very friable fine sandy loam

Subsurface layer:
2 to 3 inches—brown, very friable fine sandy loam

Subsoil:
3 to 17 inches—dark brown and brown, friable fine sandy loam
17 to 21 inches—brown, friable fine sandy loam
21 to 61 inches—brown, friable gravelly loamy sand and brown, friable gravelly sandy loam

Substratum:
61 to 80 inches—reddish brown, friable gravelly sandy loam

Composition

Sarona soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Padus soils and the somewhat excessively drained Pence soils, which are underlain by sandy or sandy and gravelly glacial outwash
• The excessively drained Sayner and Vilas soils, which are sandy throughout
• Areas of soils in which the lower layers are clay loam or silty clay loam
• Areas of wet soils in depressions

- Areas of stratified sandy, loamy, and silty deposits
- Soils that have firm layers in the subsoil
- Soils that have bedrock within a depth of 60 inches
- Areas of Sarona soils that are not stony or that are bouldery
- Gently sloping or moderately steep areas of Sarona soils

Similar inclusions:
- Areas of soils in which the upper layers are loamy fine sand, sandy loam, very fine sandy loam, loam, or silt loam
- Areas of soils in which the lower layers are loamy sand, sandy loam, loam, or gravelly loam

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate or moderately rapid
Available water capacity: Moderate
Organic matter content: Very high in the organic layer; moderately low or moderate in the mineral surface layer
Percent of surface covered by stones: About 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited in areas where surface stones have been removed; generally unsuited in other areas
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are somewhat limited during dry years by the restricted available water capacity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
- Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, nutrient and pesticide loss, rock fragments
Management considerations:
- Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Stones on the surface may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Moderate
Major restrictive features: Restricted permeability, slope
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs in very stony areas; IIIe in areas that are not stony
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: AQVib or AVVib

SaD—Sarona fine sandy loam, 15 to 25 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 150 acres

Representative Profile

Surface layer:
0 to 2 inches—very dark brown, very friable fine sandy loam

Subsurface layer:
2 to 4 inches—brown, very friable fine sandy loam

Subsoil:
4 to 21 inches—dark brown and brown, friable fine sandy loam
21 to 25 inches—brown, very friable loamy sand
25 to 60 inches—brown, friable gravelly loamy sand and brown, friable gravelly sandy loam

Substratum:
60 to 65 inches—brown, friable gravelly sandy loam

Composition

Sarona soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Padus soils and the somewhat excessively drained Pence soils, which are underlain by sandy or sandy and gravelly outwash
• The excessively drained Sayner and Vilas soils, which are sandy throughout
• Areas of soils in which the lower layers are clay loam or silty clay loam
• Areas of wet soils in depressions
• Areas of stratified sandy, loamy, and silty deposits
• Soils that have firm layers in the subsoil
• Soils that have bedrock within a depth of 60 inches
• Areas of Sarona soils that are not stony or that are bouldery
• Gently sloping, sloping, or steep areas of Sarona soils

Similar inclusions:
• Areas of soils in which the upper layers are loamy fine sand, sandy loam, very fine sandy loam, loam, or silt loam
• Areas of soils in which the lower layers are loamy sand, sandy loam, loam, or gravelly loam

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate or moderately rapid
Available water capacity: Moderate
Organic matter content: Moderately low or moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting the seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.

• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, nutrient and pesticide loss, rock fragments
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Stones on the surface may interfere with the use of machinery.

Cropland

Suitability: Generally unsuited because of surface stones, the slope, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe in very stony areas; VIe in areas that are not stony
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: AQVib or AVVib

SdB—Sarona-Padus complex, 0 to 6 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Shoulders and linear and slightly convex summits
Slope range: Sarona—1 to 6 percent; Padus—0 to 6 percent
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 150 acres

Representative Profile

Sarona

Surface layer:
0 to 2 inches—dark brown, very friable fine sandy loam

Subsurface layer:
2 to 4 inches—brown, very friable fine sandy loam

Subsoil:
4 to 14 inches—dark brown and brown, friable fine sandy loam
14 to 17 inches—brown, friable fine sandy loam
17 to 63 inches—brown, friable gravelly loamy sand and brown, friable gravelly sandy loam

Substratum:
63 to 70 inches—brown, friable gravelly sandy loam

Padus

Surface layer:
0 to 2 inches—dark brown, friable sandy loam

Subsurface layer:
2 to 5 inches—brown, friable sandy loam

Subsoil:
5 to 34 inches—dark brown and brown, friable sandy loam

Substratum:
34 to 60 inches—strong brown, stratified sand and gravelly coarse sand

Composition

Sarona soil and similar inclusions: 55 to 65 percent
Padus soil and similar inclusions: 20 to 30 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Pence soils, which have loamy upper layers less than 20 inches thick underlain by sandy and gravelly glacial outwash
- Rousseau soils and the excessively drained Sayner and Vilas soils, which are sandy throughout
- Areas of wet soils in depressions
- Areas of Sarona soils in which the lower layers are clay loam or silty clay loam
- Areas of moderately well drained soils
- Soils that have firm layers in the subsoil
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have bedrock within a depth of 60 inches
- Areas of bouldery soils
- Sloping areas of Sarona and Padus soils

Similar inclusions:
- Areas of soils in which the upper layers are loamy fine sand, very fine sandy loam, loam, or silt loam
- Areas of Sarona soils in which the lower layers are loamy sand, sandy loam, loam, or gravelly loam

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Sarona—moderate or moderately rapid; Padus—moderate in the upper part and rapid or very rapid in the substratum
Available water capacity: Sarona—moderate; Padus—low or moderate
Organic matter content: Moderately low or moderate in the surface layer
Percent of surface covered by stones: Sarona—about 0.1 to 3.0 percent; Padus—none

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited in areas where surface stones have been removed; poorly suited in other areas
Major management concerns: Sarona—water erosion, soil blowing, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments; Padus—water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting in areas of the Sarona soil.
- Some areas of the Sarona soil have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Sarona—soil blowing, rock fragments; Padus—water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and

legumes reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields on the Padus soil are limited during most years in areas where the available water capacity is restricted. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Padus soil by reducing runoff losses to lakes and streams.
• Stones on the surface of the Sarona soil may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Sarona—moderate; Padus—severe
Major restrictive features: Sarona—restricted permeability; Padus—poor filtering capacity
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—water erosion, soil blowing; dwellings with basements—water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs in very stony areas; IIe in areas that are not stony
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD

SdC—Sarona-Padus complex, 6 to 15 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 200 acres

Representative Profile

Sarona

Surface layer:
0 to 1 inch—dark brown, very friable fine sandy loam

Subsurface layer:
1 to 2 inches—brown, very friable fine sandy loam

Subsoil:
2 to 18 inches—dark brown and brown, friable fine sandy loam
18 to 21 inches—brown, friable fine sandy loam
21 to 55 inches—brown, friable gravelly loamy sand and brown, friable gravelly sandy loam

Substratum:
55 to 60 inches—brown gravelly sandy loam

Padus

Surface layer:
0 to 1 inch—very dark brown, friable sandy loam

Subsurface layer:
1 to 3 inches—brown, friable sandy loam

Next layer:
3 to 33 inches—brown and dark brown, friable sandy loam

Substratum:
33 to 60 inches—yellowish brown and light yellowish brown, loose, stratified sand and gravelly coarse sand

Composition

Sarona soil and similar inclusions: 50 to 60 percent
Padus soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Pence soils,

which have loamy upper layers less than 20 inches thick underlain by sandy and gravelly glacial outwash
• Rousseau soils and the excessively drained Sayner and Vilas soils, which are sandy throughout
• Areas of wet soils in depressions
• Areas of Sarona soils in which the lower layers are clay loam or silty clay loam
• Areas of moderately well drained soils
• Soils that have firm layers in the subsoil
• Areas of stratified sandy, loamy, and silty deposits
• Soils that have bedrock within a depth of 60 inches
• Areas of bouldery soils
• Gently sloping or moderately steep areas of Padus and Sarona soils

Similar inclusions:
• Areas of soils in which the upper layers are loamy fine sand, very fine sandy loam, loam, or silt loam
• Areas of Sarona soils in which the lower layers are loamy sand, sandy loam, loam, or gravelly loam

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Sarona—moderate or moderately rapid; Padus—moderate in the upper part and rapid or very rapid in the substratum
Available water capacity: Sarona—moderate; Padus—low or moderate
Organic matter content: Moderately low or moderate in the surface layer
Percent of surface covered by stones: Sarona—about 0.1 to 3.0 percent; Padus—none

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited in areas where surface stones have been removed; generally unsuited in other areas
Major management concerns: Sarona—water erosion, soil blowing, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments; Padus—water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting in areas of the Sarona soil.
• Some areas of the Sarona soil have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Sarona—water erosion, soil blowing, nutrient and pesticide loss, rock fragments; Padus—water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and

legumes reduces the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Forage yields on the Padus soil are limited during most years in areas where the available water capacity is restricted. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Stones on the surface of the Sarona soil may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Sarona—moderate; Padus—severe
Major restrictive features: Sarona—restricted permeability, slope; Padus—poor filtering capacity, slope
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
- Onsite investigation is needed.
- Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
- Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs in very stony areas; IIIe in areas that are not stony
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD

SdD—Sarona-Padus complex, 15 to 30 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 50 acres

Representative Profile

Sarona

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 3 inches—dark brown, very friable fine sandy loam

Subsurface layer:
3 to 5 inches—brown, very friable fine sandy loam

Subsoil:
5 to 18 inches—brown, friable fine sandy loam
18 to 54 inches—brown, friable gravelly sandy loam and brown, friable gravelly loamy sand

Substratum:
54 to 61 inches—brown, friable gravelly sandy loam

Padus

Surface layer:
0 to 1 inch—dark brown, very friable sandy loam

Subsurface layer:
1 to 2 inches—brown, very friable sandy loam

Subsoil:
2 to 14 inches—dark brown and brown, friable sandy loam
14 to 25 inches—brown, friable sandy loam
25 to 30 inches—strong brown, very friable gravelly loamy sand

Substratum:
30 to 60 inches—yellowish brown, loose, stratified sand and gravelly coarse sand

Composition

Sarona soil and similar inclusions: 45 to 55 percent
Padus soil and similar inclusions: 30 to 40 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Pence soils, which have loamy upper layers less than 20 inches thick underlain by sandy and gravelly glacial outwash
- Rousseau soils and the excessively drained Sayner and Vilas soils, which are sandy throughout
- Areas of wet soils in depressions
- Areas of Sarona soils in which the lower layers are clay loam or silty clay loam
- Soils that have firm layers in the subsoil
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have bedrock within a depth of 60 inches
- Areas of bouldery soils
- Gently sloping or sloping areas of Sarona and Padus soils or areas of Sarona and Padus soils that have slopes of more than 30 percent

Similar inclusions:
- Areas of soils in which the upper layers are loamy fine sand, very fine sandy loam, loam, or silt loam
- Areas of Sarona soils in which the lower layers are loamy sand, sandy loam, loam, or gravelly loam

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Sarona—moderate or moderately rapid; Padus—moderate in the upper part and rapid or very rapid in the substratum
Available water capacity: Sarona—moderate; Padus—low or moderate
Organic matter content: Sarona—very high in the organic layer and moderately low or moderate in the mineral surface layer; Padus—moderately low or moderate in the surface layer
Percent of surface covered by stones: Sarona—about 0.1 to 3.0 percent; Padus—none

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard, plant competition
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
- Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Poorly suited
Major management concerns: Sarona—water erosion, soil blowing, nutrient and pesticide loss, rock fragments; Padus—water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants reduces the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Forage yields on the Padus soil are limited during most years in areas where the available water capacity is restricted. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Stones on the surface of the Sarona soil may interfere with the use of machinery.

Cropland

Suitability: Generally unsuited because of surface stones, the slope, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Sarona—restricted permeability, slope; Padus—poor filtering capacity, slope
Management considerations:
- Onsite investigation is needed. The design of

absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe in very stony areas; VIe in areas that are not stony
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: ATD

SlB—Sarona-Vilas complex, 0 to 6 percent slopes, very stony

Setting

Landform: Moraines
Landscape position: Shoulders and linear and slightly convex summits
Slope range: Sarona—1 to 6 percent; Vilas—0 to 6 percent
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 200 acres

Representative Profile

Sarona

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 2 inches—dark brown, very friable fine sandy loam

Subsurface layer:
2 to 3 inches—brown, very friable fine sandy loam

Subsoil:
3 to 16 inches—dark brown and brown, very friable fine sandy loam
16 to 30 inches—brown, friable fine sandy loam and reddish brown, friable gravelly sandy loam
30 to 61 inches—brown, friable gravelly loamy sand and reddish brown, friable gravelly sandy loam

Substratum:
61 to 70 inches—reddish brown, friable gravelly sandy loam

Vilas

Surface layer:
0 to 2 inches—black, very friable loamy sand

Subsurface layer:
2 to 5 inches—brown, very friable loamy sand

Subsoil:
5 to 15 inches—dark brown and brown, very friable loamy sand
15 to 27 inches—strong brown, very friable sand

Substratum:
27 to 60 inches—yellowish brown, loose sand

Composition

Sarona soil and similar inclusions: 55 to 65 percent
Vilas soil and similar inclusions: 20 to 30 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
• The well drained Padus soils and the somewhat excessively drained Pence soils, which have loamy upper layers underlain by sandy or sandy and gravelly glacial outwash
• Areas of moderately well drained soils
• Areas of stratified sandy, loamy, and silty deposits
• Areas of Sarona soils in which the lower layers are clay loam or silty clay loam
• Areas of Sarona soils that have firm layers in the subsoil
• Areas of wet soils in depressions
• Soils that have bedrock within a depth of 60 inches
• Sloping areas of Sarona and Vilas soils

Similar inclusions:
• Areas of soils in which the upper layers are loamy fine sand, sandy loam, very fine sandy loam, or loam
• Areas of Sarona soils in which the lower layers are sandy loam, loamy sand, loam, or gravelly loam

Soil Properties and Qualities

Drainage class: Sarona—well drained; Vilas—excessively drained

Depth class: Very deep
Permeability: Sarona—moderate or moderately rapid; Vilas—rapid
Available water capacity: Sarona—moderate; Vilas—low
Organic matter content: Sarona—very high in the organic layer and moderately low or moderate in the mineral surface layer; Vilas—moderately low or moderate in the surface layer
Percent of surface covered by stones: Sarona—about 0.1 to 3.0 percent; Vilas—none

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Sarona—equipment limitation, plant competition; Vilas—no major soil limitations or hazards
Management considerations:
• In areas of the Sarona soil, ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition in areas of the Sarona soil can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited in areas where surface stones have been removed; generally unsuited in other areas
Major management concerns: Sarona—water erosion, soil blowing, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments; Vilas—soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas of the Sarona soil.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Sarona soil by reducing runoff losses to lakes and streams.
• Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season reduce leaching losses in areas of the Vilas soil and protect the quality of ground water.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting in areas of the Sarona soil.
• Some areas of the Sarona soil have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Sarona—soil blowing, rock fragments; Vilas—soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Forage yields on the Vilas soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates reduce leaching losses in areas of the Vilas soil and protect the quality of ground water.
• Stones on the surface of the Sarona soil may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Sarona—moderate; Vilas—severe
Major restrictive features: Sarona—restricted permeability; Vilas—poor filtering capacity
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Well suited
Major management concerns: Sarona—water erosion, soil blowing; Vilas—soil blowing
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.

Dwellings with basements

Suitability: Well suited
Major management concerns: Sarona—water erosion, soil blowing, caving of cutbanks; Vilas—soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs in very stony areas; IIIe in areas that are not stony
Woodland ordination symbol: Sarona—3L (sugar maple); Vilas—6A (red pine)
Primary forest habitat type: AVVib
Secondary forest habitat type: AQVib or AQV

SlC—Sarona-Vilas complex, 6 to 15 percent slopes, very stony

Setting

Landform: Moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 150 acres

Representative Profile

Sarona

Surface layer:
0 to 2 inches—dark brown, very friable fine sandy loam

Subsurface layer:
2 to 3 inches—brown, very friable fine sandy loam

Subsoil:
3 to 16 inches—dark brown and brown, friable fine sandy loam
16 to 59 inches—brown, friable gravelly loamy sand and brown, friable gravelly sandy loam

Substratum:
59 to 65 inches—brown, friable gravelly sandy loam

Vilas

Surface layer:
0 to 2 inches—dark brown, very friable loamy sand

Subsurface layer:
2 to 3 inches—brown, very friable loamy sand

Subsoil:
3 to 13 inches—dark brown and brown, very friable loamy sand
13 to 19 inches—yellowish brown, very friable sand

Substratum:
19 to 60 inches—yellowish brown and brownish yellow, loose sand

Composition

Sarona soil and similar inclusions: 50 to 60 percent
Vilas soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
• The well drained Padus soils and the somewhat excessively drained Pence soils, which have loamy upper layers underlain by sandy or sandy and gravelly glacial outwash
• Areas of moderately well drained soils
• Areas of stratified sandy, loamy, and silty deposits
• Areas of Sarona soils in which the lower layers are clay loam or silty clay loam
• Areas of Sarona soils that have firm layers in the subsoil
• Areas of wet soils in depressions
• Soils that have bedrock within a depth of 60 inches
• Gently sloping or moderately steep areas of Sarona and Vilas soils

Similar inclusions:
• Areas of soils in which the upper layers are loamy fine sand, sandy loam, very fine sandy loam, or loam
• Areas of Sarona soils in which the lower layers are loamy sand, sandy loam, loam, or gravelly loam

Soil Properties and Qualities

Drainage class: Sarona—well drained; Vilas—excessively drained
Depth class: Very deep

Permeability: Sarona—moderate or moderately rapid; Vilas—rapid
Available water capacity: Sarona—moderate; Vilas—low
Organic matter content: Moderately low or moderate in the surface layer
Percent of surface covered by stones: Sarona—about 0.1 to 3.0 percent; Vilas—none

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Sarona—equipment limitation, plant competition; Vilas—equipment limitation
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• In areas of the Sarona soil, ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition in areas of the Sarona soil can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Poorly suited in areas where surface stones have been removed; generally unsuited in other areas
Major management concerns: Sarona—water erosion, soil blowing, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments; Vilas—water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season reduce leaching losses in areas of the Vilas soil and protect the quality of ground water.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting in areas of the Sarona soil.
• Some areas of the Sarona soil have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Sarona—water erosion, soil blowing, nutrient and pesticide loss, rock fragments; Vilas—water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields on the Vilas soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates reduce leaching losses in areas of the Vilas soil and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Stones on the surface of the Sarona soil may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Sarona—moderate; Vilas—severe

Major restrictive features: Sarona—restricted permeability, slope; Vilas—poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs in very stony areas; IVe in areas that are not stony
Woodland ordination symbol: Sarona—3L (sugar maple); Vilas—6A (red pine)
Primary forest habitat type: AVVib
Secondary forest habitat type: AQVib or AQV

SlD—Sarona-Vilas complex, 15 to 30 percent slopes, very stony

Setting

Landform: Moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 100 acres

Representative Profile

Sarona

Organic layer:
0 to 1 inch—very dark brown, very friable mucky peat

Mineral surface layer:
1 to 2 inches—dark brown, very friable fine sandy loam

Subsurface layer:
2 to 3 inches—brown, very friable fine sandy loam

Subsoil:
3 to 17 inches—dark brown and brown, friable fine sandy loam
17 to 56 inches—brown, friable gravelly loamy sand and brown, friable gravelly sandy loam

Substratum:
56 to 61 inches—brown, friable gravelly sandy loam

Vilas

Surface layer:
0 to 1 inch—black, very friable loamy sand

Subsurface layer:
1 to 2 inches—brown, very friable loamy sand

Subsoil:
2 to 12 inches—dark brown and brown, very friable loamy sand
12 to 25 inches—strong brown, very friable sand

Substratum:
25 to 60 inches—brown, loose sand

Composition

Sarona soil and similar inclusions: 45 to 55 percent
Vilas soil and similar inclusions: 30 to 40 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
• The well drained Padus soils and the somewhat excessively drained Pence soils, which have loamy upper layers underlain by sandy or sandy and gravelly glacial outwash
• Areas of stratified sandy, loamy, and silty deposits
• Areas of Sarona soils in which the lower layers are clay loam or silty clay loam
• Areas of Sarona soils that have firm layers in the subsoil
• Areas of wet soils in depressions
• Soils that have bedrock within a depth of 60 inches
• Gently sloping or sloping areas of Sarona and Vilas soils or areas of Sarona and Vilas soils that have slopes of more than 30 percent

Similar inclusions:
• Areas of soils in which the upper layers are loamy fine sand, sandy loam, very fine sandy loam, or loam
• Areas of Sarona soils in which the lower layers are loamy sand, sandy loam, loam, or gravelly loam

Soil Properties and Qualities

Drainage class: Sarona—well drained; Vilas—excessively drained

Depth class: Very deep
Permeability: Sarona—moderate or moderately rapid; Vilas—rapid
Available water capacity: Sarona—moderate; Vilas—low
Organic matter content: Sarona—very high in the organic layer and moderately low or moderate in the mineral surface layer; Vilas—moderately low or moderate in the surface layer
Percent of surface covered by stones: Sarona—about 0.1 to 3.0 percent; Vilas—none

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Sarona—equipment limitation, erosion hazard, plant competition; Vilas—equipment limitation, erosion hazard
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special planting and harvesting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
• In areas of the Sarona soil, ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
• Plant competition in areas of the Sarona soil can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Poorly suited
Major management concerns: Sarona—water erosion, soil blowing, nutrient and pesticide loss, rock fragments; Vilas—water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields on the Vilas soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates reduce leaching losses in areas of the Vilas soil and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Some areas of the Sarona soil have stones on the surface. Unless they are removed, the stones interfere with tillage.

Cropland

Suitability: Generally unsuited because of surface stones, the slope, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Sarona—restricted permeability, slope; Vilas—poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe in very stony areas;

VIe in areas where surface stones have been removed
Woodland ordination symbol: Sarona—3R (sugar maple); Vilas—6R (red pine)
Primary forest habitat type: AVVib
Secondary forest habitat type: AQVib or AQV

SnB—Sayner loamy sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, stream terraces, kames, and eskers
Landscape position: Toeslopes, side slopes, and linear and slightly convex summits
Shape of areas: Irregular
Size of areas: 10 to 150 acres

Representative Profile

Surface layer:
0 to 2 inches—very dark grayish brown, very friable loamy sand

Subsurface layer:
2 to 4 inches—brown, very friable loamy sand

Subsoil:
4 to 18 inches—dark brown and brown, very friable loamy sand
18 to 30 inches—brown, very friable sand

Substratum:
30 to 60 inches—strong brown and reddish yellow, loose gravelly sand

Composition

Sayner soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Padus soils and the somewhat excessively drained Pence soils, which have loamy upper layers
- Areas of stratified sandy and loamy deposits
- Soils that have strata or pockets of loamy sand or gravelly loamy sand in the substratum
- Areas of moderately well drained soils
- Soils that have stones or boulders on the surface
- Sloping areas of Sayner soils

Similar inclusions:
- Areas of soils in which the upper layers are sand, gravelly sand, or gravelly loamy sand
- Soils that contain little or no gravel in the substratum
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Excessively drained
Depth class: Very deep
Permeability: Moderately rapid or rapid in the upper part and rapid or very rapid in the substratum
Available water capacity: Low
Organic matter content: Moderately low in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: No major soil limitations or hazards

Cropland

Suitability: Poorly suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
- Proper irrigation scheduling helps to minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
- Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years by the

restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—soil blowing; dwellings with basements—soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 7A (red pine)
Primary forest habitat type: AQV
Secondary forest habitat type: PMV

SnC—Sayner loamy sand, 6 to 15 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 80 acres

Representative Profile

Organic layer:
0 to 3 inches—black, very friable mucky peat

Mineral surface layer:
3 to 4 inches—dark reddish gray, very friable loamy sand

Subsoil:
4 to 17 inches—dark reddish brown and reddish brown, very friable loamy sand
17 to 27 inches—brown, very friable gravelly sand

Substratum:
27 to 63 inches—strong brown, loose gravelly sand

Composition

Sayner soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Padus soils and the somewhat excessively drained Pence soils, which have loamy upper layers
• Areas of stratified sandy and loamy deposits
• Soils that have strata or pockets of loamy sand or gravelly loamy sand in the substratum
• Areas of wet soils in depressions
• Soils that have stones or boulders on the surface
• Gently sloping or moderately steep areas of Sayner soils

Similar inclusions:
• Areas of soils in which the upper layers are sand, gravelly sand, or gravelly loamy sand
• Soils that contain little or no gravel in the substratum
• Areas of eroded soils

Soil Properties and Qualities

Drainage class: Excessively drained
Depth class: Very deep
Permeability: Moderately rapid or rapid in the upper part and rapid or very rapid in the substratum
Available water capacity: Low
Organic matter content: Very high in the organic layer; moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.

Cropland

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 7A (red pine)
Primary forest habitat type: AQV
Secondary forest habitat type: PMV

SnD—Sayner loamy sand, 15 to 30 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 200 acres

Representative Profile

Organic mat:
0 to 1 inch—black, very friable mucky peat

Mineral surface layer:
1 to 4 inches—brown, very friable loamy sand

Subsoil:
4 to 17 inches—dark reddish brown and reddish brown, very friable loamy sand

Substratum:
17 to 61 inches—strong brown, loose gravelly sand

Composition

Sayner soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Pence soils, which have loamy upper layers
• Areas of stratified sandy and loamy deposits
• Soils that have strata or pockets of loamy sand or gravelly loamy sand in the substratum
• Areas of wet soils in depressions
• Soils that have stones or boulders on the surface
• Gently sloping or sloping areas of Sayner soils or areas of Sayner soils that have slopes of more than 30 percent

Similar inclusions:
• Areas of soils in which the upper layers are sand, gravelly sand, or gravelly loamy sand
• Soils that contain little or no gravel in the substratum
• Areas of eroded soils

Soil Properties and Qualities

Drainage class: Excessively drained
Depth class: Very deep
Permeability: Moderately rapid or rapid in the upper part and rapid or very rapid in the substratum
Available water capacity: Low
Organic matter content: Very high in the organic layer; moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.

Pasture

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of droughtiness, the slope, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks

Management considerations:
- Onsite investigation is needed.
- In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
- Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 7R (red pine)
Primary forest habitat type: AQV
Secondary forest habitat type: PMV

SoD—Soperton-Goodman silt loams, 15 to 35 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Long and narrow
Size of areas: 10 to 30 acres

Representative Profile

Soperton

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 3 inches—black, friable silt loam

Subsurface layer:
3 to 5 inches—brown, friable silt loam

Subsoil:
5 to 15 inches—dark brown and brown, friable silt loam
15 to 22 inches—brown, friable silt loam
22 to 42 inches—brown, firm sandy loam

Substratum:
42 to 61 inches—brown, friable gravelly loamy sand

Goodman

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 3 inches—black, friable silt loam

Subsurface layer:
3 to 6 inches—brown, friable silt loam

Subsoil:
6 to 19 inches—dark brown and brown, friable silt loam
19 to 27 inches—brown, friable silt loam
27 to 34 inches—brown, friable sandy loam

Substratum:
34 to 61 inches—brown gravelly loamy sand

Composition

Soperton soil and similar inclusions: 65 to 75 percent
Goodman soil and similar inclusions: 15 to 25 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Goodwit and Wabeno soils
- Padus and Stambaugh soils and the somewhat excessively drained Pence soils, all of which are underlain by sandy or sandy and gravelly glacial outwash
- Areas of stratified sandy, loamy, and silty deposits
- Areas of wet soils in depressions
- Areas of Soperton and Goodman soils that are not stony or that are bouldery
- Gently sloping or sloping areas of Soperton and Goodman soils or areas of Soperton and Goodman soils that have slopes of more than 35 percent

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
- Soils that have a substratum of loamy sand, sandy loam, or gravelly sandy loam
- Areas where the silty deposits are as much as 60 inches thick

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Soperton—moderately deep to a fragipan; Goodman—very deep
Permeability: Soperton—moderate in the upper part, slow in the fragipan, and moderate or moderately rapid in the substratum; Goodman—moderate in the upper part and moderate or moderately rapid in the lower part
Available water capacity: Soperton—low; Goodman—moderate or high
Organic matter content: Very high in the organic layer; moderate in the mineral surface layer

Percent of surface covered by stones: About 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Soperton—equipment limitation, erosion hazard, windthrow hazard, plant competition; Goodman—equipment limitation, erosion hazard, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
• Windthrow in areas of the Soperton soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Poorly suited
Major management concerns: Soperton—water erosion, droughtiness, nutrient and pesticide loss, rock fragments; Goodman—water erosion, nutrient and pesticide loss, rock fragments
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Forage yields on the Soperton soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Stones on the surface may interfere with the use of machinery.

Cropland

Suitability: Generally unsuited because of surface stones, the slope, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe in very stony areas; VIe in areas that are not stony
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: AViO

StC—Stambaugh silt loam, 6 to 15 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Side slopes

Shape of areas: Irregular or long and narrow
Size of areas: 10 to 400 acres

Representative Profile

Organic layer:
0 to 1 inch—very dark grayish brown, very friable peat

Mineral surface layer:
1 to 4 inches—black, friable silt loam

Subsurface layer:
4 to 6 inches—grayish brown, friable silt loam

Subsoil:
6 to 17 inches—dark brown and brown, friable silt loam
17 to 33 inches—brown, friable silt loam

Substratum:
33 to 61 inches—dark yellowish brown, loose, stratified sand and gravelly coarse sand

Composition

Stambaugh soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Fence soils, which are underlain by stratified lacustrine deposits
- The somewhat excessively drained Pence soils, which have loamy layers 10 to 20 inches thick
- The moderately well drained Vanzile soils in the less sloping areas
- Areas of wet soils in depressions
- Soils that have stones or boulders on the surface
- Gently sloping or moderately steep areas of Stambaugh soils

Similar inclusions:
- Areas of soils in which the upper layers are fine sandy loam, very fine sandy loam, sandy loam, or loam
- Soils in which the substratum is at a depth of more than 40 inches
- Areas of eroded soils
- Soils that contain little or no gravel in the substratum

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderately slow in the upper part and very rapid in the substratum
Available water capacity: Moderate
Organic matter content: Very high in the organic layer; moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, poor tilth
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Crop yields are somewhat limited during dry years by the restricted available water capacity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, nutrient and pesticide loss

Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
- Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability, slope
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, caving of cutbanks
Management considerations:
- Onsite investigation is needed.
- Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
- Seeding and mulching exposed areas can help to control water erosion during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO

StD—Stambaugh silt loam, 15 to 25 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 20 acres

Representative Profile

Organic layer:
0 to 1 inch—black, very friable peat

Mineral surface layer:
1 to 3 inches—black, friable silt loam

Subsurface layer:
3 to 4 inches—grayish brown, friable silt loam

Subsoil:
4 to 16 inches—dark brown, friable silt loam
16 to 30 inches—brown, friable silt loam

Substratum:
30 to 61 inches—brown and dark yellowish brown, loose, stratified sand and gravelly coarse sand

Composition

Stambaugh soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Pence soils, which have loamy upper layers 10 to 20 inches thick
- Areas of wet soils in depressions
- Soils that have stones or boulders on the surface
- Areas of stratified sandy, loamy, and silty deposits
- Gently sloping, sloping, or steep areas of Stambaugh soils

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
- Soils in which the substratum is at a depth of more than 40 inches
- Areas of eroded soils
- Soils that contain little or no gravel in the substratum

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderately slow in the upper part and very rapid in the substratum
Available water capacity: Moderate
Organic matter content: Very high in the organic layer; moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard, plant competition

Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, nutrient and pesticide loss
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the slope and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Slope, water erosion, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: AViO

SuC—Stambaugh-Goodman silt loams, 6 to 15 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 40 acres

Representative Profile

Stambaugh

Organic layer:
0 to 1 inch—black, very friable peat

Mineral surface layer:
1 to 3 inches—brown, friable silt loam

Subsoil:
3 to 13 inches—dark brown and brown, friable silt loam
13 to 35 inches—brown, friable silt loam

Substratum:
35 to 61 inches—brown, loose, stratified sand and gravelly coarse sand

Goodman

Surface layer:
0 to 2 inches—black, friable silt loam

Subsurface layer:
2 to 3 inches—brown, friable silt loam

Subsoil:
3 to 29 inches—brown, friable silt loam
29 to 37 inches—brown, friable gravelly sandy loam

Substratum:
37 to 60 inches—brown, friable gravelly sandy loam

Composition

Stambaugh soil and similar inclusions: 55 to 65 percent
Goodman soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Pence soils, which have loamy upper layers less than 20 inches thick underlain by sandy and gravelly glacial outwash
- Areas of stratified sandy, loamy, and silty deposits
- Areas of moderately well drained soils
- Areas of bouldery soils
- Areas of wet soils in depressions
- Gently sloping or moderately steep areas of Goodman and Stambaugh soils

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
- Areas in which the silty deposits are as much as 60 inches thick
- Areas of Goodman soils in which the substratum is sandy loam, loamy sand, or gravelly loamy sand

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Stambaugh—moderately slow in the upper part and very rapid in the substratum; Goodman—moderate in the upper part and moderate or moderately rapid in the lower part
Available water capacity: Stambaugh—moderate; Goodman—moderate or high
Organic matter content: Stambaugh—very high in the organic layer and moderately low or moderate in the mineral surface layer; Goodman—moderate in the surface layer
Percent of surface covered by stones: Stambaugh—none; Goodman—about 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited in areas where surface stones have been removed; generally unsuited in other areas
Major management concerns: Stambaugh—water erosion, droughtiness, nutrient and pesticide loss, poor tilth; Goodman—water erosion, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Crop yields are somewhat limited during dry years in areas where the available water capacity is restricted.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
- Some areas of the Goodman soil have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Stambaugh—water erosion, nutrient and pesticide loss; Goodman—water erosion, nutrient and pesticide loss, rock fragments

Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
- Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Stones on the surface of the Goodman soil may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Stambaugh—severe; Goodman—moderate
Major restrictive features: Stambaugh—poor filtering capacity, restricted permeability, slope; Goodman—restricted permeability, slope
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, caving of cutbanks
Management considerations:
- Onsite investigation is needed.
- Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
- Seeding and mulching exposed areas can help to control water erosion during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs in very stony areas; IIIe in areas that are not stony
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO

SuD—Stambaugh-Goodman silt loams, 15 to 35 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Slope range: Stambaugh—15 to 25 percent; Goodman—15 to 35 percent
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 40 acres

Representative Profile

Stambaugh

Surface layer:
0 to 1 inch—very dark brown, friable silt loam

Subsurface layer:
1 to 2 inches—grayish brown, friable silt loam

Subsoil:
2 to 28 inches—brown, friable silt loam

Substratum:
28 to 60 inches—yellowish brown, loose, stratified sand and gravelly coarse sand

Goodman

Surface layer:
0 to 1 inch—very dark brown, friable silt loam

Subsurface layer:
1 to 2 inches—brown, friable silt loam

Subsoil:
2 to 27 inches—dark brown and brown, friable silt loam
27 to 35 inches—brown, friable sandy loam

Substratum:
35 to 60 inches—brown gravelly sandy loam

Composition

Stambaugh soil and similar inclusions: 60 to 70 percent
Goodman soil and similar inclusions: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Pence soils, which have loamy upper layers less than 20 inches thick underlain by sandy and gravelly glacial outwash
- Areas of stratified sandy, loamy, and silty deposits
- Areas of bouldery soils
- Areas of moderately well drained soils
- Areas of wet soils in depressions
- Gently sloping or sloping areas of Stambaugh and Goodman soils, areas of Goodman soils that have slopes of more than 35 percent, or areas of Stambaugh soils that have slopes of more than 25 percent

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam

• Areas in which the silty deposits are as much as 60 inches thick
• Areas of Goodman soils in which the substratum is sandy loam, loamy sand, or gravelly loamy sand

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Stambaugh—moderately slow in the upper part and very rapid in the substratum; Goodman—moderate in the upper part and moderate or moderately rapid in the lower part
Available water capacity: Stambaugh—moderate; Goodman—moderate or high
Organic matter content: Stambaugh—moderately low or moderate in the surface layer; Goodman—moderate in the surface layer
Percent of surface covered by stones: Stambaugh—none; Goodman—about 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting the seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Poorly suited
Major management concerns: Stambaugh—water erosion, nutrient and pesticide loss; Goodman—water erosion, nutrient and pesticide loss, rock fragments
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Stones on the surface of the Goodman soil may interfere with the use of machinery.

Cropland

Suitability: Generally unsuited because of surface stones, the slope, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Stambaugh—poor filtering capacity, restricted permeability, slope; Goodman—restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Stambaugh—poorly suited; Goodman—poorly suited in the less sloping areas and generally unsuited in other areas
Major management concerns: Slope, water erosion, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe in very stony areas; VIe in areas that are not stony
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: AViO

TpA—Tipler sandy loam, 0 to 3 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, toeslopes, and footslopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 50 acres

Representative Profile

Surface layer:
0 to 2 inches—very dark grayish brown, friable sandy loam

Subsurface layer:
2 to 4 inches—brown, friable sandy loam

Subsoil:
4 to 15 inches—dark reddish brown and dark brown, friable sandy loam
15 to 22 inches—brown, friable sandy loam
22 to 31 inches—brown, mottled, friable sandy loam

Substratum:
31 to 60 inches—brown, mottled, loose, stratified sand and gravelly coarse sand

Composition

Tipler soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- Manitowish soils and the somewhat excessively drained Pence soils, which have thinner loamy deposits than those of the Tipler soil
- The well drained Padus soils in the higher landscape positions
- The somewhat poorly drained Worcester soils in depressions
- Areas of stratified sandy, loamy, and silty deposits
- Soils that have stones or boulders on the surface
- Soils that have bedrock within a depth of 60 inches
- Areas of Tipler soils that have slopes of 3 to 6 percent

Similar inclusions:
- Areas of soils in which the upper layers are fine sandy loam, very fine sandy loam, loam, or silt loam
- Soils that have a substratum of sand or coarse sand or the gravelly, very gravelly, cobbly, or very cobbly analogs of these textures
- Soils that have a perched seasonal high water table
- Soils in which the substratum is at a depth of more than 40 inches

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Apparent, 2.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderate in the upper part and rapid or very rapid in the substratum
Available water capacity: Low or moderate
Organic matter content: Moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited
Major management concerns: Soil blowing, droughtiness
Management considerations:
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.

Pasture

Suitability: Well suited
Major management concerns: Soil blowing, droughtiness
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.

• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years in areas where the available water capacity is restricted. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Well suited
Major management concerns: Soil blowing
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Moderately well suited
Major management concerns: Wetness, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIs
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM

VaB—Vanzile silt loam, 0 to 6 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, toeslopes, and footslopes
Shape of areas: Irregular
Size of areas: 10 to 250 acres

Representative Profile

Surface layer:
0 to 1 inch—black, friable silt loam

Subsurface layer:
1 to 4 inches—brown, friable silt loam

Subsoil:
4 to 13 inches—dark brown and brown, friable silt loam
13 to 17 inches—brown, friable silt loam
17 to 33 inches—brown, mottled, friable silt loam

Substratum:
33 to 60 inches—dark yellowish brown, loose, stratified sand and gravelly coarse sand

Composition

Vanzile soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Fence soils, which are underlain by stratified lacustrine deposits
• The somewhat excessively drained Pence soils, which have loamy upper layers 10 to 20 inches thick
• Areas of somewhat poorly drained soils
• Areas of well drained soils
• Soils that have stones or boulders on the surface
• Soils that have an apparent seasonal high water table 2.5 to 3.5 feet below the surface
• Sloping areas of Vanzile soils

Similar inclusions:
• Areas of soils in which the upper layers are fine sandy loam, very fine sandy loam, sandy loam, or loam
• Soils in which the substratum is at a depth of more than 40 inches
• Areas of eroded soils
• Soils that contain little or no gravel in the substratum

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: More than 6 feet below the surface; mottled zone of seasonal saturation 1.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderate or moderately slow in the upper part and rapid or very rapid in the substratum
Available water capacity: Moderate

Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, poor tilth
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Crop yields are somewhat limited during dry years by the restricted available water capacity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—water erosion; dwellings with basements—water erosion, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO

VgB—Vanzile-Goodwit silt loams, 0 to 6 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Shoulders and linear and slightly convex summits
Slope range: Vanzile—0 to 6 percent; Goodwit—1 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Representative Profile

Vanzile

Surface layer:
0 to 2 inches—black, friable silt loam

Subsurface layer:
2 to 4 inches—brown, friable silt loam

Subsoil:
4 to 20 inches—brown, friable silt loam
20 to 37 inches—brown, mottled, friable silt loam

Substratum:
37 to 60 inches—yellowish brown, loose, stratified sand and gravelly coarse sand

Goodwit

Surface layer:
0 to 1 inch—black, friable silt loam

Subsurface layer:
1 to 2 inches—brown, friable silt loam

Subsoil:
2 to 21 inches—brown, friable silt loam
21 to 35 inches—brown, mottled, friable silt loam
35 to 38 inches—brown, friable sandy loam

Substratum:
38 to 60 inches—brown, friable gravelly sandy loam

Composition

Vanzile soil and similar inclusions: 45 to 55 percent
Goodwit soil and similar inclusions: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Mudlake soils in depressions and drainageways
- The somewhat excessively drained Pence soils, which have loamy upper layers less than 20 inches thick underlain by sandy and gravelly glacial outwash
- Areas of stratified sandy, loamy, and silty deposits
- Areas of bouldery soils
- Areas of well drained soils
- Sloping areas of Vanzile and Goodwit soils

Similar inclusions:
- Areas of soils in which the upper layers are fine sandy loam, very fine sandy loam, sandy loam, or loam
- Areas in which the silty deposits are as much as 60 inches thick
- Areas of Goodwit soils in which the substratum is sandy loam, loamy sand, or gravelly loamy sand

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Vanzile—more than 6 feet below the surface (mottled zone of seasonal saturation 1.5 to 3.5 feet below the surface); Goodwit—perched, 2.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Vanzile—moderate or moderately slow in the upper part and rapid or very rapid in the substratum; Goodwit—moderate
Available water capacity: Vanzile—moderate; Goodwit—moderate or high
Organic matter content: Vanzile—moderately low or moderate in the surface layer; Goodwit—moderate in the surface layer
Percent of surface covered by stones: Vanzile—none; Goodwit—about 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited in areas where surface stones have been removed; poorly suited in other areas
Major management concerns: Vanzile—water erosion, droughtiness, nutrient and pesticide loss, poor tilth; Goodwit—water erosion, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Crop yields are somewhat limited during dry years in areas where the available water capacity is restricted.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the

quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
• Some areas of the Goodwit soil have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Vanzile—water erosion, nutrient and pesticide loss; Goodwit—rock fragments
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion in areas of the Vanzile soil.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water in areas of the Vanzile soil by reducing runoff losses to lakes and streams.
• Stones on the surface of the Goodwit soil may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Vanzile—poor filtering capacity, restricted permeability; Goodwit—restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Well suited
Major management concerns: Water erosion
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.

Dwellings with basements

Suitability: Vanzile—well suited; Goodwit—moderately well suited
Major management concerns: Vanzile—water erosion, caving of cutbanks; Goodwit—wetness, water erosion, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness in areas of the Goodwit soil.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs in very stony areas; IIe in areas that are not stony
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO

VsB—Vilas loamy sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, stream terraces, kames, and moraines
Landscape position: Toeslopes, side slopes, and linear and slightly convex summits
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 300 acres

Representative Profile

Organic layer:
0 to 2 inches—very dark grayish brown, very friable peat

Mineral surface layer:
2 to 4 inches—black, very friable loamy sand

Subsurface layer:
4 to 5 inches—brown, very friable loamy sand

Subsoil:
5 to 19 inches—dark reddish brown and brown, very friable loamy sand
19 to 37 inches—strong brown, very friable sand

Substratum:
37 to 62 inches—yellowish brown, loose sand

Composition

Vilas soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils in the lower landscape positions

- The well drained Rousseau soils, which contain more fine sand than the Vilas soil
- Soils that have strata or pockets of loamy sand, loamy fine sand, loamy very fine sand, fine sandy loam, very fine sandy loam, or silt loam in the substratum
- Soils that have stones or boulders on the surface
- Soils that have cemented layers in the subsoil
- Sloping areas of Vilas soils

Similar inclusions:
- Areas of soils in which the upper layers are sand, loamy fine sand, fine sand, sandy loam, or fine sandy loam
- Soils that have strata of gravelly sand in the substratum
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Excessively drained
Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Very high in the organic layer; moderately low or low in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: No major soil limitations or hazards

Cropland

Suitability: Poorly suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
- Proper irrigation scheduling helps to minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
- Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—soil blowing; dwellings with basements—soil blowing, caving of cutbanks
Management considerations:
- Onsite investigation is needed.
- Seeding and mulching exposed areas can help to control soil blowing during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 6A (red pine)
Primary forest habitat type: AQV

VsC—Vilas loamy sand, 6 to 15 percent slopes

Setting

Landform: Outwash plains, stream terraces, kames, and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 200 acres

Representative Profile

Surface layer:
0 to 2 inches—dark brown, very friable loamy sand

Subsurface layer:
2 to 3 inches—brown, very friable loamy sand

Subsoil:
3 to 26 inches—dark reddish brown and reddish brown, very friable loamy sand

Substratum:
26 to 60 inches—light brown, loose sand

Composition

Vilas soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Rousseau soils, which contain more fine sand than the Vilas soil
- Soils that have strata or pockets of loamy sand, loamy fine sand, loamy very fine sand, fine sandy loam, very fine sandy loam, or silt loam in the substratum
- Areas of wet soils in depressions
- Soils that have stones or boulders on the surface
- Soils that have cemented layers in the subsoil
- Gently sloping or moderately steep areas of Vilas soils

Similar inclusions:
- Areas of soils in which the upper layers are sand, loamy fine sand, fine sand, sandy loam, or fine sandy loam
- Soils that have strata of gravelly sand in the substratum
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Excessively drained
Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.

Cropland

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss

Management considerations:
- Establishing a high-quality cover of grasses and legumes reduces the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
- Onsite investigation is needed.
- Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
- Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 6A (red pine)
Primary forest habitat type: AQV

VsD—Vilas loamy sand, 15 to 30 percent slopes

Setting

Landform: Outwash plains, stream terraces, kames, and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 500 acres

Representative Profile

Organic layer:
0 to 1 inch—black, very friable peat

Mineral surface layer:
1 to 3 inches—brown, very friable loamy sand

Subsoil:
3 to 20 inches—dark reddish brown and reddish brown, very friable loamy sand
20 to 32 inches—brown, very friable sand

Substratum:
32 to 61 inches—strong brown, loose sand

Composition

Vilas soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Rousseau soils, which contain more fine sand than the Vilas soil
- Soils that have strata or pockets of loamy sand, loamy fine sand, loamy very fine sand, fine sandy loam, very fine sandy loam, or silt loam in the substratum
- Areas of wet soils in depressions
- Soils that have stones or boulders on the surface
- Soils that have cemented layers in the subsoil
- Gently sloping or sloping areas of Vilas soils or areas of Vilas soils that have slopes of more than 30 percent

Similar inclusions:
- Areas of soils in which the upper layers are sand, loamy fine sand, fine sand, sandy loam, or fine sandy loam
- Soils that have strata of gravelly sand in the substratum
- Areas of eroded soils

Soil Properties and Qualities

Drainage class: Excessively drained

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Very high in the organic layer; moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour help to control erosion and minimize equipment limitations.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.

Pasture

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants reduces the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the slope, droughtiness, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, soil blowing, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 6R (red pine)
Primary forest habitat type: AQV

W—Water

Setting

Landform: Mostly stream terraces, outwash plains, and moraines
Shape of areas: Round or irregular
Size of areas: 2 to 520 acres

General Description

• This map unit consists of areas that typically contain water throughout the year.

Composition

Water: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
- Shoreline areas and sandbars exposed during periods of low water
- Areas of floating aquatic vegetation

Use and Management

Land uses: Dominant use—wetland wildlife habitat; other uses—water-based recreation

Interpretive Groups

Land capability classification: Not assigned
Woodland ordination symbol: Not assigned
Primary forest habitat type: Not assigned

WaC—Wabeno-Goodman silt loams, 6 to 15 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Long and narrow
Size of areas: 10 to 40 acres

Representative Profile

Wabeno

Organic layer:
0 to 2 inches—black, very friable mucky peat

Mineral surface layer:
2 to 4 inches—brown, friable silt loam

Subsoil:
4 to 16 inches—brown, friable silt loam
16 to 22 inches—brown, mottled, friable silt loam
22 to 60 inches—brown, firm sandy loam

Substratum:
60 to 62 inches—brown, friable loamy sand

Goodman

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 2 inches—dark brown, friable silt loam

Subsurface layer:
2 to 4 inches—brown, friable silt loam

Subsoil:
4 to 13 inches—brown, friable silt loam
13 to 39 inches—brown and reddish brown, friable silt loam
39 to 47 inches—reddish brown, friable gravelly sandy loam

Substratum:
47 to 61 inches—reddish brown, friable gravelly sandy loam

Composition

Wabeno soil and similar inclusions: 55 to 65 percent
Goodman soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
- Padus and Stambaugh soils and the somewhat excessively drained Pence soils, all of which are underlain by sandy or sandy and gravelly glacial outwash
- Areas of wet soils in depressions
- Areas of Wabeno and Goodman soils that are not stony or that are bouldery
- Gently sloping or moderately steep areas of Wabeno and Goodman soils

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
- Soils that have a substratum of sandy loam or gravelly loamy sand
- Areas in which the silty deposits are as much as 60 inches thick

Soil Properties and Qualities

Drainage class: Wabeno—moderately well drained; Goodman—well drained
Seasonal high water table: Wabeno—perched, 1.5 to 3.0 feet below the surface; Goodman—more than 6 feet below the surface
Depth class: Wabeno—moderately deep to a fragipan; Goodman—very deep
Permeability: Wabeno—moderate in the upper layers, slow in the fragipan, and moderate in the substratum; Goodman—moderate in the upper part and moderate or moderately rapid in the lower part
Available water capacity: Wabeno—low; Goodman—moderate or high
Organic matter content: Wabeno—very high in the organic layer and moderately low or moderate in the mineral surface layer; Goodman—very high in the organic layer and moderate in the mineral surface layer
Percent of surface covered by stones: About 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Wabeno—equipment limitation, windthrow hazard, plant competition; Goodman—equipment limitation, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow in areas of the Wabeno soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited in areas where surface stones have been removed; generally unsuited in other areas
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Crop yields are somewhat limited during dry years in areas where the available water capacity is restricted. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
• Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Wabeno—water erosion, droughtiness, nutrient and pesticide loss, rock fragments; Goodman—water erosion, nutrient and pesticide loss, rock fragments
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Forage yields on the Wabeno soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Stones on the surface may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Wabeno—severe; Goodman—moderate
Major restrictive features: Wabeno—restricted permeability, wetness, slope; Goodman—restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Moderately well suited
Major management concerns: Wabeno—wetness, slope, water erosion, caving of cutbanks; Goodman—slope, water erosion, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness in areas of the Wabeno soil.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.

• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Dwellings with basements

Suitability: Wabeno—poorly suited; Goodman—moderately well suited
Major management concerns: Wabeno—wetness, slope, water erosion, caving of cutbanks; Goodman—slope, water erosion, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness in areas of the Wabeno soil.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs in very stony areas; IIIe in areas that are not stony
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO

WbB—Wabeno-Goodwit silt loams, 1 to 6 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Shoulders and linear and slightly convex summits
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 100 acres

Representative Profile

Wabeno

Organic layer:
0 to 3 inches—black, very friable muck

Mineral surface layer:
3 to 5 inches—brown, friable silt loam

Subsoil:
5 to 11 inches—brown, friable silt loam
11 to 15 inches—brown, friable silt
15 to 24 inches—dark brown and brown, mottled, friable silt loam
24 to 55 inches—dark brown, firm gravelly sandy loam

Substratum:
55 to 63 inches—dark brown, friable gravelly sandy loam

Goodwit

Surface layer:
0 to 1 inch—black, friable silt loam

Subsurface layer:
1 to 3 inches—brown, friable silt loam

Subsoil:
3 to 21 inches—brown, friable silt loam
21 to 38 inches—brown, mottled, friable silt loam
38 to 45 inches—brown, friable gravelly sandy loam

Substratum:
45 to 60 inches—brown gravelly sandy loam

Composition

Wabeno soil and similar inclusions: 45 to 55 percent
Goodwit soil and similar inclusions: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Fence soils, which are underlain by stratified lacustrine deposits
• The well drained Goodman soils
• The somewhat poorly drained Mudlake soils and the poorly drained Capitola soils in depressions
• The well drained Padus and Stambaugh soils and Vanzile soils, all of which are underlain by sandy or sandy and gravelly glacial outwash
• Areas of Wabeno and Goodwit soils that are not stony or that are bouldery
• Sloping areas of Wabeno and Goodwit soils

Similar inclusions:
• Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
• Soils that have a substratum of sandy loam, loamy sand, or gravelly loamy sand
• Areas in which the silty deposits are as much as 60 inches thick

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Wabeno—perched, 1.5 to 3.0 feet below the surface; Goodwit—perched, 2.5 to 3.5 feet below the surface
Depth class: Wabeno—moderately deep to a fragipan; Goodwit—very deep

Permeability: Wabeno—moderate in the upper part, slow in the fragipan, and moderate in the substratum; Goodwit—moderate
Available water capacity: Wabeno—low; Goodwit—moderate or high
Organic matter content: Wabeno—very high in the organic layer and moderately low or moderate in the mineral surface layer; Goodwit—moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Wabeno—equipment limitation, windthrow hazard, plant competition; Goodwit—equipment limitation, plant competition
Management considerations:
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow in areas of the Wabeno soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited in areas where surface stones have been removed; poorly suited in other areas
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Crop yields are somewhat limited during dry years in areas where the available water capacity is restricted.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
• Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Wabeno—droughtiness, rock fragments; Goodwit—rock fragments
Management considerations:
• Forage yields on the Wabeno soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Stones on the surface may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings without basements

Suitability: Wabeno—moderately well suited; Goodwit—well suited
Major management concerns: Wabeno—wetness, water erosion; Goodwit—water erosion
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness in areas of the Wabeno soil.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.

Dwellings with basements

Suitability: Wabeno—poorly suited; Goodwit—moderately well suited
Major management concerns: Wetness, water erosion, caving of cutbanks
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.

• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs in very stony areas; IIe in areas that are not stony
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO

WkB—Wakefield silt loam, 1 to 6 percent slopes, very stony

Setting

Landform: Moraines
Landscape position: Shoulders and linear and slightly convex summits
Shape of areas: Irregular or elongated
Size of areas: 5 to 350 acres

Representative Profile

Surface layer:
0 to 5 inches—dark reddish brown, friable silt loam

Subsurface layer:
5 to 6 inches—brown, friable silt loam

Subsoil:
6 to 16 inches—dark reddish brown, friable silt loam
16 to 27 inches—reddish brown, mottled, firm fine sandy loam and dark reddish brown, mottled, firm loam
27 to 50 inches—dark reddish brown, firm loam

Substratum:
50 to 60 inches—reddish brown, friable loam

Composition

Wakefield soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Goodwit soils, which do not have a fragipan and contain less silt and clay in the substratum than the Wakefield soil
• The well drained Padus and Stambaugh soils and Vanzile soils, all of which are underlain by sandy or sandy and gravelly glacial outwash
• Areas of somewhat poorly drained or poorly drained soils in depressions
• Soils that have sandy and gravelly strata in the lower part of the subsoil
• Areas of Wakefield soils that are not stony or that are bouldery
• Areas of well drained soils
• Soils that have bedrock within a depth of 60 inches
• Sloping areas of Wakefield soils

Similar inclusions:
• Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
• Areas of soils in which the lower layers are loamy sand, sandy loam, or fine sandy loam or the gravelly analogs of these textures or are clay loam or gravelly loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Perched, 1.0 foot to 1.5 feet below the surface
Depth class: Shallow to a fragipan
Permeability: Moderate in the upper part, very slow in the fragipan, and moderate in the lower part
Available water capacity: Low
Organic matter content: Moderately low or moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality can be minimized by using harvest methods that leave some mature trees to provide shade and protection and by planting vigorous

nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Well suited in areas where surface stones have been removed; poorly suited in other areas
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
• Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Droughtiness, rock fragments
Management considerations:
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Stones on the surface may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Wetness, water erosion
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.

Interpretive Groups

Land capability classification: IVs in very stony areas; IIe in areas that are not stony
Woodland ordination symbol: 3W (sugar maple)
Primary forest habitat type: AViO
Secondary forest habitat type: ATD

WkC—Wakefield silt loam, 6 to 15 percent slopes, very stony

Setting

Landform: Moraines
Landscape position: Side slopes
Shape of areas: Irregular or elongated
Size of areas: 5 to 200 acres

Representative Profile

Surface layer:
0 to 4 inches—dark brown, friable silt loam

Subsurface layer:
4 to 5 inches—brown, friable silt loam

Subsoil:
5 to 12 inches—dark brown, friable silt loam
12 to 14 inches—reddish brown, firm fine sandy loam
14 to 28 inches—dark reddish brown, mottled, firm loam and reddish brown, mottled, firm fine sandy loam
28 to 40 inches—dark reddish brown, firm loam

Substratum:
40 to 60 inches—reddish brown, friable loam

Composition

Wakefield soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- Goodwit soils and the well drained Goodman soils, which do not have a fragipan and contain less silt and clay in the substratum than the Wakefield soil
- The well drained Padus and Stambaugh soils, which are underlain by sandy or sandy and gravelly glacial outwash
- Areas of somewhat poorly drained or poorly drained soils in depressions
- Soils that have sandy and gravelly strata in the lower part of the subsoil
- Areas of Wakefield soils that are not stony or that are bouldery
- Areas of well drained soils
- Soils that have bedrock within a depth of 60 inches
- Gently sloping or moderately steep areas of Wakefield soils

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
- Areas of soils in which the lower layers are loamy sand, sandy loam, or fine sandy loam or the gravelly analogs of these textures or are clay loam or gravelly loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Perched, 1.0 foot to 1.5 feet below the surface
Depth class: Shallow to a fragipan
Permeability: Moderate in the upper part, very slow in the fragipan, and moderate in the lower part
Available water capacity: Low
Organic matter content: Moderately low or moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0 percent

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
- Seedling mortality can be minimized by using harvest methods that leave some mature trees to provide shade and protection and by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Moderately well suited in areas where surface stones have been removed; generally unsuited in other areas
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
- Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, rock fragments

Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
- Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
- Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Stones on the surface may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness, slope
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Wetness, slope, water erosion
Management considerations:
- Onsite investigation is needed.
- Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
- Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
- Seeding and mulching exposed areas can help to control water erosion during and after construction.

Interpretive Groups

Land capability classification: VIs in very stony areas; IIIe in areas that are not stony
Woodland ordination symbol: 3W (sugar maple)
Primary forest habitat type: AViO
Secondary forest habitat type: ATD

WrA—Worcester sandy loam, 0 to 3 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular
Size of areas: 5 to 45 acres

Representative Profile

Organic layer:
0 to 2 inches—black, very friable muck

Mineral surface layer:
2 to 5 inches—reddish gray, very friable sandy loam

Subsoil:
5 to 9 inches—dark reddish brown, very friable sandy loam
9 to 30 inches—brown, mottled, friable sandy loam
30 to 34 inches—brown, mottled, very friable gravelly loamy sand

Substratum:
34 to 62 inches—dark yellowish brown, mottled, loose, stratified sand and gravelly coarse sand

Composition

Worcester soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The poorly drained Minocqua soils in the lower depressions and drainageways
- The well drained Padus soils and the moderately well drained Tipler soils in convex areas
- Areas that are subject to flooding
- Soils that have stones or boulders on the surface
- Soils that have pockets of loamy sand, sandy loam, gravelly loamy sand, or gravelly sandy loam in the substratum

Similar inclusions:
- Areas of soils in which the upper layers are loamy sand, loamy fine sand, fine sandy loam, very fine sandy loam, loam, or silt loam
- Soils in which the substratum is at a depth of 40 to 60 inches

• Areas in which the loamy deposits are less than 24 inches thick
• Soils that have a substratum of sand or coarse sand or the gravelly or very gravelly analogs of these textures

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 2.0 feet below the surface
Depth class: Very deep
Permeability: Moderate in the upper part and rapid or very rapid in the lower part
Available water capacity: Low or moderate
Organic matter content: Very high in the organic layer; moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Well suited
Major management concerns: Soil blowing, droughtiness, wetness, low strength
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• If the water table is lowered, crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity of the soil and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.
• Low soil strength limits the use of farm equipment to periods when the soil is not wet.

Pasture

Suitability: Well suited
Major management concerns: Soil blowing, low strength
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Low strength restricts the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Dwellings without basements—wetness, soil blowing; dwellings with basements—wetness, soil blowing, caving of cutbanks

Management considerations:

- Onsite investigation is needed.
- Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
- Seeding and mulching exposed areas can help to control soil blowing during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 2W (red maple)
Primary forest habitat type: TMC

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils as woodland; for crops and pasture; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the suitability and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Woodland Management and Productivity

Forest resources are of major importance in Florence County. In 1983, about 82 percent of the land area in the county was forested (USDA, 1984). Approximately 96 percent of the forested acreage was in commercial forest. About 47 percent of commercial forests are publicly owned.

The composition of commercial forest land by stand-size class in 1983 was about 34 percent sawtimber, 46 percent poletimber, and 18 percent saplings and seedlings. About 2 percent was nonstocked. The sawtimber was mostly sugar maple, eastern hemlock, and aspen and smaller numbers of yellow birch, American basswood, red pine, white spruce, northern whitecedar, and eastern white pine. Poletimber, saplings, and seedlings were mostly aspen and sugar maple, but birch, American basswood, eastern hemlock, fir, pine, spruce, and other species were also included.

The composition of forest land by timber type in 1983 was about 40 percent sugar maple-hemlock-basswood-yellow birch, 37 percent aspen-birch, 4 percent pine, 13 percent spruce-fir and other conifers, 3 percent oak, and 1 percent elm-ash and other lowland hardwoods. About 2 percent was nonstocked.

In 1983, the volume of growing stock was 284,632,000 cubic feet, the annual growth was 7,850,000 cubic feet, and the annual removal was 6,145,000 cubic feet. For sawtimber, the volume was 676,752,000 board feet, the annual growth was 25,888,000 board feet, and the annual removal was 14,220,000 board feet.

Northern hardwoods are dominant in the upland areas of Florence County. Sugar maple is the dominant tree species in some areas of Goodwit, Padus, Pence, Vanzile, and Wabeno soils, but also northern hardwoods also grow in the stands. The major species are sugar maple, American basswood, yellow birch, northern red oak, and eastern hemlock (fig. 5). Species that occur as minor components in stands are balsam fir, red maple, American elm, black cherry, white ash, eastern white pine, and white spruce. Aspen and paper birch stands are common but are often replaced by sugar maple and other northern hardwoods.

Sugar maple and northern red oak are the dominant species in most timber stands in areas of Annalake, Ellwood, Goodwit, Iosco, Padus, Sarona,

Figure 5.—Mixed northern hardwoods in an area of Wabeno-Goodwit silt loams, 1 to 6 percent slopes, very stony.

and Vilas soils. American basswood, eastern hemlock, yellow birch, white ash, paper birch, red pine, eastern white pine, red maple, white spruce, aspen, balsam fir, and northern pin oak also occur.

Pine and aspen are dominant in some areas of Pence and Vilas soils, but other species include jack pine, red pine, eastern white pine, aspen, paper birch, red maple, northern red oak, northern pin oak, white spruce, and balsam fir. Many pine plantations are in areas of these soils (fig. 6).

Species in areas of Metonga and Ishpeming soils include sugar maple, yellow birch, red maple, aspen, paper birch, balsam fir, northern red oak, northern pin oak, American basswood, eastern hemlock, eastern white pine, red pine, and jack pine.

Wooded swamps are mostly balsam fir, northern whitecedar, and black ash. Red maple, American elm, aspen, paper birch, and yellow birch are in some stands. In the bogs that are scattered throughout the county, the species are typically limited to stunted black spruce and tamarack.

Management of the different soils for forest products varies, but it should be governed by the species in the stand, the suitability of the soils for the

species, and the objectives of the landowner. Current management alternatives include a selection harvest approach for sawlogs or an even-aged approach for sawlog or pulpwood production. Even-aged management that favors pine species and northern red oak is desirable if the stand includes significant amounts of these species. Management should include controlling water erosion, planting trees where natural regeneration is unreliable, controlling vegetation that competes with natural or planted regeneration, improving the seedling survival rate, minimizing windthrow on the wetter sites, harvesting in a timely manner, controlling damage by insects and diseases, removing cull trees and undesirable species, maintaining optimum basal area, overcoming soil-related equipment limitations, preventing woodland fires, and excluding livestock from the woodland.

Water erosion can occur as a result of site preparation and cutting if the soil is exposed along roads, skid trails, and fire lanes and on landings.

Figure 6.—A plantation of mixed pines in an area of Vilas loamy sand, 0 to 6 percent slopes. Thinning this plantation would provide pulpwood and permit the remaining trees to grow larger.

Burned areas also are subject to erosion. Erosion generally is a hazard on forest land if the slope is 15 percent or more. It is a problem in the steeper areas of such soils as Goodman, Padus, and Vilas soils. Excessive soil loss can be prevented by using proper logging techniques, planting trees, and establishing roads and trails on the contour; yarding uphill with a cable; removing water with water bars, out-sloping road surfaces, and culverts; preventing fires; and excluding livestock from the woodland. Drop structures may be needed to stabilize highly erodible areas. Seeding areas exposed by logging activities helps to establish a protective cover of vegetation.

Soil strength can limit the use of equipment on upland soils during the spring thaw and other excessively wet periods. Upland soils, such as Fence, Goodman, Goodwit, Metonga, Padus, Sarona, Soperton, Stambaugh, Tipler, and Wabeno soils, have low strength during wet periods. Ruts can form if wheeled vehicles are used when these soils are wet (fig. 7). Deep ruts tend to restrict lateral drainage and result in damage to tree roots. Wheeled vehicles

Figure 7.—Ruts caused by the use of wheeled vehicles in an area of Padus sandy loam, 0 to 6 percent slopes. Ruts can form easily if wheeled forestry equipment is used during wet periods.

should be used only when the soil is dry or has a thick snow cover. Stabilizing landings and roads with gravel can help to prevent the damage caused by the repeated use of heavy equipment.

Soil wetness is the result of a high water table, flooding, or ponding. It causes seeding mortality, limits the use of equipment, results in the invasion or growth of undesirable plants following harvest, and increases the likelihood of windthrow by restricting the rooting depth of some tree species.

Seedling mortality is high in areas of poorly drained soils, such as Capitola, Kinross, and Minocqua soils. It can also be a problem in areas of somewhat poorly drained soils, such as Au Gres soils, and in areas where water ponds in the swales between cradle-knolls. The seedling survival rate can be improved by planting vigorous nursery stock on prepared ridges or on the crest of cradle-knolls. In areas where mechanical tree planters cannot be used because of wetness during the tree planting season, hand planting of trees is necessary if natural tree regeneration is unreliable.

The use of wheeled vehicles in areas of somewhat poorly drained, poorly drained, and very poorly drained soils is frequently limited to the dry summer months or to periods when the ground is frozen or snow cover is thick. In these areas, a gravel base for roads and landings can improve the ability of soils to withstand the repeated use of heavy equipment. Landings can also be established on suitable adjacent soils that are better drained. Providing adequate culverts for graveled roads helps to maintain the natural drainage system.

Trees are shallow rooted where the water table is near the surface, and they can be blown down during periods of strong winds. Using a harvest method that does not leave the remaining trees widely spaced, such as a shelter-wood cut, can minimize the windthrow of trees. This method of harvesting also helps to ensure natural regeneration of trees by controlling the extent of competing vegetation.

Plant competition is a problem on most of the woodland in the county because soil productivity is so high that undesirable plants grow when a harvest creates openings in the tree canopy. Competition from unwanted plants can delay or prevent natural regeneration of the desired tree species and hinder the establishment of planted trees. Plant competition is more severe on the wetter soils than on other soils. It can be controlled by using a method of selective cutting that maintains most of the tree canopy, by establishing the new forest soon after harvesting, or by removing the undesirable plants with herbicides. In areas where equipment can be used, the unwanted plants can be removed by machinery. Skidding may expose enough soil for adequate regeneration. Before trees are planted, site preparation by mechanical or chemical means generally is needed to control competing vegetation. Subsequent control of invading species may be needed on the more fertile soils, especially the wetter ones.

Slope and *rock outcrops* can limit the use of forestry equipment. Slope is a problem in areas where it is 15 percent or more. Bedrock outcrops also interfere with the use of equipment. Rock outcrop is common in areas of Ishpeming and Metonga soils (fig. 8). Trees should be planted by hand and yarded with a cable in areas where the slope or rock outcrop prohibits the use of equipment. Logging roads can be built on the contour. Roads and landings can be established in the less sloping areas.

Soil droughtiness can cause seedling mortality. The steeper slopes facing south or west are especially droughty because of high soil temperatures and evaporation rates. Seedling mortality can be minimized by using harvest methods that leave some mature trees to provide shade and protection and by planting vigorous nursery stock in the early spring when the soil is moist. Reinforcement planting may be needed on very dry sites.

Tables 5 and 6 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. Table 5 lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce in a pure stand under natural conditions. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *L*, low strength. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and L.

Figure 8.—Schist outcrop along State Highway 101.

In table 5, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed also are subject to erosion. Ratings of the erosion hazard are based on the percent of the slope and on the content of rock fragments in the surface layer. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture, depth to a seasonal

high water table, rock fragments in the upper 20 inches of the soil, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in 50 years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production. Additional information about these trees is available in the local office of the Natural Resources Conservation Service.

Table 6 gives information about operating forestry equipment in logging areas and along skid trails, on log landings, along haul roads, and in site preparation and planting, which includes row seeding. Limitations are given for the most limiting season. In Florence County the most limiting season generally is spring. The limitations can also apply, however, during other excessively wet periods, such as after a heavy rainfall. The preferred operating season is the period when the use of forestry equipment causes the least amount of soil damage. This period generally is when the soil is not too wet or when the ground is frozen.

In table 6, the equipment limitations reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland harvesting and regeneration activities. The chief characteristics and conditions considered in the ratings are soil wetness, the hazard of flooding, rock outcrops, stones and boulders on the surface, texture of the surface layer, slope, depth to hard bedrock, traffic-supporting capacity (or soil strength), and the potential for frost action. Soils that have a moderate or high content of silt have low strength in the extended spring thaw period and during extended periods of high rainfall. Ruts can form easily in areas of these soils during these wet periods.

The ratings of *slight, moderate,* or *severe* in the table are based on the use of conventional equipment and procedures. Special procedures or types of equipment can sometimes be utilized to reduce or overcome the site limitations. If wetness is a limitation, for example, the use of high flotation equipment may prevent the formation of ruts. Restrictions on the use of equipment indicate the need for choosing the right equipment to be used and the need for accurate timing of operations to avoid seasonal limitations. The cost of operations generally increases as the limitations become more severe. The ratings for log landings and haul roads can be used as a guide for establishing them in the least costly locations.

Logging areas and skid trails include areas where some or all of the trees are being cut. Generally, equipment traffic is least intensive in the logging areas. Skid trails, which generally are within the logging area,

are roads or trails over which the logs are dragged or hauled from the stump to a log landing. A rating of *slight* indicates that the use of conventional equipment is not normally restricted by the physical site conditions. A rating of *moderate* indicates that the use of equipment or season of use is restricted because of one or more soil factors. A rating of *severe* indicates that special equipment or techniques are needed to overcome the limitations or that the time of efficient operation is very limited.

Log landings are areas where logs are assembled for transportation (fig. 9). Wheeled equipment may be used more frequently in these areas than in any other areas affected by logging. Considerable soil compaction can be expected in these areas. Good areas for landings require little or no surface preparation or cutting and filling. A rating of *slight* indicates that the soil is a good site for landings and the area can readily be returned to forest use. A rating of *moderate* indicates that the season of use is somewhat limited or that such practices as grading, cutting, filling, or drainage are usually required to make the site suitable for a landing and returning the site to forest use is difficult. A rating of *severe* indicates that the season of use is very limited or that special or expensive techniques are needed to overcome the limitations. There may also be significant risk of environmental damage, which makes returning the area to forest use very difficult or impossible.

Haul roads are access roads leading from log landings to primary or surfaced roads. The haul roads serve as transportation routes for wheeled logging equipment. Generally, they are unpaved roads and are not graveled. The wetter soils and the silty upland soils, which are slippery and easily rutted during wet periods, commonly provide poor locations for haul

Figure 9.—A log landing in an area of Padus-Pence sandy loams, 0 to 6 percent slopes.

roads. A rating of *slight* indicates that no serious limitations affect the location, construction, and maintenance of haul roads or the season of use. A rating of *moderate* indicates some limitations, but the limitations can be overcome with routine construction techniques. A rating of *severe* indicates that it is difficult and expensive to establish and maintain haul roads on the soil or that the season of use may be severely restricted.

Site preparation and planting are the mechanized operations for establishing planted trees in an area. The ratings are based on limitations that affect the efficient use of equipment and the risk of damage to the site caused by the equipment. Operating techniques should not displace or remove topsoil from the site or create channels that concentrate storm runoff. A rating of *slight* indicates that no serious limitations affect site preparation and planting. A rating of *moderate* indicates that the site conditions prevent the efficient use of the equipment or that the site may be damaged by the equipment. A rating of *severe* indicates that special equipment or techniques, such as hand planting of trees, are needed to overcome the limitations.

Additional information about woodland management and productivity can be obtained from the Wisconsin Department of Natural Resources, the local office of the Natural Resources Conservation Service, or the Cooperative Extension Service.

Forest Habitat Types

John Kotar, senior research scientist, Department of Forestry, University of Wisconsin-Madison, helped prepare this section.

The forest habitat type system used in Florence County is derived from a field guide developed for northern Wisconsin (Kotar and others, 1988). The system of habitat classification is based on the concept that plants, including trees, normally occur in predictable patterns or communities and that these communities reflect differences in site characteristics, primarily the moisture content and fertility of the soils. A forest habitat type is an association of dominant tree and ground flora species in a climax plant community. It encompasses all soils capable of producing similar plant communities at climax, which is the stage in ecological development when the vegetative community becomes stable and perpetuates itself.

A habitat type can be identified during most stages of successional growth by examining the reproductive success of various tree species and by inspecting the ground flora, which becomes relatively stable soon after the establishment of a forest canopy. In a young forest, the patterns or associations of understory plants can be used to predict the dominant tree species in the climax forest.

The successional stages and trends also are predictable for the various habitat types. This predictability allows forest managers to make accurate prescriptions for manipulating vegetation based on the ecological potential of the soil rather than on the current forest cover type, which can vary depending largely on how the forest has been disturbed. Additional management implications for each habitat type are in the “Field Guide to Forest Habitat Types of Northern Wisconsin” (Kotar and others, 1988).

Habitat types have been determined for most of the soils in Florence County. They are specified at the end of each map unit description in the section “Detailed Soil Map Units.” Although soil map units do not coincide exactly with habitat types, there is a strong correlation between them. If more than one habitat type is associated with a detailed soil map unit, the habitat types are identified as primary and secondary. The primary habitat type is the one that is most common on the map unit. The secondary habitat type is less common. The assigned habitat types may be different in some small areas included in mapping. The following paragraphs provide brief descriptions of the habitat types in the county. The name of each habitat type is derived from the potential climax vegetation on a site. It represents a combination of tree species, which are listed first, and ground flora species. The descriptions provide information about the potential climax tree species and some of the common understory species.

AQV—Acer-Quercus/Vaccinium (Red Maple-Red Oak/Low Sweet Blueberry) habitat type. The presumed climax overstory of this habitat type is dominated by red maple and northern red oak and commonly includes some eastern white pine. Present stands are dominated almost entirely by early successional species, such as aspen, paper birch, jack pine, red pine, and eastern white pine.

The understory vegetation consists primarily of beaked hazelnut, brackenfern, blueberries, wild lily-of-the-valley, and large-leaved aster.

This habitat type is suitable for management of the native species, including pine, aspen, and paper birch. Of the hardwoods, only northern red oak and red maple are suitable for fiber production or wildlife habitat.

PMV—Pinus/Maianthemum-Vaccinium (White Pine/Wild Lily-of-the-Valley-Low Sweet Blueberry) habitat type. The presumed climax overstory of this

habitat type is dominated by eastern white pine, but it may include balsam fir, white spruce, red maple, or northern red oak as a second canopy.

Present stands are largely dominated by mixtures of jack pine, red pine, eastern white pine, aspen, red maple, and northern red oak. The understory vegetation is similar to that of the AQV habitat type, but the herb layer generally is better developed.

This habitat type is considered optimal for management of red pine or eastern white pine. Yields are nearly as high as those of the more mesic habitat types, but the potential for competition from hardwood species is much lower. Except for northern red oak, hardwoods are suitable only for fiber production or for wildlife habitat. The potential for production of aspen is very high.

AQVib—Acer-Quercus/Viburnum (Sugar Maple-Red Oak/Mapleleaf Viburnum) habitat type. The presumed climax species of this habitat type is dominated by sugar maple. The succession to sugar maple on logged-over sites, however, is less rapid than on other habitat types where this species is capable of growing. Present successional stands on AQVib are most commonly dominated by mixtures of northern red oak and red maple. Mixtures of aspen, paper birch, and eastern white pine also are common. Productivity potential is very high for eastern white pine and red pine; high for northern red oak, red maple, white ash, and American basswood; and moderate to low for sugar maple.

Characteristic understory species are mapleleaf viburnum, witch hazel, and pointed-leaved tick trefoil. Other common species include beaked hazelnut, hog peanut, large-leaved aster, and brackenfern.

ATM—Acer-Tsuga/Maianthemum (Sugar Maple-Hemlock/Wild Lily-of-the-Valley) habitat type. The presumed climax overstory of this habitat type is dominated by sugar maple, eastern hemlock, and yellow birch. Successional stages, however, can be very diverse because many native tree species grow well in areas of this habitat type. Management options generally are determined by the condition of current stands rather than by site limitations.

The diversity of understory species is relatively low. The most common species are wild lily-of-the-valley, wild sarsaparilla, large-leaved aster, and beaked hazelnut.

TMC—Tsuga/Maianthemum-Coptis (Hemlock/Wild Lily-of-the-Valley-Goldthread) habitat type. The presumed climax overstory of this habitat type consists of eastern hemlock, yellow birch, red maple, and sugar maple.

This habitat type commonly occurs in low areas within many of the other habitat types and as a transitional type in areas between lake shores or swamps and upland areas. Conifers, such as balsam fir, northern whitecedar, and white spruce, also occur in areas of this habitat type. Characteristic understory species are wild lily-of-the-valley, goldthread, bunchberry, clubmoss, and yellow beadlily. Blueberries, brackenfern, and large-leaved aster are abundant in some areas.

Eastern hemlock and yellow birch have the highest potential for forestry products, and northern whitecedar, balsam fir, and white spruce are suitable as wildlife habitat or for fiber production. Although sugar maple reproduces in areas of this type, it grows poorly and exhibits poor form. Areas of this type that are in the better drained positions are well suited to management for eastern white pine.

ATD—Acer-Tsuga/Dryopteris (Sugar Maple-Hemlock/Spinulose Shield Fern) habitat type. The presumed climax overstory of this habitat type is dominated by sugar maple, eastern hemlock, and yellow birch.

Although most hardwoods grow well on this habitat type once they are established, sugar maple tends to dominate both the young and mature stands. For this reason, management is difficult for intolerant and mid-tolerant species in areas of this habitat type.

The understory is typically poorly developed. A shrub layer is normally absent, and ground vegetation is sparse. The most conspicuous species are spinulose shield fern, lady fern, wild lily-of-the-valley, and sugar maple seedlings.

AVVib—Acer/Vaccinium-Viburnum (Sugar Maple/Low Sweet Blueberry-Mapleleaf Viburnum) habitat type. The presumed climax overstory of this habitat type is dominated by sugar maple, red maple, and northern red oak.

The shrub layer on this type consists of mapleleaf viburnum, beaked hazelnut, and leatherwood. Ground vegetation tends to be poorly developed. Large-leaved aster, brackenfern, and wild sarsaparilla are the most common species.

In pre-logging eras, this type was dominated by eastern white pine and red pine and was characterized by exceptional yields. Present stands are most commonly dominated by aspen or mixtures of northern red oak, red maple, and sugar maple. Although sugar maple reproduces in areas of this habitat type, it grows slowly and exhibits poor form. The optimal species for management on this type are northern red oak, eastern white pine, and aspen. Red pine yields also are high, but competition is a serious concern.

AViO—Acer/Viola-Osmorhiza (Sugar Maple/Yellow Violet-Sweet Cicely) habitat type. The presumed

climax overstory of this habitat type is dominated by sugar maple. Early and mid-successional stages may have a mixture of several hardwood species, including American basswood, white ash, yellow birch, and northern red oak. With the exception of eastern hemlock, conifers generally are absent from this habitat type. The growth potential for all native hardwoods is very high.

The understory vegetation in areas of this type generally is well developed, and the diversity of species is high. The most characteristic species are sweet cicely, trillium, yellow violet, lady fern, spinulose shield fern, hairy Solomon's seal, false Solomon's seal, jack-in-the-pulpit, and blue cohosh.

Crops and Pasture

John W. Pingry, agronomist, Natural Resources Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

In 1990, about 23,000 acres in Florence County was farmland (Wisconsin Agricultural Statistics Service, 1991). Of this total, 11,000 acres was used for corn, mainly corn for silage; 400 acres for oats; 200 acres for barley; 3,300 acres for alfalfa hay; 2,000 acres for other hay; and 450 acres for potatoes. The rest of the acreage was used for other crops, pasture, woodlots, or other farm uses.

The soils in Florence County have potential for increased production of crops. Food production could be increased by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology. Some acreage currently being used as woodland could be cleared and used for crop production. However, climatic conditions and market availability make this unlikely.

Management varies on the different kinds of soil in Florence County. Basic management, however, is needed on practically all of the soils. Basic management of cropland includes controlling water erosion, providing an adequate drainage system, maintaining fertility, maintaining or improving tilth, applying lime, preparing a good seedbed, and harvesting in a timely manner. Basic management of pasture includes pasture renovation, proper stocking rates, and clipping or mowing where feasible. Clipping and mowing remove weeds and brush and encourage uniform regrowth and grazing. Timely deferment of grazing is also needed to keep the pasture in good condition.

The paragraphs that follow describe the major management concerns in areas of cropland and pasture in the county.

Water erosion is a major problem on much of the cropland and pasture in the county. It generally is a hazard in areas where the slope is more than about 2 percent. Much of the acreage in Florence County is susceptible to water erosion, but most of this acreage has a protective cover of vegetation. Erosion is a concern in areas where erodible soils are used for row crops.

Erosion is damaging for three main reasons. First, productivity is reduced as the surface layer is lost and the less fertile subsurface layer and part of the subsoil are incorporated into the plow layer. Loss of the organic-rich surface layer is especially damaging on soils that have a layer in or below the subsoil that limits the depth of the root zone. Wabeno soils, for example, have such a layer in the subsoil. Second, erosion adversely affects tilth and the infiltration of water. Eroded soils are generally more difficult to till than uneroded soils because the clay content of the plow layer generally increases when part of the subsoil is incorporated into the plow layer. Third, erosion results in the sedimentation of lakes and streams. Control of erosion helps to minimize this sedimentation and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

Erosion-control practices should provide a protective cover, reduce the runoff rate, and increase the rate of water infiltration. A conservation cropping system that keeps a vegetative cover on the soil for extended periods can hold soil erosion to amounts that do not reduce the productive capacity of the soils. On livestock farms, which require pasture and hay, including legumes or legume and grass forage crops in the cropping system helps to control erosion and also provides nitrogen and improves tilth for other crops grown in rotation.

A conservation tillage system that leaves protective amounts of plant residue on the surface after planting, such as mulch tillage using a chisel or a disc, increases the rate of water infiltration, reduces the runoff rate, and helps to control water erosion.

Conservation tillage systems that clear a narrow band of residue away from the seed help to overcome cool soil temperatures in the spring.

Contour stripcropping and contour farming also help to control runoff and erosion. These practices are best suited to soils that generally have uniform slopes, such as Goodman and Wabeno soils. Grassed waterways remove excess surface water and reduce the hazard of erosion along natural drainageways. Diversions direct runoff away from erodible areas. Terraces reduce the length of slopes and provide safe outlets for runoff.

Critical-area plantings, such as those along roadsides and in gravel pits, help to stabilize highly erodible soils where vegetation is difficult to establish.

Soil blowing is a hazard on many of the soils in Florence County, especially the sandy soils, such as Croswell, Cublake, Rousseau, and Vilas soils. It can result in soil loss and can damage young crops in a few hours if winds are strong and the soils are dry and bare of vegetation or crop residue. Windbreaks help to prevent the damage to soils and crops caused by soil blowing. They also conserve soil moisture. Small grain crops can be planted as a cover, and green manure crops and a system of conservation tillage can be used to maintain surface cover, maintain the content of organic matter, and reduce the hazard of soil blowing.

Further information about the design of erosion-control practices for each kind of soil can be obtained at the local office of the Natural Resources Conservation Service.

Soil wetness is a major management concern on some of the acreage used for crops and pasture in the county. The poorly drained Kinross and Minocqua soils are naturally so wet that the production of crops commonly grown in the county is generally not possible unless the soils are drained. Unless drained, somewhat poorly drained soils, such as Gastrow and Worcester soils, are so wet that crops are damaged during most years.

If organic soils are drained and used as cropland, they oxidize, subside, and are subject to soil blowing when the pore space is filled with air. Special drainage systems are needed to control the depth and period of drainage. Keeping the water table at the level required by crops during the growing season and raising it to the surface during other times of the year can help to minimize oxidation and subsidence and reduce the hazard of soil blowing in areas of organic soils.

The design of both surface and subsurface drainage systems varies with the kind of soil and with particular site conditions. In some cases, artificial drainage is impossible or impractical because of a lack of suitable outlets.

Crops grown in most areas of poorly drained and very poorly drained soils are subject to frost damage because of the low position of these soils on the landscape. The number of frost-free days per season is lower in these areas than on adjacent uplands because of cold air drainage to the lowlands.

Further information about the design of drainage systems for each kind of soil can be obtained at the local office of the Natural Resources Conservation Service.

Soil fertility is naturally low or medium in most of the soils in the county. Fertility can be improved by applying nutrients and by choosing a cropping system that adds organic material to the soil. On dairy farms, a diversified cropping system and applications of manure help to maintain the content of organic matter. If specialty crops, such as potatoes, are grown, green manure crops are needed to maintain the content of organic matter.

The addition of nutrients increases the yields of most crops. Most soils in the county are naturally acid and require applications of lime, which can raise the pH level sufficiently for good growth of alfalfa and other crops that grow best on nearly neutral soils. Some soils in the eastern part of the county, such as Crossett and Ellwood soils, are naturally acid or neutral in the upper layers and alkaline in the lower layers. On all soils, additions of lime and nutrients should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The University of Wisconsin Extension Service can help in determining the kind and amount of nutrients and lime to be applied.

Soil tilth is an important factor affecting the germination of seeds, the emergence of seedlings, and the infiltration of water into the soil. Soils that have good tilth are granular and porous. Tilling or grazing when the soil is too wet can cause poor tilth, especially if the surface layer is loam or silt loam. Intense rainfall on bare soil can cause the formation of a crust on the surface. The crust reduces the rate of water infiltration and increases the runoff rate and the hazard of erosion. Good soil tilth is more difficult to maintain on eroded soils than in areas that are not eroded because the eroded soils have a lower content of organic matter. Returning crop residue to the soil, growing green manure crops, and regularly adding manure or other organic material improve soil structure and tilth and minimize crusting.

Excessive tillage, use of heavy farm machinery, overgrazing, and tilling or grazing when the soil is too

wet can result in surface compaction and, thus, in poor tilth. Excessive tillage can be avoided by using a system of conservation tillage. Proper stocking rates and rotation grazing can prevent overgrazing. Chisel plowing helps to loosen compacted soil.

Some soils in the survey area have stones on the surface. Examples are areas of Goodman, Sarona, and Wabeno soils. These areas cannot be tilled unless the stones are removed.

Irrigation is well suited to some of the nearly level and gently sloping soils that have a very low, low, or moderate available water capacity, such as Manitowish, Padus, Pence, Rousseau, Sayner, and Vilas soils. Irrigation helps to maintain a sufficient amount of available water for sustained crop yields. Because of the rapid and very rapid permeability in these soils, the irrigation rate should be limited. Limiting the irrigation rate can minimize the leaching of chemicals and nutrients, especially nitrogen, out of the root zone and into the ground water. The water for irrigation is generally drawn from wells or ponds. Strong winds can prevent uniform applications of water from sprinkler systems. Field windbreaks and vegetative row barriers help to deflect the force of the wind and conserve available water.

Further information about the design of irrigation systems for each kind of soil can be obtained at the local office of the Natural Resources Conservation Service.

Field crops commonly grown in the county include corn, oats, and barley (fig. 10). Most of the corn is used for silage. Small acreages of wheat and rye are grown in some years. Because of the beef and dairy herds in the county, hay is an important crop. Mixtures of bromegrass and alfalfa and mixtures of timothy and red clover are the dominant hay crops (fig. 11).

Pastures are vegetated with the same grass-legume mixtures used for hay. A good system of

Figure 10.—Barley in an area of Pence sandy loam, 0 to 6 percent slopes.

Figure 11.—An area of Padus sandy loam, 0 to 6 percent slopes, used as hayland.

fertilization and a system of rotation grazing that includes adequate rest periods would improve most pastures substantially. Forage yields on droughty soils, such as Pence and Vilas soils, are generally somewhat limited. Planting early in spring, before the surface layer has a chance to dry, is most effective in areas of these soils. Restricted use during dry periods helps to keep the pasture in good condition. Overgrazing reduces the plant cover and thus can increase the hazard of erosion. It also affects soil tilth. Fertilization, renovation, and controlled grazing help to maintain the plant cover. In areas of the finer textured soils, restricting grazing during wet periods also helps to keep the pasture in good condition.

Specialty crops, including potatoes (fig. 12), are grown commercially in the county on a very limited basis. Small acreages of sweet corn, tomatoes, asparagus, strawberries, raspberries, and pumpkins also are grown. The latest information about growing specialty crops can be obtained from the local offices of the Cooperative Extension Service and the Natural Resources Conservation Service.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 7. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of map units in the survey area also is shown in the table.

The yields are based mainly on the experience and

records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 7 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service

Figure 12.—Potatoes in an area of Padus-Pence sandy loams, 0 to 6 percent slopes.

or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class V soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The capability classification of map units in this survey area is given in the section “Detailed Soil Map Units” and in the yields table.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation’s prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, woodland, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 80,472 acres in Florence County, or 25.9

percent of the land area, is prime farmland. This land is in scattered areas throughout the county. Much of this land remains wooded, but some is used for crops, mainly corn, oats, hay, and potatoes.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 8. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Windbreaks and Environmental Plantings

There are few windbreaks in Florence County because the county is mostly wooded, and individual tracts of cropland are surrounded by naturally occurring woodland. Because most homesites also are surrounded by woodland, there is little need for windbreaks, shelterbelts, or environmental plantings.

Most windbreaks are used in areas of Padus, Pence, Stambaugh, and Vanzile soils. Norway spruce, white spruce, Colorado blue spruce, and red pine are the most commonly planted species. The plantings are mostly on the west or north sides of the protected areas or are on both sides. Multi-row plantings, ranging from two to six rows, are generally used.

Windbreaks protect livestock, buildings, yards, fruit trees, gardens, and cropland from wind and snow; help to keep snow on fields; and provide food and cover for wildlife. Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service or of the Cooperative Extension Service or from a commercial nursery.

Recreation

The lakes, rivers, streams, and woodlands in Florence County have made the county a popular vacation area. Water-based recreation, such as fishing, boating, water skiing, and swimming, are important. The rivers and streams in the county offer excellent trout fishing. Three major rivers—the Brule, Pine, and Popple Rivers—provide challenging opportunities for the use of canoes, innertubes, and kayaks. The Pine and Popple Rivers are designated by the State as Wild Rivers (fig. 13).

The large wooded areas in Florence County attract many ruffed grouse hunters during the bird season and many deer and bear hunters during the archery and gun seasons. Wild turkey hunting is also becoming popular in the southeastern part of the county. The Nicolet National Forest, the Florence County Forest, and many State holdings provide areas for sightseeing, camping, hiking, and hunting. There is a public golf course along U.S. Highway 2-141 between Florence and Spread Eagle. During the winter months, snowmobiling and cross-country skiing are common on the many miles of groomed trails in Florence County. Downhill skiing is also offered at Keyes Peak Ski Hill, which is operated by the county. Ice fishing is also a very popular winter sport.

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent

Figure 13.—The Popple River in southern Florence County provides good trout fishing and offers opportunities for other forms of water-based recreational activities.

and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders,

absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Robert D. Weihrouch, biologist, Natural Resources Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The species and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. The diversity of habitat types is of major importance. Land use also is a factor. Florence County has a diversity of wildlife habitats that sustain species suited to wilderness forest areas as well as farmland. The wooded wetlands scattered throughout the county add to the diversity of habitats. The quality of wildlife habitat improves where the upland forests are associated with adjacent wetlands.

In general, the sandy soils have open areas, which promote grass, shrub, and oak woodlands. Loamy and silty soils favor sugar maple hardwood forests, which have dense canopies and provide little understory food and cover. Wildlife habitat can be created or improved by maintaining the existing plant cover or by promoting the natural establishment of desirable plants.

The majority of land in Florence County is forested. The western one-third is part of the Nicolet National Forest. Wildlife species in the densely canopied hardwood forests include white-tailed deer, black bear, gray wolf, bobcat, coyote, snowshoe hare, red squirrel, flying squirrel, porcupine, and short-tailed shrew. The fisher, reintroduced in the late 1960s, is now common in the forests. Forest birds include thrushes, warblers, vireos, pileated woodpeckers, great crested flycatchers, broadwinged hawks, goshawks, bald eagles, saw-whet owls, and barred owls.

The more open oak-aspen forest, which includes scattered wetlands, provides excellent habitat for white-tailed deer, black bear, coyote, bobcat, snowshoe hare, red squirrels, gray squirrels, porcupine, deer mice, and meadow voles. Maintaining aspen of different age classes provides optimum food and cover for these wildlife species. Birds that frequent disturbed or open woodland areas include ruffed grouse, sharp-tailed grouse, woodcock, upland sandpipers, sparrows, towhee, indigo buntings, chickadees, goldfinches, blue jays, red-tailed hawks, and great horned owls.

Most agricultural land is in the eastern half of the county. Cropland, pasture, hay fields, woodlots, and edge areas provide specific habitat elements. Wildlife species typical of agricultural areas include white-tailed deer, black bear, coyote, red fox, cottontail rabbit, skunk, badger, woodchuck, raccoon, and rodents. Grassland birds associated with agriculture include meadowlarks, bluebirds, sparrows, and red-tailed hawks. Ruffed grouse, wild turkeys, woodcock, gray squirrels, and red squirrels are common in the adjacent woodlots. Canada geese feed in the crop fields during their annual migrations, and wild turkeys rely on cropland for food during periods of deep snow.

Lakes, streams, wetlands, and riparian areas provide important habitat for waterfowl, furbearers, reptiles, and amphibians. Although the county is not on a principal flyway, ducks and geese migrate through the area. Wood ducks, mallards, black ducks, blue-winged teal, hooded mergansers, and great blue herons are common in streams and beaver ponds throughout the county. Loons, marsh birds, shore birds, bald eagles, and osprey live and feed along the larger lakes and rivers. White-tailed deer, black bear, bobcat, snowshoe hare, red squirrels, raccoon, fisher, otter, mink, beaver, muskrat, ruffed grouse, woodcock,

saw-whet owls, and red-shouldered hawks can be found in areas of wetland and riparian habitat. Conifer swamps and hemlock stands provide winter cover for deer.

The paragraphs that follow provide some generalized information about the kinds of wildlife and wildlife habitat in areas of specific soils.

Most areas of the mucky organic soils, such as Lupton soils, the loamy and silty lacustrine soils, such as Annalake and Gastrow soils, and the loamy and sandy soils that are relatively shallow over bedrock, such as Metonga and Ishpeming soils, are woodland or wetland. A few areas are cropland or pasture. The major upland tree species are sugar maple, yellow birch, American basswood, red maple, quaking aspen, paper birch, balsam fir, northern red oak, eastern white pine, red pine, jack pine, eastern hemlock, and northern pin oak. Scattered wetlands contain northern whitecedar, red maple, black spruce, balsam fir, American elm, and tamarack. Areas of these soils provide good habitat for wildlife species associated with hardwood forest, open oak woodland, and wetlands. Scattered areas of cropland and pasture provide habitat for wildlife typical of agricultural areas.

Most areas of the silty and loamy till soils, such as Goodwit, Sarona, and Wabeno soils, are private or commercial woodland, county forest, or part of the Nicolet National Forest. These soils support northern hardwoods. The major tree species are sugar maple, northern red oak, American basswood, white ash, yellow birch, American elm, eastern hophornbeam, red maple, eastern white pine, white spruce, black cherry, and eastern hemlock. Aspen and paper birch regenerate after logging, but these species are commonly replaced by sugar maple and other northern hardwoods. These upland areas produce some of the best timber in the county but provide little understory food and cover for wildlife. The habitat is important for many canopy-nesting species of songbirds and hardwood forest wildlife species.

Most areas of the loamy and silty outwash soils, such as Padus, Pence, and Vanzile soils, are private or commercial woodland or part of the Nicolet National Forest. A few areas are wetland or cropland. The variety of soil types and the pitted landscape result in a diversity of wildlife habitats. The major tree species are sugar maple, northern red oak, American basswood, white ash, yellow birch, eastern hemlock, American elm, red maple, black cherry, paper birch, white spruce, eastern white pine, quaking aspen, and balsam fir. Scattered wetlands, swales, and creek bottoms support northern whitecedar, red maple, American elm, balsam fir, black ash, tamarack, and black spruce. Areas of these soils provide good habitat for wildlife species associated with hardwood forest and with some agricultural and wetland areas. The endangered wood turtle has been observed in areas of these soils.

Most areas of loamy, sandy, and silty soils, such as Ellwood, Iosco, Padus, Sarona, and Vilas soils, are private or commercial woodland, county forest, or cropland. A few areas are wetland. The major tree species are sugar maple, northern red oak, American basswood, eastern hemlock, yellow birch, white ash, paper birch, red pine, eastern white pine, red maple, white spruce, quaking aspen, balsam fir, and northern pin oak. Scattered wetlands support northern whitecedar, balsam fir, black spruce, black ash, red maple, American elm, and tamarack. These areas provide good habitat for wildlife species associated with hardwood forest, open oak woodland, agricultural areas, and wetlands. Bald eagles feed below the dams on the Menominee River. Most areas of the sandy and loamy outwash soils, such as Pence and Vilas soils, are private or commercial woodland or county forest. A few areas are cropland or wetland. Areas of these soils include a sandy “natural area” with unique vegetation. The major tree species are jack pine and quaking aspen. Northern pin oak (fig. 14), red pine, eastern white pine, paper birch, red maple, northern red oak, white spruce, and balsam fir are also included. Areas of these soils provide excellent habitat for upland wildlife. Red pine plantations are also common. Scattered wetlands support northern whitecedar, balsam fir, black spruce, tamarack, red maple, black ash, and American elm. These soils provide habitat for wildlife species associated with open oak woodland and with wetlands. They are too sandy for woodcock, but they provide habitat for the upland sandpiper, the sharp-tailed grouse, and the endangered Karner blue butterfly. Scattered areas of cropland provide habitat for wildlife typical of agricultural areas.

The bogs scattered throughout much of the county support some rare and interesting plants and wildlife species that rely specifically on this type of habitat. These areas generally support wetland plants, such as leatherleaf, bog rosemary, pale laurel, Labrador tea, and sphagnum moss. Tree species are generally limited to scattered black spruce and tamarack (fig. 15). Swamps generally support marsh grasses, sedges, reeds, alder, and cattail. Tree species include northern whitecedar, balsam fir, black ash, American elm, and red maple. These areas provide good habitat for wetland wildlife and are winter deer yarding areas.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas,

Figure 14.—Northern pin oak in an area of Vilas loamy sand, 0 to 6 percent slopes. Brackenfern is a common understory species on this soil.

and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil

Figure 15.—Leatherleaf and Labrador tea and stunted black spruce and tamarack in an area of Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes.

moisture also are considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are bluegrass, timothy, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are pigweed, lambsquarter, goldenrod, and common yarrow.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the

root zone, available water capacity, and wetness. Examples of these plants are oak, aspen, cherry, dogwood, beaked hazelnut, raspberry, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, highbush cranberry, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and hemlock.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wild rice, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous and/or coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, snowshoe hare, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Further information on habitat management for different species of wildlife can be obtained from the local office of the Natural Resources Conservation Service or the Wisconsin Department of Natural Resources.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading “Soil Properties.”

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank

absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, or other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

The table also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

The table gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in the table are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, and soil reaction affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential

for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large

amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders or organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone and by soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control water erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey.

Soil properties are ascertained by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine particle-size distribution, plasticity, and compaction characteristics. These results are reported in table 19.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include engineering index properties, physical and chemical properties, and pertinent soil and water features.

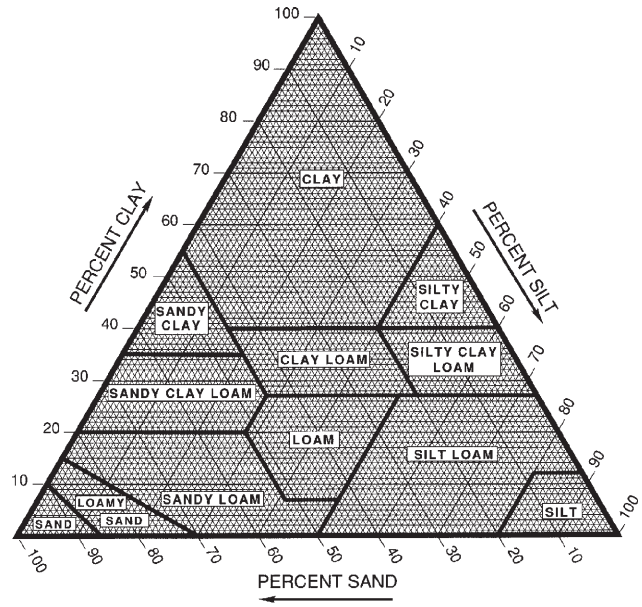

Figure 16.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 gives the engineering classifications and the range of index properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 16). “Loam,” for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, “gravelly.” Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2001) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other

extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 19.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$-bar moisture tension. Weight is determined after the soil is dried at 105 degrees C. In table 17, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability (K_{sat}) refers to the ability of a soil to transmit water or air. The term “permeability,” as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect retention of water and depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for

fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on the basis of measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, 6 to 9 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. The soils assigned to group 1 are the most susceptible to soil blowing, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.
8. Soils that are not subject to soil blowing because of rock fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or

well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in the table, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

The table gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in the table are depth to the seasonal high water table, the kind of water table, and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in the table.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. “More than 6.0” indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected total subsidence, which usually is a result of drainage and oxidation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and

depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 19 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section “Soil Series and Their Morphology.” The soil samples were tested by the Wisconsin Department of Transportation, Division of Highways and Transportation Facilities.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are Moisture density—T 99 (AASHTO), D 698 (ASTM); Mechanical analysis—T 88 (AASHTO), D 422 (ASTM), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 4318 (ASTM); Plasticity index—T 90 (AASHTO), D 4318 (ASTM); AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); and Unified classification—D 2487 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Spodosol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquod (*Aqu*, meaning water, plus *od*, from Spodosol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Endoaquods (*Endo*, referring to endosaturation, plus *aquod*, the suborder of the Spodosols that has aquic conditions).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Endoaquods.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is sandy, mixed, frigid Typic Endoaquods.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (Soil Survey Staff, 1999) and in “Keys to Soil Taxonomy” (Soil Survey Staff, 1994). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

Annalake Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Primarily loamy deposits underlain by stratified lacustrine deposits
Slope range: 0 to 15 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Annalake fine sandy loam, 0 to 6 percent slopes, approximately 1,800 feet south and 1,650 feet east of the northwest corner of sec. 33, T. 38 N., R. 16 E.

A—0 to 3 inches; very dark gray (10YR 3/1) fine sandy loam, gray (10YR 5/1) dry; moderate medium and coarse granular structure; friable; many very fine and fine roots; strongly acid; abrupt broken boundary.

E—3 to 6 inches; brown (7.5YR 5/2) fine sandy loam, pinkish gray (7.5YR 6/2) dry; weak very thick platy structure parting to moderate medium subangular blocky; friable; many very fine and fine roots; strongly acid; clear wavy boundary.

Bs1—6 to 9 inches; dark brown (7.5YR 3/4) fine sandy loam; moderate medium and coarse subangular blocky structure; friable; many very fine and fine roots; very strongly acid; clear wavy boundary.

Bs2—9 to 17 inches; brown (7.5YR 4/4) fine sandy loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; very strongly acid; abrupt wavy boundary.

E/B—17 to 31 inches; 75 percent brown (10YR 5/3) fine sandy loam (E´), very pale brown (10YR 7/3) dry; moderate thin platy structure; friable; tonguing into and surrounding remnants of dark yellowish brown (10YR 4/4) fine sandy loam (Bt); moderate medium subangular blocky structure; friable; few very fine and fine roots; few distinct dark brown (7.5YR 3/4) clay films on faces of some peds; very strongly acid; clear wavy boundary.

Bt—31 to 39 inches; brown (7.5YR 4/4) sandy loam; moderate medium and coarse subangular blocky structure; friable; few faint dark brown (7.5YR 3/4) clay films on faces of some peds; few fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; strongly acid; abrupt wavy boundary.

C—39 to 60 inches; brown (7.5YR 4/4 and 5/4), stratified fine sand, very fine sand, loamy very fine sand, very fine sandy loam, and silt loam; massive; friable; few fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; moderately acid.

Range in Characteristics

Thickness of the solum: 30 to more than 60 inches
Content of gravel: 0 to 10 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—fine sandy loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—5
Chroma—2
Texture—fine sandy loam or loamy fine sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam or fine sandy loam

E´ part of E/B horizon:
Hue—10YR, 7.5YR, or 5YR
Value—5
Chroma—3
Texture—loamy sand, loamy fine sand, sandy loam, or fine sandy loam

Bt horizon and Bt part of E/B horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4
Chroma—4
Texture—fine sandy loam or sandy loam

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—3 or 4
Texture—stratified fine sand, very fine sand, loamy very fine sand, very fine sandy loam, and silt loam

Au Gres Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Rapid
Landform: Outwash plains and stream terraces
Parent material: Primarily sandy glacial outwash
Slope range: 0 to 2 percent

Taxonomic classification: Sandy, mixed, frigid Typic Endoaquods

Typical Pedon

Au Gres loamy sand, 0 to 2 percent slopes, approximately 2,000 feet north and 300 feet east of the southwest corner of sec. 14, T. 38 N., R. 17 E.

Oa—0 to 2 inches; black (10YR 2/1) (broken face and rubbed) muck (sapric material, which is a mat of partially decomposed forest litter); about 40 percent fiber, 10 percent rubbed; weak medium granular structure; very friable; many very fine and fine and few medium and coarse roots; extremely acid (pH 4.3 in water 1:1); abrupt smooth boundary.

E—2 to 7 inches; grayish brown (10YR 5/2) loamy sand, light gray (10YR 7/1) dry; weak thick platy structure; very friable; common very fine and fine and few medium and coarse roots; very strongly acid; abrupt irregular boundary.

Bhs—7 to 8 inches; dark brown (7.5YR 3/3) loamy sand; weak fine subangular blocky structure; very friable; common very fine and fine and few medium and coarse roots; few fine distinct strong brown (7.5YR 4/6) masses of iron accumulation; very strongly acid; abrupt broken boundary.

Bs—8 to 17 inches; dark brown (7.5YR 3/4) loamy sand; weak fine and medium subangular blocky structure; very friable; common very fine and fine and few medium and coarse roots; many medium and coarse distinct strong brown (7.5YR 4/6) masses of iron accumulation; strongly acid; clear wavy boundary.

BC—17 to 26 inches; strong brown (7.5YR 4/6) sand; weak coarse subangular blocky structure; very friable; few very fine and fine roots; many medium and coarse distinct yellowish red (5YR 4/6) masses of iron accumulation and common fine and medium distinct brown (7.5YR 4/2) iron depletions; strongly acid; clear wavy boundary.

C—26 to 62 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; many coarse prominent yellowish red (5YR 4/6) masses of iron accumulation and many medium and coarse brown (7.5YR 5/2) iron depletions; moderately acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Content of gravel: 0 to 10 percent throughout the profile
Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—loamy sand

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2
Texture—loamy sand

Bhs horizon:
Hue—7.5YR or 5YR
Value—2 or 3
Chroma—2 or 3
Texture—loamy sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—loamy sand or sand

C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 8
Texture—sand

Beseman Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderate or moderately rapid in the organic material; moderately slow in the substratum
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Sphagnum moss and herbaceous organic material 16 to 51 inches thick over loamy or silty deposits
Slope range: 0 to 1 percent

Taxonomic classification: Loamy, mixed, dysic Terric Borosaprists

Typical Pedon

Beseman peat, in an area of Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes, approximately 1,995 feet west and 1,200 feet south of the northeast corner of sec. 28, T. 38 N., R. 13 E., in Forest County, Wisconsin:

Oi—0 to 12 inches; peat, dark brown (10YR 3/3) broken face and rubbed; about 90 percent fiber, 50 percent rubbed; weak coarse subangular blocky structure; very friable; many fine roots; fibers are primarily sphagnum moss; extremely acid (pH 4.0 in water 1:1); clear wavy boundary.

Oa1—12 to 22 inches; muck, dark reddish brown (5YR 2.5/2) broken face and rubbed; about 45 percent fiber, 5 percent rubbed; weak coarse subangular blocky structure; friable; few fine roots; fibers are primarily herbaceous; extremely acid (pH 4.0 in water 1:1); gradual wavy boundary.

Oa2—22 to 36 inches; muck, black (5YR 2.5/1) broken face and rubbed; about 40 percent fiber, 5 percent rubbed; moderate coarse subangular blocky structure; friable; few fine roots; fibers are primarily herbaceous; about 10 percent mineral material; extremely acid (pH 4.0 in water 1:1); abrupt wavy boundary.

Cg—36 to 60 inches; dark gray (5Y 4/1) silt loam; massive; friable; about 3 percent gravel; few highly decomposed root fibers in channels; very strongly acid.

Range in Characteristics

Thickness of the organic material: 16 to 51 inches
Kind of organic material: Upper layer—peat; lower layers—dominantly muck (thin layers of mucky peat or peat in some pedons)
Content of woody fragments: 0 to 10 percent

Oi horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—2 or 3
Texture—peat

Oa horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—muck

C horizon:
Hue—5Y, 2.5Y, 10YR, or 7.5YR
Value—4 to 6
Chroma—1 to 3
Texture—silt loam, loam, sandy loam, or fine sandy loam

Capitola Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate or moderately slow in the solum and moderately slow in the substratum
Landform: Drumlins and moraines
Parent material: Primarily silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 0 to 2 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Mollic Epiaqualfs

Typical Pedon

Capitola muck, 0 to 2 percent slopes, very stony, approximately 1,900 feet north and 2,110 feet west of the southeast corner of sec. 25, T. 40 N., R. 16 E.

Oa—0 to 5 inches; muck, black (10YR 2/1) broken face, very dark brown (10YR 2/2) rubbed; about 30 percent fiber, 5 percent rubbed; weak medium subangular blocky structure; very friable; many very fine and fine roots; fibers are primarily herbaceous; very strongly acid (pH 4.7 in water 1:1); abrupt smooth boundary.

Bg—5 to 20 inches; dark grayish brown (2.5Y 4/2) silt loam; moderate medium subangular blocky structure; friable; few very fine and fine roots; few fine prominent yellowish brown (10YR 5/6) masses of iron accumulation; about 1 percent gravel and 1 percent cobbles; very strongly acid; clear wavy boundary.

2Btg—20 to 34 inches; brown (7.5YR 4/2) sandy loam; moderate medium subangular blocky structure; friable; few faint dark brown (7.5YR 3/2) clay films on faces of some peds; many medium prominent yellowish red (5YR 4/6) masses of iron accumulation and common fine and medium prominent grayish brown (2.5Y 5/2) iron depletions; about 5 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

2C—34 to 60 inches; brown (7.5YR 4/4) gravelly sandy loam; massive; friable; many medium prominent yellowish red (5YR 4/6) masses of iron accumulation and common medium prominent grayish brown (10YR 5/2) iron depletions; about 20 percent gravel and 1 percent cobbles; moderately acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Thickness of the silty mantle: 15 to 36 inches
Content of gravel: 0 to 10 percent in the upper part of the solum; 5 to 25 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 15 percent throughout the profile

Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0 percent

Oa horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 or 3
Chroma—0 to 2
Texture—muck

A horizon (if it occurs):
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bg horizon:
Hue—2.5Y, 10YR, or 7.5YR
Value—4 to 6
Chroma—1 or 2
Texture—silt loam

2Btg horizon:
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—1 or 2
Texture—sandy loam or gravelly sandy loam

2C horizon:
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—2 to 4
Texture—sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand

Cathro Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow to moderately rapid in the organic material; moderately slow or moderate in the substratum
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Herbaceous organic material 16 to 51 inches thick over loamy or silty deposits
Slope range: 0 to 1 percent

Taxonomic classification: Loamy, mixed, euic Terric Borosaprists

Typical Pedon

Cathro muck, in an area of Lupton, Cathro, and Markey mucks, 0 to 1 percent slopes, approximately 150 feet east and 2,300 feet south of the northwest corner of sec. 30, T. 35 N., R. 15 E., in Forest County, Wisconsin:

Oa1—0 to 8 inches; muck, black (N 2.5/0) broken face and rubbed; about 45 percent fiber, 9 percent rubbed; moderate fine granular structure; very friable; many fine and very fine and common medium roots; fibers are primarily herbaceous; neutral (pH 7.0 in water 1:1); clear wavy boundary.
Oa2—8 to 16 inches; muck, black (N 2.5/0) broken face, black (10YR 2/1) rubbed; about 40 percent fiber, 4 percent rubbed; moderate fine granular structure; very friable; common fine and very fine and few medium roots; fibers are primarily herbaceous; neutral (pH 6.9 in water 1:1); clear wavy boundary.
Oa3—16 to 30 inches; muck, black (N 2.5/0) broken face, black (10YR 2/1) rubbed; about 40 percent fiber, 4 percent rubbed; weak medium subangular blocky structure; very friable; fibers are primarily herbaceous; about 3 percent mineral material; neutral (pH 7.2 in water 1:1); abrupt wavy boundary.
Cg1—30 to 37 inches; gray (5Y 5/1) silt loam; massive; friable; black (10YR 2/1) organic staining in the upper one-half inch; slightly alkaline; abrupt wavy boundary.
Cg2—37 to 45 inches; grayish brown (10YR 5/2) sandy loam; massive; friable; few fine distinct yellowish brown (10YR 5/4) masses of iron accumulation; about 4 percent gravel; slightly alkaline; gradual wavy boundary.
C—45 to 60 inches; brown (10YR 5/3) sandy loam; massive; friable; common medium distinct dark yellowish brown (10YR 4/4) masses of iron accumulation; about 4 percent gravel; slightly alkaline.

Range in Characteristics

Thickness of the organic material: 16 to 51 inches
Kind of organic material: Dominantly muck; thin layers of mucky peat or peat in some pedons
Content of woody fragments: 0 to 10 percent

Oa horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—muck

C horizon:
Hue—5Y, 2.5Y, 10YR, or 7.5YR
Value—4 to 6
Chroma—1 to 3
Texture—sandy loam, fine sandy loam, very fine sandy loam, silt loam, silty clay loam, clay loam, or loam

Crossett Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Silty deposits underlain by silty, loamy, or clayey glacial till
Slope range: 0 to 3 percent

Taxonomic classification: Fine-loamy, mixed Glossaquic Eutroboralfs

Typical Pedon

Crossett silt loam, in an area of Ellwood-Crossett silt loams, 0 to 6 percent slopes, approximately 1,420 feet north and 1,170 feet west of the southeast corner of sec. 3, T. 38 N., R. 18 E.

Ap—0 to 9 inches; brown (7.5YR 4/2) silt loam, pinkish gray (7.5YR 6/2) dry; weak fine subangular blocky structure; friable; many very fine and fine and few medium and coarse roots; about 4 percent gravel; neutral; abrupt smooth boundary.

E/B—9 to 19 inches; 70 percent brown (7.5YR 5/2) silt loam (E), pinkish gray (7.5YR 7/2) dry; moderate thick platy structure; friable; many fine and medium prominent yellowish red (5YR 4/6) masses of iron accumulation; extending into and surrounding remnants of reddish brown (5YR 4/4) silty clay loam (Bt); moderate medium prismatic structure parting to strong fine angular blocky; firm; common very fine and fine and few medium and coarse roots; common fine and medium distinct yellowish red (5YR 4/6) masses of iron accumulation; about 4 percent gravel; slightly acid; clear wavy boundary.

Bt1—19 to 30 inches; dark reddish brown (5YR 3/4) silty clay loam; moderate medium prismatic structure parting to strong fine and medium angular blocky; firm; few very fine, fine, medium, and coarse roots; common faint dark reddish brown (5YR 3/4) and reddish brown (5YR 4/3) clay films on faces of peds and in some pores; few fine and medium distinct yellowish red (5YR 4/6) masses of iron accumulation; few fine prominent grayish brown (10YR 5/2) iron depletions; few soft black (N 2.5/0) masses (iron-manganese oxides); about 5 percent gravel; slightly acid; clear wavy boundary.

Bt2—30 to 38 inches; dark reddish brown (5YR 3/4) silty clay loam; moderate medium prismatic structure parting to strong fine and medium angular blocky; firm; few very fine, fine, and medium roots; common faint reddish brown (5YR 4/3) clay films on faces of some peds and in some pores; few fine distinct yellowish red (5YR 4/6) masses of iron accumulation; few soft black (N 2.5/0) masses (iron-manganese oxides); about 5 percent gravel; neutral; clear wavy boundary.

Btk1—38 to 62 inches; dark reddish brown (5YR 3/4) silty clay loam; weak coarse prismatic structure parting to strong medium and coarse angular blocky; firm; few very fine and fine roots; few faint reddish brown (5YR 4/3) clay films on faces of some peds and in some pores; few soft black (N 2.5/0) masses (iron-manganese oxides); about 10 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

Btk2—62 to 80 inches; dark reddish brown (5YR 3/4) silty clay loam; weak coarse prismatic structure parting to strong medium and coarse angular blocky; firm; few very fine and fine roots; few faint reddish brown (5YR 4/3) clay films on faces of peds; few soft black (N 2.5/0) masses (iron-manganese oxides); about 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 40 to more than 80 inches
Depth to carbonates: 20 to 40 inches
Content of gravel: 0 to 15 percent throughout the profile
Content of cobbles: 0 to 5 percent throughout the profile

Ap horizon:
Hue—10YR, 7.5YR, or 5YR
Value—3 or 4
Chroma—2 or 3
Texture—silt loam

E part of E/B horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam, loam, or fine sandy loam

Bt horizon, Bt part of E/B horizon, and Btk horizon:
Hue—5YR or 2.5YR
Value—3 or 4
Chroma—4
Texture—silt loam, loam, clay loam, silty clay loam, silty clay, or clay

C horizon (if it occurs):
Hue—5YR or 2.5YR
Value—3 or 4
Chroma—4
Texture—silt loam, loam, clay loam, silty clay loam, silty clay, or clay

Croswell Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Rapid
Landform: Outwash plains and stream terraces
Parent material: Primarily sandy glacial outwash
Slope range: 0 to 3 percent

Taxonomic classification: Sandy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Croswell loamy sand, 0 to 3 percent slopes, approximately 100 feet north and 3,050 feet east of the southwest corner of sec. 13, T. 38 N., R. 17 E.

Oa—0 to 2 inches; black (10YR 2/1) (broken face and rubbed) muck (sapric material, which is a mat of partially decomposed forest litter); about 35 percent fiber, 10 percent rubbed; weak medium granular structure; very friable; many very fine and fine and few medium and coarse roots; extremely acid (pH 4.3 in water 1:1); abrupt smooth boundary.

E—2 to 5 inches; brown (7.5YR 5/2) loamy sand, pinkish gray (7.5YR 6/2) dry; weak fine subangular blocky structure; very friable; common very fine and fine and few medium roots; extremely acid; abrupt wavy boundary.

Bs1—5 to 12 inches; dark brown (7.5YR 3/4) loamy sand; weak fine and medium subangular blocky structure; very friable; common very fine and fine and few medium roots; very strongly acid; clear wavy boundary.

Bs2—12 to 21 inches; brown (7.5YR 4/4) sand; weak medium and coarse subangular blocky structure; very friable; few very fine and fine roots; moderately acid; clear wavy boundary.

BC—21 to 27 inches; strong brown (7.5YR 5/6) sand; weak coarse subangular blocky structure; very friable; moderately acid; clear wavy boundary.

C—27 to 62 inches; yellowish brown (10YR 5/4) sand; many coarse prominent strong brown (7.5YR 5/8) masses of iron accumulation; single grain; loose; slightly acid.

Range in Characteristics

Thickness of the solum: 20 to 42 inches
Content of gravel: 0 to 15 percent throughout the profile
Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—loamy sand

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2
Texture—loamy sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—loamy sand or sand

C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 6
Texture—sand

Cublake Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderately rapid or rapid in the upper layers; moderate or moderately slow in the lower layer
Landform: Outwash plains, glacial lake plains, and stream terraces
Parent material: Sandy glacial outwash underlain by stratified lacustrine deposits
Slope range: 0 to 3 percent

Taxonomic classification: Sandy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Cublake loamy sand, 0 to 3 percent slopes, approximately 3,800 feet north and 3,000 feet east of the southwest corner of sec. 7, T. 38 N., R. 18 E.

A—0 to 3 inches; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; many very fine and fine and few medium and coarse roots; about 1 percent gravel; very strongly acid; clear smooth boundary.

E—3 to 4 inches; brown (7.5YR 4/2) loamy sand, pinkish gray (7.5YR 6/2) dry; weak fine subangular blocky structure; very friable; many very fine and fine and few medium and coarse roots; about 1 percent gravel; very strongly acid; abrupt broken boundary.

Bs1—4 to 10 inches; dark brown (7.5YR 3/4) loamy sand; weak fine and medium subangular blocky structure; very friable; common very fine and fine and few medium and coarse roots; about 3 percent gravel; strongly acid; clear wavy boundary.

Bs2—10 to 23 inches; brown (7.5YR 4/4) loamy sand; weak fine and medium subangular blocky structure; very friable; common very fine and fine and few medium and coarse roots; about 3 percent gravel; moderately acid; clear wavy boundary.

BC—23 to 32 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; few fine roots; about 8 percent gravel; moderately acid; abrupt wavy boundary.

C1—32 to 40 inches; yellowish brown (10YR 5/4) sand; single grain; loose; few fine prominent strong brown (7.5YR 5/8) masses of iron accumulation; about 8 percent gravel; moderately acid; abrupt wavy boundary.

C2—40 to 48 inches; yellowish brown (10YR 5/4) fine sand with thin strata of very fine sand; massive; very friable; few fine and medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; moderately acid; abrupt wavy boundary.

2C3—48 to 60 inches; brown (7.5YR 4/4), stratified very fine sandy loam and silt loam with a few thin strata of very fine sand; massive; friable; many fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; strongly acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Thickness of the sandy mantle: 40 to 60 inches
Content of gravel: 0 to 15 percent in the sandy glacial outwash and 0 to 5 percent in the stratified lacustrine deposits

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—loamy sand

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2
Texture—sand or loamy sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sand or loamy sand

C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—4 or 6
Texture—sand or fine sand with thin strata of very fine sand

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—stratified very fine sandy loam and silt loam with a few thin strata of very fine sand

Dawson Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow to moderately rapid in the organic material; rapid in the substratum
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Sphagnum moss and herbaceous organic material 16 to 51 inches thick over sandy or sandy and gravelly deposits
Slope range: 0 to 1 percent

Taxonomic classification: Sandy or sandy-skeletal, mixed, dysic Terric Borosaprists

Typical Pedon

Dawson peat, in an area of Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes, approximately 3,000 feet north and 10 feet west of the southeast corner of sec. 7, T. 38 N., R. 18 E.

Oi—0 to 10 inches; peat, dark reddish brown (5YR 3/4) broken face and rubbed; about 95 percent fiber, 90 percent rubbed; massive; very friable; fibers are primarily sphagnum moss; extremely acid (pH 4.3 in water 1:1); abrupt smooth boundary.

Oa1—10 to 29 inches; muck, dark reddish brown (5YR 2.5/2) broken face and rubbed; about 40 percent

fiber, 5 percent rubbed; massive; very friable; fibers are primarily herbaceous; extremely acid (pH 4.3 in water 1:1); clear smooth boundary.

Oa2—29 to 44 inches; muck, dark reddish brown (5YR 2.5/2) broken face and rubbed; about 30 percent fiber, 7 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 5 percent sand; extremely acid (pH 4.3 in water 1:1); abrupt smooth boundary.

C—44 to 60 inches; brown (10YR 4/3) sand; single grain; loose; few thin strata and pockets of loamy fine sand; very strongly acid.

Range in Characteristics

Thickness of the organic material: 16 to 51 inches

Kind of organic material: Upper layer—peat; lower layers—dominantly muck (thin layers of mucky peat or peat in some pedons)

Content of woody fragments: 0 to 10 percent

Oi horizon:
Hue—10YR, 7.5YR, or 5YR
Value—3 to 6
Chroma—2 to 4
Texture—peat

Oa horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—muck

C horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—4 to 6
Chroma—0 to 4
Texture—sand, fine sand, loamy fine sand, loamy sand, gravelly loamy sand, or gravelly sand

Ellwood Series

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Moderately slow

Landform: Moraines

Parent material: Silty deposits underlain by silty, loamy, or clayey glacial till

Slope range: 1 to 15 percent

Taxonomic classification: Fine-loamy, mixed Oxyaquic Eutroboralfs

Typical Pedon

Ellwood silt loam (fig. 17), in an area of Ellwood-Crossett silt loams, 0 to 6 percent slopes, approximately 1,290 feet west and 1,500 feet north of the southeast corner of sec. 3, T. 38 N., R. 18 E.

Ap—0 to 8 inches; dark brown (7.5YR 3/2) silt loam, pinkish gray (7.5YR 6/2) dry; weak medium subangular blocky structure; friable; common fine and few medium and coarse roots; about 8 percent gravel; moderately acid; abrupt smooth boundary.

B/E—8 to 15 inches; 80 percent dark reddish brown (5YR 3/4) clay loam (Bt); moderate medium prismatic structure parting to strong fine angular blocky; firm; many faint reddish brown (5YR 4/4) clay films on faces of peds and in some pores; penetrated by reddish brown (5YR 4/3) silt loam (E), pink (5YR 7/3) dry; moderate medium platy structure; friable; common fine and few medium and coarse roots; few fine distinct yellowish red (5YR 4/6) masses of iron accumulation; few soft black (N 2.5/0) masses (iron-manganese oxides); about 3 percent gravel; neutral; clear wavy boundary.

Bt1—15 to 25 inches; dark reddish brown (5YR 3/4) clay loam; moderate medium prismatic structure parting to strong fine angular blocky; firm; common fine and few medium and coarse roots; many faint reddish brown (5YR 4/4) clay films on faces of peds and in pores; few fine distinct yellowish red (5YR 4/6) masses of iron accumulation; few soft black (N 2.5/0) masses (iron-manganese oxides); about 2 percent gravel; slightly acid; clear wavy boundary.

Bt2—25 to 35 inches; dark reddish brown (5YR 3/4) silty clay loam; moderate medium prismatic structure parting to strong very fine and fine angular blocky; firm; many faint reddish brown (5YR 4/4) clay films on faces of peds and in pores; few soft black (N 2.5/0) masses (iron-manganese oxides); about 2 percent gravel; neutral; abrupt smooth boundary.

Btk1—35 to 42 inches; dark reddish brown (5YR 3/4) silty clay loam; moderate medium prismatic structure parting to strong very fine and fine angular blocky; firm; common faint reddish brown (5YR 4/4) clay films on faces of peds and in pores; few soft black (N 2.5/0) masses (iron-manganese oxides); few reddish brown (5YR 5/4) calcium carbonate accumulations in soft mycelial masses; about 2 percent gravel; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Btk2—42 to 51 inches; dark reddish brown (5YR 3/4) silty clay loam; moderate medium prismatic structure parting to strong very fine and fine angular blocky; firm; common faint reddish brown

(5YR 4/4) clay films on faces of some peds and in some pores; few soft black (N 2.5/0) masses (iron-manganese oxides); common reddish brown (5YR 5/4) calcium carbonate accumulations in soft mycelial masses; about 11 percent gravel; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Btk3—51 to 80 inches; dark reddish brown (5YR 3/4) silty clay loam; weak coarse prismatic structure parting to strong medium and coarse angular blocky; firm; common faint reddish brown (5YR 4/4) clay films on faces of some peds and in some pores; few soft black (N 2.5/0) masses (iron-manganese oxides); common reddish brown (5YR 5/4) calcium carbonate accumulations in soft mycelial masses; about 5 percent gravel; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 40 to more than 80 inches
Depth to carbonates: 20 to 40 inches
Content of gravel: 0 to 15 percent throughout the profile
Content of cobbles: 0 to 5 percent throughout the profile

Ap horizon:
Hue—10YR, 7.5YR, or 5YR
Value—3 or 4
Chroma—2 or 3
Texture—silt loam

E part of B/E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 to 3
Texture—silt loam or loam

Bt horizon, Bt part of B/E horizon, and Btk horizon:
Hue—5YR or 2.5YR
Value—3 or 4
Chroma—4
Texture—silt loam, loam, silty clay loam, clay loam, silty clay, or clay

C horizon (if it occurs):
Hue—5YR or 2.5YR
Value—3 or 4
Chroma—4
Texture—silt loam, loam, silty clay loam, clay loam, silty clay, or clay

Fence Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate in the solum; moderately slow in the substratum
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Primarily silty deposits underlain by stratified lacustrine deposits
Slope range: 0 to 6 percent

Taxonomic classification: Coarse-silty, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Fence silt loam, 0 to 6 percent slopes, approximately 2,370 feet east and 1,080 feet north of the southwest corner of sec. 12, T. 40 N., R. 15 E.

A—0 to 2 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/2) dry; moderate fine granular structure; friable; many fine roots; moderately acid; clear wavy boundary.

E—2 to 6 inches; brown (7.5YR 5/2) silt loam, pinkish gray (7.5YR 7/2) dry; moderate fine subangular blocky structure; friable; many fine roots; very strongly acid; clear wavy boundary.

Bs—6 to 14 inches; brown (7.5YR 4/4) silt loam; moderate fine subangular blocky structure; friable; common fine roots; very strongly acid; clear wavy boundary.

E´—14 to 20 inches; brown (7.5YR 5/3) silt loam, pink (7.5YR 7/3) dry; moderate thin platy structure; friable; few fine roots; moderately acid; clear wavy boundary.

E/B—20 to 25 inches; 70 percent brown (7.5YR 5/3) silt loam (E´), pink (7.5YR 7/3) dry; moderate thin platy structure; friable; tonguing into and surrounding remnants of reddish brown (5YR 4/4) silt loam (Bt); moderate fine subangular blocky structure; friable; few fine roots; few distinct yellowish red (5YR 4/6) clay films on faces of some peds; strongly acid; clear irregular boundary.

B/E—25 to 42 inches; 70 percent reddish brown (5YR 4/4) silt loam (Bt); strong coarse prismatic structure parting to moderate medium subangular blocky; friable; common distinct yellowish red (5YR 4/6) clay films on faces of prisms and some peds; penetrated by tongues of brown (7.5YR 5/3) silt loam (E´), pink (7.5YR 7/3) dry; moderate fine subangular blocky structure; friable; few fine roots; many fine prominent and distinct strong brown (7.5YR 5/6) masses of iron accumulation; few thin strata of very fine sand; strongly acid; abrupt smooth boundary.

C—42 to 60 inches; brown (7.5YR 5/4), stratified silt loam and very fine sandy loam; massive; breaks to weak thick plates along depositional strata; friable;

common fine distinct strong brown (7.5YR 5/6) masses of iron accumulation and few fine faint brown (7.5YR 5/3) iron depletions; few thin strata of very fine sand; strongly acid.

Range in Characteristics

Thickness of the solum: 5 to 50 inches
Content of gravel: Less than 2 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam, silt, or very fine sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam, silt, or very fine sandy loam

E´ horizon and E´ part of E/B and B/E horizons:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—2 or 3
Texture—very fine sandy loam, silt loam, or silt

Bt part of E/B and B/E horizons:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—silt loam, silt, or very fine sandy loam

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—3 to 6
Texture—stratified silt loam and very fine sandy loam with thin strata of very fine sand or stratified silt loam, fine sandy loam, and fine sand

Fordum Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate or moderately rapid in the upper layers; rapid or very rapid in the lower layer
Landform: Flood plains
Parent material: Primarily loamy alluvium underlain by sandy or sandy and gravelly deposits
Slope range: 0 to 2 percent

Taxonomic classification: Coarse-loamy, mixed, nonacid, frigid Mollic Fluvaquents

Typical Pedon

Fordum loam, 0 to 2 percent slopes, approximately 20 feet north and 1,100 feet west of the southeast corner of sec. 22, T. 40 N., R. 18 E.

A—0 to 9 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; friable; many very fine and fine and few medium roots; neutral; abrupt smooth boundary.

Cg—9 to 15 inches; dark gray (10YR 4/1) very fine sandy loam; common fine and medium prominent olive brown (2.5Y 4/4) masses of iron accumulation; massive; very friable; few very fine and fine roots; slightly alkaline; abrupt smooth boundary.

Oa—15 to 17 inches; muck, black (N 2.5/0) broken face and rubbed; about 20 percent fiber, 5 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 5 percent sand; neutral (pH 7.0 in water 1:1); abrupt smooth boundary.

C´g1—17 to 29 inches; dark gray (10YR 4/1) fine sandy loam, common fine and medium prominent olive brown (2.5Y 4/4) masses of iron accumulation; massive; friable; about 5 percent gravel and 1 percent cobbles; moderately alkaline; abrupt smooth boundary.

C´g2—29 to 60 inches; dark gray (10YR 4/1) sand; single grain; loose; about 10 percent gravel and 4 percent cobbles; moderately alkaline.

Range in Characteristics

Depth to sand or sandy and gravelly deposits: 24 to 40 inches
Content of gravel: 0 to 15 percent in the upper part; 0 to 60 percent in the lower part
Content of cobbles: 0 to 10 percent throughout the profile

A horizon:
Hue—2.5Y, 10YR, 7.5YR, or N

Value—2 or 3
Chroma—0 to 3
Texture—loam

Cg and C´g1 horizons:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—1 to 4
Texture—silt loam, loam, sandy loam, fine sandy loam, or very fine sandy loam; some pedons contain thin strata of fine sand, very fine sand, loamy fine sand, or loamy very fine sand or the gravelly or mucky analogs of these textures

C´g2 horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—1 to 4
Texture—sand, coarse sand, or fine sand or the gravelly or very gravelly analogs of these textures

Gastrow Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Primarily silty deposits underlain by stratified lacustrine deposits
Slope range: 0 to 3 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Argic Endoaquods

Typical Pedon

Gastrow silt loam, 0 to 3 percent slopes, approximately 1,000 feet west and 1,350 feet north of the southeast corner of sec. 32, T. 38 N., R. 16 E.

A—0 to 3 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak medium and fine granular structure; friable; many very fine and fine and few medium and coarse roots; very strongly acid; abrupt wavy boundary.

E—3 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; weak medium and thick platy structure; friable; many very fine and fine and few medium and coarse roots; few fine and medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; very strongly acid; abrupt wavy boundary.

Bs—6 to 10 inches; brown (7.5YR 4/4) silt loam; moderate medium and coarse subangular blocky structure; friable; many very fine and fine and few medium and coarse roots; few fine and medium prominent yellowish brown (10YR 5/6) masses of iron accumulation; strongly acid; abrupt wavy boundary.

E/B—10 to 21 inches; 70 percent brown (10YR 5/3) silt loam (E´), very pale brown (10YR 7/3) dry; moderate thin platy structure; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; few faint dark brown (7.5YR 3/4) clay films on faces of some peds; common very fine and fine and few medium and coarse roots; few fine prominent and distinct strong brown (7.5YR 4/6) masses of iron accumulation; strongly acid; clear wavy boundary.

B/E—21 to 31 inches; 70 percent brown (7.5YR 4/4) silt loam (Bt); moderate medium and coarse subangular blocky structure; friable; few faint dark brown (7.5YR 3/4) clay films on faces of peds; penetrated by tongues of brown (10YR 5/3) silt loam (E´), very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; friable; few fine roots; many medium distinct and prominent strong brown (7.5YR 5/6) masses of iron accumulation and few fine prominent reddish gray (5YR 5/2) iron depletions; strongly acid; clear wavy boundary.

Bt—31 to 37 inches; brown (7.5YR 4/4) fine sandy loam; moderate medium and coarse subangular blocky structure; friable; few fine dark brown (7.5YR 4/4) clay films on faces of peds; many medium prominent grayish brown (10YR 5/2) iron depletions and many medium distinct strong brown (7.5YR 4/6) masses of iron accumulation; moderately acid; clear wavy boundary.

C—37 to 60 inches; brown (7.5YR 4/4) and yellowish brown (10YR 5/4), stratified fine sand, fine sandy loam, very fine sandy loam, and silt loam; massive; friable; many medium distinct strong brown (7.5YR 4/6) masses of iron accumulation; moderately acid.

Range in Characteristics

Thickness of the solum: 20 to 45 inches

O horizon (if it occurs):
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR or 7.5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2
Texture—silt loam or very fine sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam or very fine sandy loam

E´ part of E/B and B/E horizons:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam or very fine sandy loam

Bt horizon and Bt part of E/B and B/E horizons:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam, very fine sandy loam, or fine sandy loam

C horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—3 or 4
Texture—stratified fine sand, fine sandy loam, very fine sandy loam, and silt loam

Goodman Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate in the upper layers; moderate or moderately rapid in the lower layer
Landform: Drumlins and moraines
Parent material: Primarily silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 6 to 35 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Alfic Haplorthods

Typical Pedon

Goodman silt loam, 6 to 15 percent slopes, very stony, approximately 950 feet north and 200 feet west of the southeast corner of sec. 24, T. 38 N., R. 16 E.

Oa—0 to 2 inches; black (10YR 2/1) (broken face and rubbed) muck (sapric material, which is a mat of partially decomposed forest litter); about 25 percent fiber, 10 percent rubbed; weak fine granular structure; very friable; many very fine and fine and few medium and coarse roots; very strongly acid (pH 5.0 in water 1:1); abrupt smooth boundary.

E—2 to 4 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak thick platy structure; friable; common very fine and fine and few medium and coarse roots; moderately acid; abrupt wavy boundary.

Bs—4 to 15 inches; brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common very fine and fine and few medium and coarse roots; strongly acid; abrupt wavy boundary.

E´—15 to 20 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak medium and thick platy structure; friable; few very fine and fine roots; moderately acid; clear wavy boundary.

B/E—20 to 31 inches; 80 percent brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; few faint dark brown (7.5YR 4/3) clay films on faces of some peds; penetrated by tongues of brown (10YR 5/3) silt loam (E´), very pale brown (10YR 7/3) dry; moderate fine subangular blocky structure; friable; strongly acid; clear wavy boundary.

2Bt—31 to 35 inches; brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few faint dark brown (7.5YR 3/4) clay films on faces of some peds; about 10 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

2C—35 to 62 inches; brown (7.5YR 4/4) gravelly sandy loam; massive; friable; about 20 percent gravel and 2 percent cobbles; moderately acid.

Range in Characteristics

Thickness of the solum: 30 to more than 60 inches
Thickness of the silty mantle: 12 to 40 inches
Content of gravel: 0 to 5 percent in the upper part of the solum; 3 to 30 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 10 percent throughout the profile
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0 percent
Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—silt loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or silt

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

E´ horizon and E´ part of B/E horizon:
Hue—10YR or 7.5YR
Value—5 or 6
Chroma—3
Texture—silt loam or silt

Bt part of B/E horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—silt loam

2Bt horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—loamy sand, sandy loam, fine sandy loam, or loam or the gravelly analogs of these textures

2C horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand

Goodwit Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Drumlins and moraines
Parent material: Primarily silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 1 to 6 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Goodwit silt loam, 1 to 6 percent slopes, very stony, approximately 2,520 feet south and 390 feet west of the northeast corner of sec. 34, T. 38 N., R. 16 E.

Oe—0 to 2 inches; very dark grayish brown (10YR 3/2) (broken face and rubbed) mucky peat (hemic material, which is a mat of partially decomposed forest litter); about 45 percent fiber, 20 percent rubbed; weak fine granular structure; very friable; common very fine and fine roots; strongly acid (pH 5.2 in water 1:1); abrupt wavy boundary.

A—2 to 5 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/2) dry; moderate fine and medium granular structure; friable; many fine roots; about 1 percent gravel; very strongly acid; clear wavy boundary.

E—5 to 6 inches; brown (7.5YR 5/2) silt loam, pinkish gray (7.5YR 7/2) dry; weak thick platy structure parting to moderate fine subangular blocky; friable; many fine roots; about 1 percent gravel; very strongly acid; abrupt broken boundary.

Bs—6 to 17 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; many fine roots; about 1 percent gravel; very strongly acid; clear wavy boundary.

E/B—17 to 21 inches; 70 percent brown (7.5YR 5/3) silt loam (E´), pink (7.5YR 7/3) dry; weak thick platy structure; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) silt loam (Bt); moderate fine subangular blocky structure; friable; common fine roots; about 1 percent gravel; strongly acid; clear wavy boundary.

B/E—21 to 40 inches; 60 percent brown (7.5YR 4/4) silt loam (Bt); moderate fine and medium subangular blocky structure; friable; few faint dark brown (7.5YR 3/4) clay films on faces of some peds; penetrated by tongues of brown (7.5YR 5/3) silt loam (E´), pink (7.5YR 7/3) dry; moderate fine subangular blocky structure; friable; common fine roots; few fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; about 1 percent gravel; strongly acid; clear smooth boundary.

2Bt—40 to 47 inches; reddish brown (5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few fine roots; few distinct yellowish red (5YR 5/6) clay films on faces of some peds; about 3 percent gravel and 2 percent cobbles; strongly acid; clear irregular boundary.

2C—47 to 62 inches; reddish brown (5YR 4/4) gravelly

sandy loam; massive; friable; about 12 percent gravel and 3 percent cobbles; moderately acid.

Range in Characteristics

Thickness of the solum: 30 to more than 60 inches
Thickness of the silty mantle: 12 to 40 inches
Content of gravel: 0 to 5 percent in the upper part of the solum; 3 to 30 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 10 percent throughout the profile
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0 percent
Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—silt loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or silt

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

E´ part of E/B and B/E horizons:
Hue—10YR or 7.5YR
Value—5 or 6
Chroma—3
Texture—silt loam or silt

Bt part of E/B and B/E horizons:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—silt loam

2Bt horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—sandy loam, loam, fine sandy loam, or loamy sand or the gravelly analogs of these textures

2C horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand

Iosco Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Rapid in the upper layers; moderately slow in the lower layers
Landform: Moraines
Parent material: Sandy deposits underlain by loamy or silty glacial till
Slope range: 0 to 3 percent

Taxonomic classification: Sandy over loamy, mixed, frigid Argic Endoaquods

Typical Pedon

Iosco loamy fine sand, 0 to 3 percent slopes, approximately 150 feet east and 2,600 feet north of the southwest corner of sec. 3, T. 39 N., R. 18 E.

Ap—0 to 9 inches; dark brown (7.5YR 3/2) loamy fine sand, brown (7.5YR 5/2) dry; weak medium granular structure; very friable; common fine roots; neutral; clear wavy boundary.
E—9 to 11 inches; brown (7.5YR 5/2) loamy fine sand, pinkish gray (7.5YR 6/2) dry; weak fine subangular blocky structure; very friable; common fine roots; neutral; abrupt wavy boundary.
Bs1—11 to 19 inches; dark reddish brown (5YR 3/4) loamy sand; weak fine subangular blocky structure; very friable; common fine roots; few medium distinct red (2.5YR 4/6) masses of iron accumulation; moderately acid; clear wavy boundary.
Bs2—19 to 33 inches; reddish brown (5YR 4/4) loamy sand; weak fine and medium subangular blocky structure; very friable; few fine roots; common medium prominent reddish gray (5YR 5/2) iron depletions and common fine distinct red (2.5YR 4/6) masses of iron accumulation; about 1 percent gravel; moderately acid; abrupt wavy boundary.
2Bt—33 to 44 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium angular blocky

structure; firm; few faint dark reddish brown (5YR 3/3) clay films on faces of peds; common medium distinct dark reddish gray (5YR 4/2) iron depletions; about 5 percent gravel; slightly acid; clear wavy boundary.

2C—44 to 60 inches; reddish brown (5YR 4/4) silty clay loam; massive; firm; about 5 percent gravel; neutral.

Range in Characteristics

Thickness of the sandy mantle: 20 to 40 inches
Content of gravel: 0 to 5 percent throughout the profile
Content of cobbles: 0 to 5 percent throughout the profile

Ap horizon:
Hue—10YR or 7.5YR
Value—3 or 4
Chroma—1 or 2
Texture—loamy fine sand

E horizon:
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—2
Texture—loamy sand, loamy fine sand, fine sand, or sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—loamy sand, loamy fine sand, fine sand, or sand

2Bt and 2C horizons:
Hue—5YR or 2.5YR
Value—3 or 4
Chroma—4
Texture—silt loam, loam, silty clay loam, or clay loam

Ishpeming Series

Depth class: Moderately deep to hard igneous or metamorphic bedrock
Drainage class: Somewhat excessively drained
Permeability: Rapid in the solum; very slow to rapid in the bedrock
Landform: Outwash plains and moraines
Parent material: Primarily sandy deposits underlain by igneous or metamorphic bedrock
Slope range: 1 to 35 percent

Taxonomic classification: Sandy, mixed, frigid Entic Haplorthods

Typical Pedon

Ishpeming loamy sand, in an area of Rock outcrop-Ishpeming-Vilas complex, 1 to 15 percent slopes, approximately 2,300 feet south and 700 feet east of the northwest corner of sec. 4, T. 38 N., R. 18 E.

Oe—0 to 1 inch; dark brown (7.5YR 3/2) (broken face and rubbed) mucky peat (hemic material, which is a mat of partially decomposed forest litter); about 40 percent fiber, 20 percent rubbed; weak fine granular structure; very friable; common very fine and fine roots; strongly acid (pH 5.2 in water 1:1); abrupt wavy boundary.

E—1 to 4 inches; brown (7.5YR 5/2) loamy sand, light gray (10YR 7/1) dry; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; very strongly acid; abrupt wavy boundary.

Bs1—4 to 8 inches; dark reddish brown (5YR 3/4) loamy sand; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; few small pieces of ortstein; moderately acid; clear wavy boundary.

Bs2—8 to 16 inches; brown (7.5YR 4/4) loamy sand; weak fine and medium subangular blocky structure; very friable; few fine roots; few small pieces of ortstein; moderately acid; clear wavy boundary.

BC—16 to 32 inches; strong brown (7.5YR 4/6) sand; weak coarse subangular blocky structure; very friable; about 3 percent gravel; moderately acid; abrupt smooth boundary.

2R—32 inches; schist bedrock.

Range in Characteristics

Depth to bedrock: 20 to 40 inches
Content of gravel: 0 to 10 percent throughout the solum
Content of cobbles: 0 to 10 percent throughout the solum
Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon (if it occurs):
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—loamy sand

E horizon:
Hue—7.5YR or 5YR
Value—5
Chroma—2
Texture—loamy sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—loamy sand or sand

2R layer:
Type of bedrock—igneous or metamorphic

Kinross Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Rapid
Landform: Outwash plains and stream terraces
Parent material: Primarily sandy glacial outwash
Slope range: 0 to 2 percent

Taxonomic classification: Sandy, mixed, frigid Typic Endoaquods

Typical Pedon

Kinross muck, 0 to 2 percent slopes, approximately 200 feet east and 3,100 feet north of the southwest corner of sec. 28, T. 38 N., R. 18 W.

Oa—0 to 2 inches; muck, black (N 2.5/0) broken face and rubbed; about 40 percent fiber, 5 percent rubbed; weak thin platy structure; very friable; many very fine and fine roots; fibers are primarily herbaceous; extremely acid (pH 4.0 in water 1:1); abrupt smooth boundary.

E—2 to 9 inches; brown (7.5YR 5/2) sand, pinkish gray (7.5YR 6/2) dry; weak medium subangular blocky structure; very friable; few very fine and fine roots; very strongly acid; abrupt wavy boundary.

Bhs—9 to 12 inches; dark reddish brown (5YR 3/2) sand; many fine and medium prominent strong brown (7.5YR 4/6) masses of iron accumulation; weak medium subangular blocky structure; very friable; few brittle peds; few very fine and fine roots; very strongly acid; clear wavy boundary.

Bs—12 to 17 inches; dark brown (7.5YR 3/4) sand; common fine distinct strong brown (7.5YR 4/6) masses of iron accumulation; weak medium subangular blocky structure; very friable; strongly acid; clear wavy boundary.

BC—17 to 39 inches; brown (7.5YR 4/4) sand; many fine and medium prominent yellowish red (5YR 5/8) masses of iron accumulation; weak medium and coarse subangular blocky structure; very friable; moderately acid; clear wavy boundary.

C—39 to 60 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; moderately acid.

Range in Characteristics

Thickness of the solum: 20 to 50 inches
Content of gravel: 0 to 5 percent throughout the profile

Oa horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—muck

A horizon (if it occurs):
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—loamy sand or sand

E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—1 or 2
Texture—loamy sand or sand

Bhs horizon:
Hue—7.5YR or 5YR
Value—2 to 3
Chroma—2 or 3
Texture—loamy sand or sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—loamy sand or sand

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—sand

Loxley Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow to moderately rapid
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Sphagnum moss and herbaceous organic material more than 51 inches thick
Slope range: 0 to 1 percent

Taxonomic classification: Dysic Typic Borosaprists

Typical Pedon

Loxley peat, in an area of Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes, approximately 2,000 feet south and 650 feet west of the northeast corner of sec. 32, T. 39 N., R. 15 E.

Oi—0 to 9 inches; peat, dark reddish brown (5YR 3/4) broken face and rubbed; about 90 percent fiber, 75 percent rubbed; massive; very friable; fibers are primarily sphagnum moss; few branches and twigs; extremely acid (pH 4.0 in water 1:1); clear smooth boundary.

Oa1—9 to 36 inches; muck, dark reddish brown (5YR 2.5/2) broken face and rubbed; about 30 percent fiber, 8 percent rubbed; massive; very friable; fibers are primarily herbaceous; few branches and twigs; extremely acid (pH 4.0 in water 1:1); clear smooth boundary.

Oa2—36 to 60 inches; muck, black (5YR 2.5/1) broken face and rubbed; about 20 percent fiber, 5 percent rubbed; massive; very friable; fibers are primarily herbaceous; extremely acid (pH 4.4 in water 1:1).

Range in Characteristics

Thickness of the organic material: More than 51 inches

Kind of organic material: Upper layer—peat; lower layers—dominantly muck (thin layers of mucky peat or peat in some pedons)

Content of woody fragments: 0 to 10 percent

Oi horizon:
Hue—10YR, 7.5YR, or 5YR
Value—3 or 4
Chroma—2 to 4
Texture—peat

Oa horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 to 3
Texture—muck

Lupton Series

Depth class: Very deep

Drainage class: Very poorly drained

Permeability: Moderately slow to moderately rapid

Landform: Outwash plains, glacial lake plains, and moraines

Parent material: Herbaceous and woody organic material more than 51 inches thick

Slope range: 0 to 1 percent

Taxonomic classification: Euic Typic Borosaprists

Typical Pedon

Lupton muck, in an area of Lupton, Cathro, and Markey mucks, 0 to 1 percent slopes, approximately 1,350 feet west and 1,300 feet south of the northeast corner of sec. 20, T. 38 N., R. 16 E.

Oa1—0 to 6 inches; muck, black (N 2.5/0) broken face and rubbed; about 10 percent fiber, 4 percent rubbed; weak fine and medium granular structure; very friable; fibers are primarily herbaceous; about 10 percent woody fragments; slightly alkaline (pH 7.5 in water 1:1); abrupt smooth boundary.

Oa2—6 to 22 inches; muck, black (10YR 2/1) broken face and rubbed; about 25 percent fiber, 7 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 10 percent woody fragments; neutral (pH 7.0 in water 1:1); clear smooth boundary.

Oa3—22 to 28 inches; muck, black (10YR 2/1) broken face and rubbed; about 35 percent fiber, 8 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 10 percent woody fragments; neutral (pH 7.0 in water 1:1); abrupt smooth boundary.

Oa4—28 to 40 inches; muck, black (N 2.5/0) broken face and rubbed; about 20 percent fiber, 5 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 10 percent woody fragments; neutral (pH 7.0 in water 1:1); clear smooth boundary.

Oa5—40 to 60 inches; muck, black (10YR 2/1) broken face and rubbed; about 25 percent fiber, 8 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 10 percent woody fragments; slightly alkaline (pH 7.5 in water 1:1).

Range in Characteristics

Thickness of the organic material: More than 51 inches

Kind of organic material: Dominantly muck; thin layers of mucky peat or muck in some pedons

Content of woody fragments: 5 to 30 percent

Oa horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—muck

Manitowish Series

Depth class: Very deep

Drainage class: Moderately well drained

Figure 17.—Profile of an Ellwood soil. The dark plow layer is underlain, between depths of about 8 and 15 inches, by a light-colored zone of degradation from which clay and free iron oxides have been removed. Calcium carbonate accumulations occur below a depth of about 35 inches. Depth is marked in feet.

Figure 18.—Profile of a Markey soil. The herbaceous organic material is underlain by lighter colored sandy deposits at a depth of about 36 inches. Depth is marked in feet.

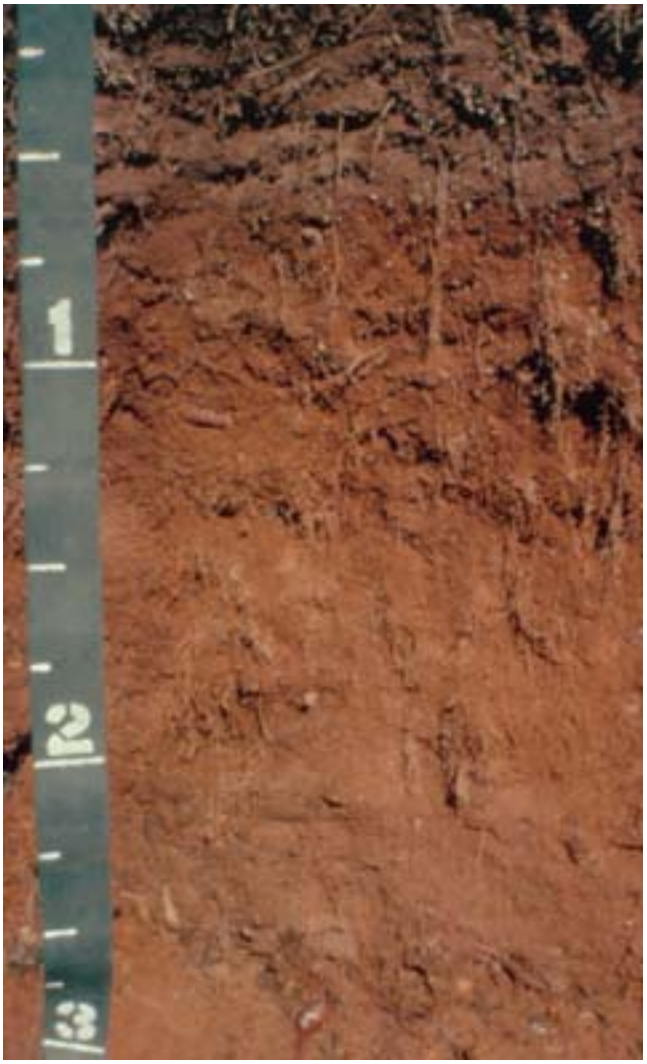

Figure 19.—Profile of a Padus soil. The dark surface layer is underlain by a lighter colored subsurface layer. Sandy and gravelly glacial outwash is at a depth of about 30 inches. Depth is marked in feet.

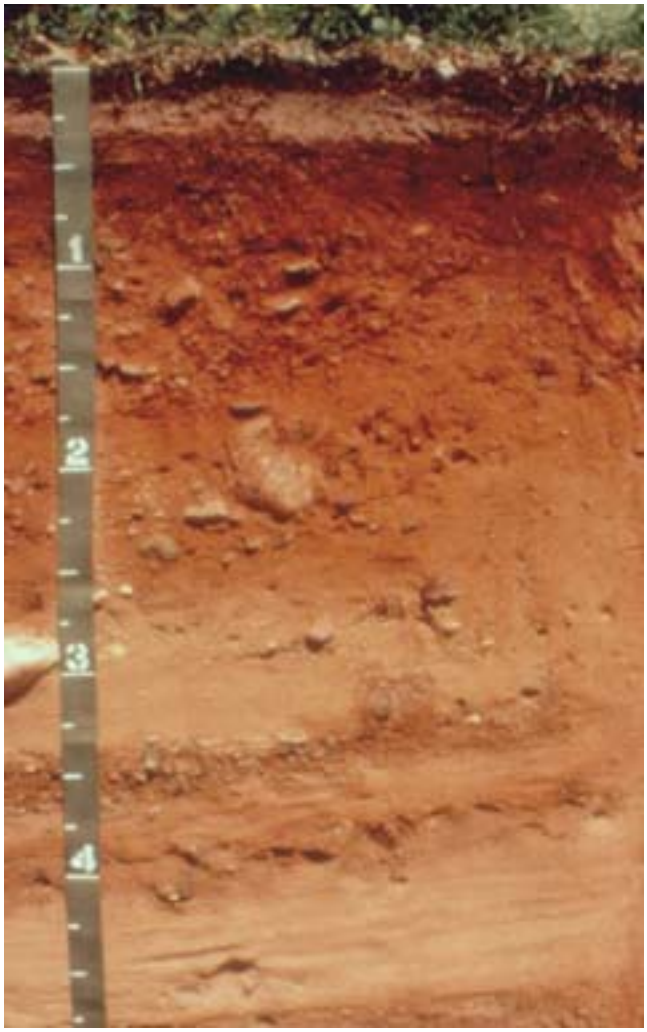

Figure 20.—Profile of a Pence soil. The thin, light-colored subsurface layer is underlain by a subsoil that has a high content of organic matter and iron and aluminum compounds. Depth is marked in feet.

Figure 21.—Profile of a Sarona soil. The top arrow indicates the leached subsurface layer. The substratum, which has undergone relatively little change since it was deposited, begins at a depth of about 48 inches and is indicated by the lower arrow. Depth is marked in feet.

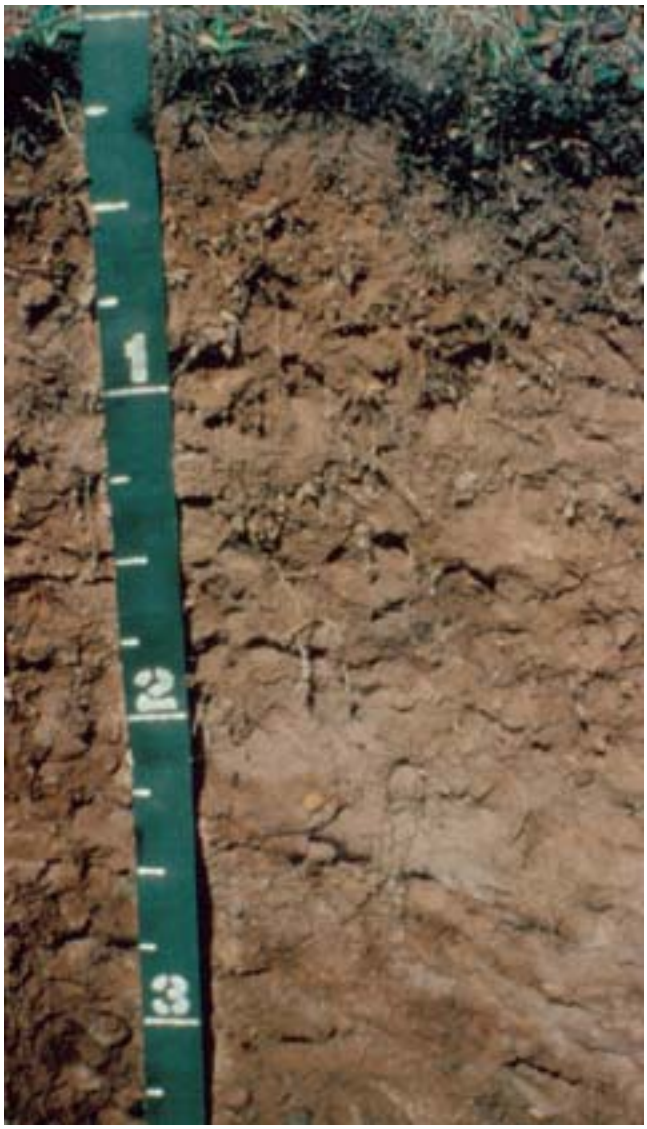

Figure 22.—Profile of a Tipler soil. The wetness characteristics are apparent in the lower part of the subsoil, where yellowish red mottles occur. Depth is marked in feet.

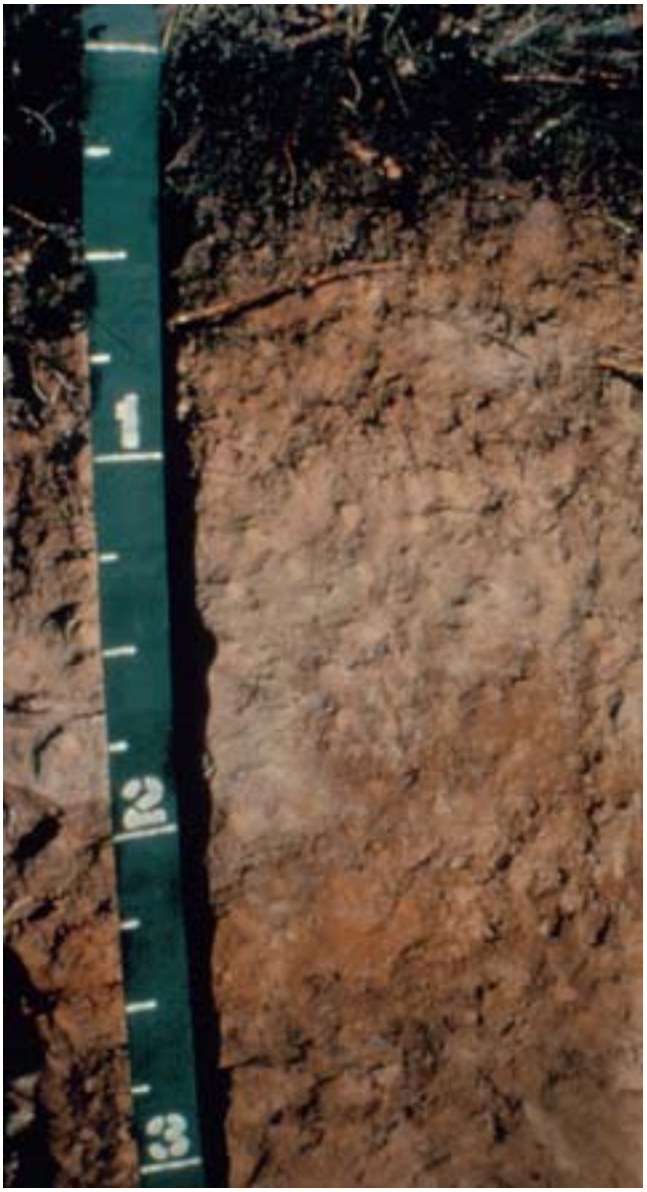

Figure 23.—Profile of a Vanzile soil. The light-colored layer between depths of about 12 and 24 inches is an eluvial layer that overlies mottled subsoil layers that have a higher content of clay. Depth is marked in feet.

Figure 24.—Profile of a Vilas soil. The top arrow indicates the surface layer. The next arrow is at the top of the subsurface layer. The third arrow indicates the upper part of the subsoil, and the bottom arrow indicates the lighter colored lower part of the subsoil. Depth is marked in feet.

Permeability: Moderate or moderately rapid in the upper layers; moderately rapid or very rapid in the lower layers
Landform: Outwash plains and stream terraces
Parent material: Primarily loamy deposits underlain by sandy and gravelly glacial outwash
Slope range: 0 to 3 percent

Taxonomic classification: Sandy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Manitowish sandy loam, 0 to 3 percent slopes, approximately 750 feet east and 1,850 feet north of the southwest corner of sec. 31, T. 38 N., R. 16 E.

Oi—0 to 2 inches; very dark grayish brown (10YR 3/2) (broken face and rubbed) peat (fibric material, which is a mat of partially decomposed forest litter); about 80 percent fiber, 45 percent rubbed; massive; very friable; many very fine and fine and few medium and coarse roots; extremely acid (pH 4.3 in water 1:1); abrupt wavy boundary.
E—2 to 4 inches; brown (7.5YR 5/2) sandy loam, pinkish gray (7.5YR 6/2) dry; weak medium subangular blocky structure; very friable; many very fine and fine and few medium and coarse roots; about 5 percent gravel; very strongly acid; abrupt smooth boundary.
Bs1—4 to 13 inches; dark brown (7.5YR 3/4) sandy loam; weak medium subangular blocky structure; very friable; many very fine and fine and few medium and coarse roots; about 10 percent gravel; very strongly acid; abrupt wavy boundary.
2Bs2—13 to 18 inches; brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; common very fine and fine and few medium and coarse roots; about 10 percent gravel; strongly acid; clear wavy boundary.
2BC—18 to 29 inches; strong brown (7.5YR 5/6) gravelly sand; single grain; loose; few very fine and fine roots; about 15 percent gravel and 3 percent cobbles; moderately acid; clear wavy boundary.
2C—29 to 62 inches; strong brown (7.5YR 4/6), stratified sand and gravelly sand; few fine distinct strong brown (7.5YR 5/8) masses of iron accumulation; single grain; loose; about 15 percent gravel and 3 percent cobbles; slightly acid.

Range in Characteristics

Thickness of the solum: 18 to 36 inches
Content of gravel: 0 to 35 percent in the solum; 15 to 35 percent in the substratum
Content of cobbles: 0 to 5 percent throughout the profile

Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric, hemic, or fibric material

A horizon (if it occurs):
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—sandy loam

E horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—2
Texture—sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam

2Bs horizon:
Hue—7.5YR or 5YR
Value—4
Chroma—4
Texture—loamy sand or gravelly loamy sand

2C horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—4 or 6
Texture—gravelly sand, gravelly coarse sand, stratified sand and gravelly sand, or stratified sand and gravelly coarse sand

Markey Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow to moderately rapid in the organic material; very rapid in the substratum
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Herbaceous organic material 16 to 51 inches thick over sandy or sandy and gravelly deposits
Slope range: 0 to 1 percent

Taxonomic classification: Sandy or sandy-skeletal, mixed, euic Terric Borosaprists

Typical Pedon

Markey muck (fig. 18), in an area of Lupton, Cathro, and Markey mucks, 0 to 1 percent slopes, approximately 150 feet south and 200 feet east of the northwest corner of sec. 12, T. 38 N., R. 17 E.

Oa—0 to 17 inches; muck, black (N 2.5/0) broken face and rubbed; about 35 percent fiber, 5 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 5 percent sand; neutral (pH 6.8 in water 1:1); clear wavy boundary.

Oe—17 to 21 inches; mucky peat, black (N 2.5/0) broken face and rubbed; about 50 percent fiber, 15 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 10 percent sand; neutral (pH 6.8 in water 1:1); clear smooth boundary.

O´a—21 to 36 inches; muck, black (N 2.5/0) broken face and rubbed; about 30 percent fiber, 8 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 10 percent sand; neutral (pH 6.9 in water 1:1); abrupt smooth boundary.

2C—36 to 60 inches; grayish brown (10YR 5/2) sand; single grain; loose; few thin strata and pockets of loamy sand; about 3 percent gravel; neutral.

Range in Characteristics

Thickness of the organic material: 16 to 51 inches
Kind of organic material: Dominantly muck; thin layers of mucky peat or peat in most pedons
Content of woody fragments: 0 to 10 percent

Oa horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 3
Texture—muck

2C horizon:
Hue—2.5Y, 10YR, 7.5YR, or N
Value—4 to 6
Chroma—0 to 4
Texture—sand, fine sand, loamy fine sand, or gravelly sand

Metonga Series

Depth class: Moderately deep to hard igneous or metamorphic bedrock
Drainage class: Well drained
Permeability: Moderate in the solum; very slow to rapid in the bedrock
Landform: Moraines
Parent material: Primarily loamy deposits over loamy glacial till underlain by igneous or metamorphic bedrock
Slope range: 1 to 35 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Entic Haplorthods

Typical Pedon

Metonga fine sandy loam, in an area of Rock outcrop-Metonga-Sarona complex, 1 to 15 percent slopes, approximately 300 feet south of the northwest corner of sec. 2, T. 38 N., R. 17 E.

Oe—0 to 1 inch; dark brown (7.5YR 3/2) (broken face and rubbed) mucky peat (hemic material, which is a mat of partially decomposed forest litter); about 50 percent fiber, 20 percent rubbed; weak fine granular structure; very friable; many very fine and fine roots; very strongly acid (pH 4.9 in water 1:1); abrupt wavy boundary.

A—1 to 2 inches; black (10YR 2/1) fine sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; many very fine and fine roots; very strongly acid; abrupt smooth boundary.

E—2 to 4 inches; brown (7.5YR 5/2) fine sandy loam, light gray (10YR 7/1) dry; weak fine subangular blocky structure; very friable; many very fine and fine roots; strongly acid; abrupt wavy boundary.

Bs1—4 to 9 inches; dark reddish brown (5YR 3/4) fine sandy loam; moderate fine and medium subangular blocky structure; friable; many very fine and fine roots; about 5 percent gravel; strongly acid; clear wavy boundary.

Bs2—9 to 17 inches; brown (7.5YR 4/4) fine sandy loam; moderate fine and medium subangular blocky structure; friable; common fine roots; about 5 percent gravel; moderately acid; clear wavy boundary.

2Bw—17 to 39 inches; dark reddish brown (5YR 3/4) gravelly sandy loam; weak medium subangular blocky structure; friable; few fine roots; about 15 percent gravel; moderately acid; abrupt irregular boundary.

3R—39 inches; granite bedrock.

Range in Characteristics

Depth to bedrock: 20 to 40 inches
Content of gravel: 0 to 5 percent in the upper layers; 5 to 35 percent in the till
Content of cobbles: 0 to 5 percent in the upper layers; 0 to 10 percent in the till
Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—fine sandy loam

E horizon:
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—fine sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—fine sandy loam or sandy loam

2Bw horizon:
Hue—7.5YR or 5YR
Value—3 to 6
Chroma—3 or 4
Texture—sandy loam or gravelly sandy loam

3R layer:
Type of bedrock—igneous or metamorphic

Minocqua Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate in the upper layers; rapid or very rapid in the lower layers
Landform: Outwash plains and stream terraces
Parent material: Primarily loamy deposits underlain by sandy or sandy and gravelly glacial outwash
Slope range: 0 to 2 percent

Taxonomic classification: Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, frigid Typic Endoaquepts

Typical Pedon

Minocqua muck, 0 to 2 percent slopes, approximately 2,900 feet south and 1,650 feet east of the northwest corner of sec. 26, T. 38 N., R. 19 E.

Oa—0 to 5 inches; muck, black (N 2.5/0) broken face and rubbed; about 30 percent fiber, 2 percent rubbed; weak fine granular structure; very friable; many very fine and fine roots; fibers are primarily herbaceous; few branches and twigs; moderately acid (pH 6.0 in water 1:1); abrupt wavy boundary.

Eg—5 to 13 inches; grayish brown (10YR 5/2) fine sandy loam, light gray (10YR 7/2) dry; weak thick platy structure parting to weak fine subangular blocky; friable; common fine and very fine roots; few very dark gray (10YR 3/1) root channels; about 1 percent gravel; strongly acid; clear wavy boundary.

Bg—13 to 21 inches; gray (5Y 6/1) fine sandy loam; moderate medium and coarse subangular blocky structure; friable; few very fine and fine roots; many fine and medium prominent dark yellowish brown (10YR 4/6) masses of iron accumulation; about 1 percent gravel; very strongly acid; abrupt wavy boundary.

2BCg—21 to 25 inches; olive gray (5Y 4/2) gravelly loamy coarse sand; weak medium and coarse subangular blocky structure; very friable; few fine prominent light yellowish brown (2.5Y 6/4) masses of iron accumulation; about 15 percent gravel; strongly acid; clear wavy boundary.

2Cg—25 to 60 inches; grayish brown (2.5Y 5/2) sand with a few thin strata of gravelly sand; single grain; loose; few fine distinct light yellowish brown (2.5Y 6/4) masses of iron accumulation; about 3 percent gravel; slightly acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Thickness of the loamy mantle: 20 to 40 inches
Content of gravel: 0 to 15 percent in the solum; 3 to 50 percent in the substratum
Content of cobbles: 0 to 5 percent throughout the profile

Oa horizon:
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—muck

A horizon (if it occurs):
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam, loam, sandy loam, or fine sandy loam or the mucky analogs of these textures

Eg horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—1 or 2
Texture—silt loam, loam, sandy loam, or fine sandy loam

Bg horizon:
Hue—5Y, 2.5Y, 10YR, or 7.5YR
Value—4 to 6
Chroma—1 or 2
Texture—silt loam, loam, sandy loam, or fine sandy loam

2C horizon:
Hue—5Y, 2.5Y, 10YR, or 7.5YR
Value—4 to 6
Chroma—2 to 4
Texture—sand or coarse sand or the gravelly or very gravelly analogs of these textures

Morganlake Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderately rapid or rapid in the upper layers; moderately slow in the lower layers
Landform: Moraines
Parent material: Sandy deposits underlain by silty or loamy glacial till
Slope range: 0 to 6 percent

Taxonomic classification: Sandy over loamy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Morganlake loamy fine sand, 0 to 6 percent slopes, approximately 1,800 feet west and 1,800 feet north of the southeast corner of sec. 16, T. 39 N., R. 18 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) loamy fine sand, grayish brown (10YR 5/2) dry; weak medium granular structure; very friable; many very fine and fine and few medium roots; strongly acid; abrupt smooth boundary.

E—7 to 8 inches; brown (7.5YR 5/2) loamy fine sand, light gray (5YR 7/1) dry; weak fine subangular blocky structure; very friable; common very fine and fine roots; moderately acid; abrupt broken boundary.

Bs1—8 to 11 inches; dark brown (7.5YR 3/4) loamy fine sand; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; strongly acid; clear wavy boundary.

Bs2—11 to 26 inches; brown (7.5YR 4/4) loamy fine sand; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; moderately acid; abrupt wavy boundary.

Bw—26 to 31 inches; strong brown (7.5YR 4/6) loamy fine sand; weak thick platy structure; very friable; few very fine and fine roots; common fine and medium distinct strong brown (7.5YR 5/6 and 5/8) masses of iron accumulation; about 3 percent gravel; moderately acid; abrupt smooth boundary.

2B/E—31 to 40 inches; about 80 percent dark reddish brown (5YR 3/4) silty clay loam (2Bt); moderate medium prismatic structure parting to strong medium angular blocky; firm; common distinct dark reddish brown (2.5YR 3/4) clay films on faces of some peds and in some pores; penetrated by tongues of brown (7.5YR 5/3) silt loam (2E´), pink (7.5YR 7/3) dry; weak medium subangular blocky structure; friable; few very fine and fine roots; few fine and medium prominent and distinct strong brown (7.5YR 5/6 and 5/8) masses of iron accumulation; about 4 percent gravel; moderately acid; clear wavy boundary.

2C—40 to 60 inches; dark reddish brown (2.5YR 3/4) silty clay loam; massive; firm; about 4 percent gravel; neutral.

Range in Characteristics

Thickness of the sandy mantle: 20 to 40 inches
Content of gravel: 0 to 5 percent in the upper part of the solum; 3 to 15 percent in the lower part of the solum and in the substratum

Ap horizon:
Hue—10YR, 7.5YR, or 5YR
Value—3 or 4
Chroma—2 or 3
Texture—loamy fine sand

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2
Texture—sand, loamy sand, loamy fine sand, or fine sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sand, loamy sand, loamy fine sand, or fine sand

Bw horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—4 or 6
Texture—sand, loamy sand, or loamy fine sand

2E´ part of 2B/E horizon:
Hue—7.5YR, 5YR, or 2.5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam, loam, sandy loam, fine sandy loam, clay loam, or silty clay loam

2Bt part of 2B/E horizon and 2C horizon:
Hue—5YR or 2.5YR
Value—3 or 4
Chroma—4
Texture—silt loam, loam, silty clay loam, or clay loam

Mudlake Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate in the upper layers; moderate or moderately rapid in the lower layers
Landform: Drumlins and moraines
Parent material: Silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 1 to 6 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Alfic Epiaquods

Typical Pedon

Mudlake silt loam, 1 to 6 percent slopes, very stony, approximately 1,200 feet east and 2,800 feet south of the northwest corner of sec. 32, T. 39 N., R. 17 E.

A—0 to 4 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; very friable; many very fine and fine and common medium and coarse roots; about 1 percent gravel and 1 percent cobbles; moderately acid; abrupt wavy boundary.

E—4 to 5 inches; brown (7.5YR 5/2) silt loam, pinkish gray (7.5YR 6/2) dry; moderate medium platy structure; friable; common very fine and fine and few medium and coarse roots; about 1 percent gravel and 1 percent cobbles; strongly acid; abrupt broken boundary.

Bs—5 to 12 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few very fine and fine roots; common fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; about 1 percent gravel and 1 percent cobbles; moderately acid; clear wavy boundary.

E/B—12 to 27 inches; 70 percent brown (10YR 5/3) silt loam (E´), very pale brown (10YR 7/3) dry; moderate medium subangular blocky structure; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; few very fine and fine roots; few fine distinct and prominent strong brown (7.5YR 5/6) masses of iron accumulation and few fine distinct brown (7.5YR 5/2) iron depletions; about 1 percent gravel and 1 percent cobbles; moderately acid; clear wavy boundary.

Bt1—27 to 34 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few faint brown (7.5YR 4/3) clay films on faces of some peds; common medium distinct strong brown (7.5YR 5/6) masses of iron accumulation and few fine distinct brown (7.5YR 5/2) iron depletions; about 1 percent gravel and 1 percent cobbles; moderately acid; clear wavy boundary.

2Bt2—34 to 43 inches; reddish brown (5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few faint brown (7.5YR 4/3) clay films on faces of some peds; few fine distinct yellowish red (5YR 4/6) masses of iron accumulation; about 12 percent gravel and 1 percent cobbles; moderately acid; clear wavy boundary.

2C—43 to 70 inches; reddish brown (5YR 4/4) sandy loam; massive; friable; about 12 percent gravel and 1 percent cobbles; moderately acid.

Range in Characteristics

Thickness of the solum: 30 to more than 60 inches
Thickness of the silty mantle: 12 to 40 inches
Content of gravel: 0 to 5 percent in the upper part of the solum; 5 to 35 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 15 percent throughout the profile
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0 percent

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or silt

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4

Chroma—4
Texture—silt loam

E´ part of E/B horizon:
Hue—10YR, 7.5YR, or 5YR
Value—5 or 6
Chroma—3
Texture—silt loam or silt

Bt horizon and Bt part of E/B horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—silt loam

2Bt horizon:
Hue—7.5YR or 5YR
Value—3 to 6
Chroma—4 or 6
Texture—loam, fine sandy loam, sandy loam, or loamy sand or the gravelly or cobbly analogs of these textures

2C horizon:
Hue—7.5YR or 5YR
Value—3 to 6
Chroma—4 or 6
Texture—sandy loam or loamy sand or the gravelly or cobbly analogs of these textures

Padus Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate in the solum; rapid or very rapid in the substratum
Landform: Outwash plains, stream terraces, eskers, kames, drumlins, and moraines
Parent material: Loamy deposits underlain by sandy or sandy and gravelly glacial outwash
Slope range: 0 to 35 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Alfic Haplorthods

Typical Pedon

Padus sandy loam (fig. 19), 0 to 6 percent slopes, approximately 2,100 feet west and 150 feet north of the southeast corner of sec. 30, T. 38 N., R. 16 E.

A—0 to 2 inches; dark brown (7.5YR 3/2) sandy loam, gray (N 5/0) dry; moderate medium and fine granular structure; friable; many very fine and fine and few medium and coarse roots; very strongly acid; abrupt wavy boundary.

E—2 to 3 inches; pinkish gray (7.5YR 6/2) sandy loam, pinkish gray (7.5YR 7/2) dry; weak medium subangular blocky structure; very friable; many very fine and fine and few medium and coarse roots; very strongly acid; abrupt broken boundary.

Bs1—3 to 8 inches; dark brown (7.5YR 3/4) sandy loam; moderate medium subangular blocky structure; friable; common very fine and fine and few medium and coarse roots; very strongly acid; abrupt wavy boundary.

Bs2—8 to 19 inches; brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; common very fine and fine and few medium and coarse roots; very strongly acid; clear wavy boundary.

E/B—19 to 26 inches; about 85 percent brown (10YR 5/3) sandy loam (E´), very pale brown (10YR 7/3) dry; weak very thick platy structure; friable; extending into and surrounding remnants of brown (7.5YR 4/4) sandy loam (Bt); moderate medium subangular blocky structure; friable; few fine roots; very strongly acid; gradual wavy boundary.

B/E—26 to 38 inches; about 80 percent brown (7.5YR 4/4) sandy loam (Bt); moderate medium and coarse subangular blocky structure; friable; few faint dark brown (7.5YR 3/4) clay films on faces of peds; penetrated by tongues of brown (10YR 5/3) sandy loam (E´), very pale brown (10YR 7/3) dry; moderate fine subangular blocky structure; friable; about 12 percent gravel; very strongly acid; abrupt wavy boundary.

2C—38 to 60 inches; yellowish brown (10YR 5/4), stratified sand and gravelly coarse sand; single grain; loose; about 20 percent gravel; slightly acid.

Range in Characteristics

Thickness of the solum: 24 to 40 inches
Thickness of the loamy mantle: 24 to 40 inches
Content of gravel: 0 to 15 percent in the upper part of the solum; 3 to 50 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 5 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 or 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—sandy loam

E horizon:
Hue—10YR, 7.5YR, or 5YR

Value—4 to 6
Chroma—2 or 3
Texture—sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam

E´ part of E/B and B/E horizons:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—3
Texture—sandy loam, fine sandy loam, or loam

Bt part of E/B and B/E horizons:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—sandy loam, fine sandy loam, or loam

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—stratified sand or coarse sand or the gravelly or very gravelly analogs of these textures

Pence Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderate or moderately rapid in the upper layers; moderately rapid to very rapid in the lower layers
Landform: Outwash plains, stream terraces, eskers, and kames
Parent material: Loamy deposits underlain by sandy and gravelly glacial outwash
Slope range: 0 to 35 percent

Taxonomic classification: Sandy, mixed, frigid Entic Haplorthods

Typical Pedon

Pence sandy loam (fig. 20), 0 to 6 percent slopes, approximately 3,100 feet north and 2,400 feet east of the southwest corner of sec. 8, T. 39 N., R. 19 E.

A—0 to 3 inches; black (N 2.5/0) sandy loam, dark gray (10YR 4/1) dry; weak fine and medium granular structure; very friable; many very fine and fine and few medium roots; many uncoated sand grains; few charcoal fragments; strongly acid; abrupt smooth boundary.

E—3 to 4 inches; brown (7.5YR 5/2) sandy loam, pinkish gray (7.5YR 7/2) dry; weak fine subangular blocky structure; very friable; common very fine and fine roots; strongly acid; abrupt smooth boundary.

Bs1—4 to 7 inches; dark brown (7.5YR 3/4) sandy loam; weak medium subangular blocky structure; very friable; common very fine and fine roots; few black (10YR 2/1) wormcasts; about 1 percent gravel; strongly acid; clear wavy boundary.

Bs2—7 to 15 inches; brown (7.5YR 4/4) sandy loam; weak medium and coarse subangular blocky structure; very friable; few very fine and fine roots; about 1 percent gravel; strongly acid; clear wavy boundary.

2BC—15 to 31 inches; strong brown (7.5YR 4/6) gravelly coarse sand; weak coarse subangular blocky structure; very friable; about 25 percent gravel; slightly acid; clear wavy boundary.

2C—31 to 60 inches; brown (7.5YR 5/4), stratified sand and gravelly coarse sand; single grain; loose; about 20 percent gravel; slightly acid.

Range in Characteristics

Thickness of the solum: 18 to 36 inches
Thickness of the loamy mantle: 10 to 20 inches
Content of gravel: 0 to 35 percent in the upper part of the solum; 3 to 35 percent in the lower part of the solum; 15 to 35 percent in the substratum
Content of cobbles: 0 to 10 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—hemic or sapric material

A horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sandy loam

E horizon:
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—2
Texture—sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam, loam, gravelly sandy loam, or gravelly loam

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—4 or 6
Texture—gravelly sand, gravelly coarse sand, stratified sand and gravelly sand, or stratified sand and gravelly coarse sand

Robago Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Primarily loamy deposits underlain by stratified lacustrine deposits
Slope range: 0 to 2 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Argic Endoaquods

Typical Pedon

Robago fine sandy loam, 0 to 2 percent slopes, approximately 1,350 feet south and 700 feet east of the northwest corner of sec. 36, T. 38 N., R. 16 E.

Oa—0 to 2 inches; black (10YR 2/1) (broken face and rubbed) muck (sapric material, which is a mat of partially decomposed forest litter); about 40 percent fiber, 10 percent rubbed; weak fine granular structure; very friable; many very fine and fine and few medium and coarse roots; extremely acid (pH 4.3 in water 1:1); abrupt wavy boundary.

E—2 to 7 inches; grayish brown (10YR 5/2) fine sandy loam, light gray (10YR 7/1) dry; weak medium platy structure; friable; few very fine and fine roots; very strongly acid; clear broken boundary.

Bs1—7 to 11 inches; dark brown (7.5YR 3/4) fine sandy loam; weak medium and coarse subangular blocky structure; friable; few fine prominent yellowish red (5YR 5/6) masses of iron accumulation; very strongly acid; clear wavy boundary.

Bs2—11 to 17 inches; brown (7.5YR 4/4) fine sandy loam; weak medium and coarse subangular blocky structure; friable; many fine distinct strong brown (7.5YR 4/6) masses of iron accumulation; strongly acid; clear wavy boundary.

E´—17 to 20 inches; brown (10YR 5/3) fine sandy loam, very pale brown (10YR 7/3) dry; weak very thick platy structure; friable; many fine prominent strong brown (7.5YR 5/8) masses of iron accumulation; moderately acid; clear wavy boundary.

E/B—20 to 27 inches; 70 percent brown (10YR 5/3) fine sandy loam (E´), very pale brown (10YR 7/3) dry; weak very thick platy structure; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) fine sandy loam (Bt); moderate medium and coarse subangular blocky structure; friable; few faint brown (7.5YR 4/3) clay films on faces of some peds; many medium prominent yellowish red (5YR 4/6) masses of iron accumulation and few fine faint and prominent light brownish gray (10YR 6/2) iron depletions; slightly acid; clear wavy boundary.

B/E—27 to 38 inches; 70 percent brown (7.5YR 4/4) fine sandy loam (Bt); moderate medium and coarse subangular blocky structure; friable; few faint brown (7.5YR 4/3) clay films on faces of some peds; penetrated by tongues of brown (10YR 5/3) fine sandy loam (E´), very pale brown (10YR 7/3) dry; moderate fine subangular blocky structure; friable; many medium prominent red (2.5YR 4/8) masses of iron accumulation and few fine prominent and faint light brownish gray (10YR 6/2) iron depletions; slightly acid; abrupt wavy boundary.

C—38 to 62 inches; dark yellowish brown (10YR 4/4), stratified very fine sandy loam and silt loam with thin strata of very fine sand and fine sand; massive; friable; many medium distinct grayish brown (10YR 5/2) iron depletions and many medium prominent strong brown (7.5YR 4/6) masses of iron accumulation; neutral.

Range in Characteristics

Thickness of the solum: 24 to 40 inches
Content of gravel: 0 to 10 percent throughout the profile
Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon (if it occurs):
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—fine sandy loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—5 or 6
Chroma—2
Texture—fine sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—fine sandy loam or sandy loam

E´ horizon and E´ part of E/B and B/E horizons:
Hue—10YR, 7.5YR, or 5YR
Value—5
Chroma—3
Texture—sandy loam or fine sandy loam

Bt part of E/B and B/E horizons:
Hue—7.5YR or 5YR
Value—4
Chroma—4
Texture—fine sandy loam or sandy loam

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—4
Texture—stratified fine sand, very fine sand, very fine sandy loam, and silt loam

Rousseau Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Rapid
Landform: Outwash plains, moraines, and glacial lake plains
Parent material: Sandy glacial outwash or lacustrine deposits
Slope range: 0 to 15 percent

Taxonomic classification: Sandy, mixed, frigid Entic Haplorthods

Typical Pedon

Rousseau loamy fine sand, 0 to 6 percent slopes, approximately 1,200 feet south and 100 feet east of the northwest corner of sec. 3, T. 38 N., R. 19 E.

A—0 to 3 inches; very dark gray (10YR 3/1) loamy fine sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; many very fine and fine and few medium and coarse roots; moderately acid; abrupt wavy boundary.
E—3 to 6 inches; brown (7.5YR 4/2) loamy fine sand, pinkish gray (7.5YR 6/2) dry; weak fine subangular blocky structure; very friable; common very fine and fine and few medium and coarse roots; very strongly acid; clear wavy boundary.
Bs—6 to 12 inches; dark brown (7.5YR 3/4) loamy fine sand; weak fine subangular blocky structure; very friable; common very fine and fine and few medium and coarse roots; strongly acid; clear wavy boundary.
BC1—12 to 31 inches; brown (7.5YR 4/4) fine sand; weak fine subangular blocky structure; very friable; common very fine and fine and few medium and coarse roots; strongly acid; clear wavy boundary.
BC2—31 to 36 inches; brown (7.5YR 5/4) fine sand; weak coarse subangular blocky structure; very friable; few very fine and fine roots; strongly acid; clear wavy boundary.
C—36 to 60 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; strongly acid.

Range in Characteristics

Thickness of the solum: 20 to 45 inches

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—loamy fine sand

E horizon:
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—2
Texture—fine sand or loamy fine sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—fine sand or loamy fine sand

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—5 or 6
Chroma—3 to 6
Texture—fine sand

Sarona Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate or moderately rapid
Landform: Drumlins and moraines
Parent material: Primarily loamy deposits underlain by

loamy or sandy glacial till or glacial mudflow sediment

Slope range: 1 to 35 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Alfic Haplorthods

Typical Pedon

Sarona fine sandy loam (fig. 21), 1 to 6 percent slopes, very stony, approximately 70 feet east and 300 feet north of the southwest corner of sec. 24, T. 38 N., R. 17 E.

Oa—0 to 1 inch; black (10YR 2/1) (broken face and rubbed) muck (sapric material, which is a mat of partially decomposed forest litter); about 25 percent fiber, 5 percent rubbed; weak fine granular structure; very friable; extremely acid (pH 4.3 in water 1:1); abrupt wavy boundary.

E—1 to 3 inches; brown (7.5YR 5/2) fine sandy loam, pinkish gray (7.5YR 6/2) dry; weak thick platy structure; friable; many very fine and fine and few medium and coarse roots; about 5 percent gravel and 2 percent cobbles; very strongly acid; abrupt wavy boundary.

Bs—3 to 17 inches; brown (7.5YR 4/4) fine sandy loam; weak fine and medium subangular blocky structure; friable; many very fine and fine and common medium and coarse roots; about 5 percent gravel and 2 percent cobbles; moderately acid; abrupt wavy boundary.

E/B—17 to 29 inches; about 60 percent brown (7.5YR 5/3) fine sandy loam (E´), pink (7.5YR 7/3) dry; weak thick platy structure; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) sandy loam (Bt); moderate medium subangular blocky structure; friable; common very fine and fine roots; about 8 percent gravel and 2 percent cobbles; slightly brittle; moderately acid; clear wavy boundary.

B/E—29 to 48 inches; about 60 percent dark reddish brown (5YR 3/4) gravelly sandy loam (Bt); weak fine subangular blocky structure; friable; breaks to weak thick plates along horizontal cleavage planes inherited from the parent material; common faint reddish brown (5YR 4/4) clay films on faces of peds; penetrated by tongues of brown (7.5YR 5/3) gravelly loamy sand (E´), pink (7.5YR 7/3) dry; weak medium platy structure; friable; few very fine and fine roots; many very fine and fine and few medium vesicular pores; about 15 percent gravel and 5 percent cobbles; slightly brittle; moderately acid; abrupt wavy boundary.

Bt—48 to 66 inches; dark reddish brown (5YR 3/4) gravelly sandy loam; weak fine subangular blocky structure; friable; breaks to weak thick plates along horizontal cleavage planes inherited from the parent material; many very fine and fine and few medium vesicular pores; common faint reddish brown (5YR 4/4) clay films on faces of peds and in some pores; about 15 percent gravel and 5 percent cobbles; slightly brittle; moderately acid; gradual wavy boundary.

C—66 to 73 inches; reddish brown (5YR 4/4) gravelly sandy loam; massive; friable; about 20 percent gravel and 5 percent cobbles; slightly acid.

Range in Characteristics

Thickness of the solum: 35 to more than 60 inches

Content of gravel: 1 to 35 percent throughout the profile

Content of cobbles: 0 to 10 percent throughout the profile

Content of stones: 0 to 5 percent throughout the profile

Percent of surface covered by stones: 0.1 to 3.0 percent

Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
- Hue—10YR, 7.5YR, or N
- Value—2 to 3
- Chroma—0 to 2
- Texture—sapric or hemic material

A horizon (if it occurs):
- Hue—10YR, 7.5YR, or 5YR
- Value—2 to 3
- Chroma—1 or 2
- Texture—fine sandy loam

E horizon:
- Hue—10YR, 7.5YR, or 5YR
- Value—4 to 6
- Chroma—2 or 3
- Texture—fine sandy loam

Bs horizon:
- Hue—7.5YR or 5YR
- Value—3 or 4
- Chroma—4
- Texture—fine sandy loam or sandy loam

E´ part of E/B and B/E horizons:
- Hue—10YR, 7.5YR, or 5YR
- Value—5 or 6
- Chroma—3
- Texture—fine sandy loam, sandy loam, loamy sand, or loamy fine sand or the gravelly analogs of these textures

Bt horizon and Bt part of E/B and B/E horizons:
Hue—10YR, 7.5YR, 5YR, or 2.5YR
Value—3 or 4
Chroma—4 or 6
Texture—loamy sand, sandy loam, gravelly loamy sand, or gravelly sandy loam

C horizon:
Hue—10YR, 7.5YR, 5YR, or 2.5YR
Value—4 to 6
Chroma—4 or 6
Texture—loamy sand, sandy loam, gravelly loamy sand, or gravelly sandy loam

Sayner Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Moderately rapid or rapid in the solum; rapid or very rapid in the substratum
Landform: Outwash plains, stream terraces, kames, and eskers
Parent material: Primarily sandy deposits underlain by sandy and gravelly glacial outwash
Slope range: 0 to 30 percent

Taxonomic classification: Sandy, mixed, frigid Entic Haplorthods

Typical Pedon

Sayner loamy sand, 6 to 15 percent slopes, approximately 400 feet west and 2,200 feet south of the northeast corner of sec. 4, T. 40 N., R. 15 E.

Oe—0 to 3 inches; black (10YR 2/1) (broken face and rubbed) mucky peat (hemic material, which is a mat of partially decomposed forest litter); about 50 percent fiber, 20 percent rubbed; weak fine granular structure; very friable; many very fine and fine roots; extremely acid (pH 4.2 in water 1:1); abrupt wavy boundary.
E—3 to 4 inches; dark reddish gray (5YR 4/2) loamy sand, pinkish gray (5YR 6/2) dry; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; about 5 percent gravel; very strongly acid; clear wavy boundary.
Bs1—4 to 7 inches; dark reddish brown (5YR 3/4) loamy sand; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; about 5 percent gravel; strongly acid; clear wavy boundary.
Bs2—7 to 17 inches; reddish brown (5YR 4/4) loamy sand; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; about 5 percent gravel; strongly acid; clear wavy boundary.
Bs3—17 to 27 inches; brown (7.5YR 4/4) gravelly sand; weak coarse subangular blocky structure; very friable; few very fine and fine roots; about 15 percent gravel; moderately acid; abrupt wavy boundary.
C—27 to 63 inches; strong brown (7.5YR 5/6) gravelly sand; single grain; loose; about 25 percent gravel; moderately acid.

Range in Characteristics

Thickness of the solum: 12 to 36 inches
Content of gravel: 0 to 35 percent in the solum; 15 to 35 percent in the substratum
Content of cobbles: 0 to 10 percent throughout the profile
Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon (if it occurs):
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—loamy sand

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2
Texture—loamy sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—loamy sand, sand, gravelly loamy sand, or gravelly sand

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—4 or 6
Texture—gravelly sand, stratified sand and gravelly sand, or stratified sand and gravelly coarse sand

Soperton Series

Depth class: Moderately deep to a fragipan
Drainage class: Well drained
Permeability: Moderate in the upper layers, slow in the fragipan, and moderate or moderately rapid in the substratum
Landform: Drumlins and moraines
Parent material: Primarily silty deposits underlain by loamy or sandy glacial till or glacial mudflow sediment
Slope range: 15 to 35 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Alfic Fragiorthods

Typical Pedon

Soperton silt loam, in an area of Soperton-Goodman silt loams, 15 to 35 percent slopes, very stony, approximately 1,100 feet east and 20 feet south of the northwest corner of sec. 8, T. 40 N., R. 15 E.

Oa—0 to 1 inch; black (10YR 2/1) (broken face and rubbed) muck (sapric material, which is a mat of partially decomposed forest litter); about 25 percent fiber, 10 percent rubbed; weak fine granular structure; very friable; many very fine and fine and common medium roots; extremely acid (pH 4.1 in water 1:1); abrupt smooth boundary.

A—1 to 3 inches; black (10YR 2/1) silt loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; many very fine and fine and common medium roots; moderately acid; abrupt wavy boundary.

E—3 to 5 inches; brown (7.5YR 5/2) silt loam, pinkish gray (7.5YR 6/2) dry; weak thick platy structure; friable; common very fine and fine and few medium roots; moderately acid; abrupt broken boundary.

Bs1—5 to 9 inches; dark brown (7.5YR 3/4) silt loam; moderate fine and medium subangular blocky structure; friable; few very fine, fine, and medium roots; strongly acid; clear wavy boundary.

Bs2—9 to 15 inches; brown (7.5YR 4/4) silt loam; moderate fine subangular blocky structure; friable; few very fine, fine, and medium roots; moderately acid; clear wavy boundary.

E´—15 to 22 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; moderate thick platy structure; friable; few very fine and fine roots; moderately acid; clear wavy boundary.

2B/Ex—22 to 31 inches; 80 percent brown (7.5YR 4/4) sandy loam (2Bt); strong coarse prismatic structure parting to moderate medium subangular blocky; firm; brittle; few faint dark brown (7.5YR 3/4) clay films on faces of some peds and in some pores; penetrated by tongues of brown (10YR 5/3) sandy loam (2E´), very pale brown (10YR 7/3) dry; moderate medium subangular blocky structure; firm; brittle; common very fine vesicular pores; about 10 percent gravel and 2 percent cobbles; moderately acid; clear wavy boundary.

2BCx—31 to 42 inches; brown (7.5YR 4/4) sandy loam; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; firm; brittle; common very fine vesicular pores; about 10 percent gravel and 2 percent cobbles; moderately acid; clear wavy boundary.

2C—42 to 61 inches; brown (7.5YR 4/4) gravelly loamy sand with a few chunks of sandy loam; massive; friable; about 20 percent gravel and 3 percent cobbles; slightly acid.

Range in Characteristics

Thickness of the solum: 40 to more than 60 inches
Thickness of the silty mantle: 12 to 36 inches
Depth to the fragipan: 20 to 40 inches
Content of gravel: 0 to 10 percent in the upper part of the solum; 5 to 25 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 10 percent in the upper part of the solum; 0 to 20 percent in the lower part of the solum and in the substratum
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0 percent
Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 or 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 7
Chroma—2 or 3
Texture—silt loam or silt

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4

Chroma—4
Texture—silt loam

E´ horizon:
Hue—10YR or 7.5YR
Value—4 to 7
Chroma—2 or 3
Texture—silt loam or silt

2E´ part of 2B/Ex horizon:
Hue—10YR or 7.5YR
Value—4 to 7
Chroma—2 or 3
Texture—sandy loam, loamy sand, or loam or the gravelly or cobbly analogs of these textures

2Bt part of 2B/Ex horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—4 or 6
Texture—sandy loam or loam or the gravelly or cobbly analogs of these textures

2C horizon:
Hue—10YR or 7.5YR
Value—3 to 6
Chroma—4 or 6
Texture—sandy loam or loamy sand or the gravelly or cobbly analogs of these textures

Stambaugh Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow in the solum; very rapid in the substratum
Landform: Outwash plains, stream terraces, drumlins, and moraines
Parent material: Primarily silty deposits underlain by sandy and gravelly glacial outwash
Slope range: 6 to 25 percent

Taxonomic classification: Coarse-silty over sandy or sandy-skeletal, mixed, frigid Alfic Haplorthods

Typical Pedon

Stambaugh silt loam, 6 to 15 percent slopes, approximately 2,660 feet south and 1,600 feet west of the northeast corner of sec. 36, T. 38 N., R. 16 E.

Oi—0 to 1 inch; very dark grayish brown (10YR 3/2) (broken face and rubbed) peat (fibric material, which is a mat of partially decomposed forest litter); about 80 percent fiber, 55 percent rubbed; massive; very friable; many very fine and fine and few medium and coarse roots; strongly acid (pH 5.5 in water 1:1); abrupt smooth boundary.

A—1 to 4 inches; black (10YR 2/1) silt loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; many very fine and fine and few medium and coarse roots; moderately acid; abrupt wavy boundary.

E—4 to 6 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak medium platy structure; friable; many very fine and fine and few medium and coarse roots; moderately acid; abrupt irregular boundary.

Bs1—6 to 9 inches; dark brown (7.5YR 3/4) silt loam; moderate medium subangular blocky structure; friable; many very fine and fine and few medium and coarse roots; very strongly acid; clear wavy boundary.

Bs2—9 to 17 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common very fine and fine and few medium and coarse roots; very strongly acid; abrupt wavy boundary.

E/B—17 to 24 inches; 70 percent brown (10YR 5/3) silt loam (E´), very pale brown (10YR 7/3) dry; weak thin platy structure; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; few very fine and fine roots; about 1 percent gravel; very strongly acid; clear wavy boundary.

B/E—24 to 33 inches; 70 percent brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; few faint dark brown (7.5YR 3/4) clay films on faces of some peds; penetrated by tongues of brown (10YR 5/3) silt loam (E´), very pale brown (10YR 7/3) dry; moderate fine subangular blocky structure; friable; about 2 percent gravel; very strongly acid; clear wavy boundary.

2C—33 to 61 inches; dark yellowish brown (10YR 4/4), stratified sand and gravelly coarse sand; single grain; loose; about 25 percent gravel; slightly acid.

Range in Characteristics

Thickness of the solum: 24 to 40 inches
Thickness of the silty mantle: 24 to 40 inches
Content of gravel: 0 to 5 percent in the solum; 25 to 55 percent in the substratum
Content of cobbles: 0 to 5 percent throughout the profile
Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, 5YR, or N

Value—2 to 3
Chroma—0 to 2
Texture—sapric, hemic, or fibric material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—2
Texture—silt loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

E´ part of E/B and B/E horizons:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam or very fine sandy loam

Bt part of E/B and B/E horizons:
Hue—7.5YR or 5YR
Value—4
Chroma—4
Texture—silt loam

C horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—3 to 6
Texture—gravelly sand, very gravelly sand, or stratified sand and gravelly coarse sand

Tipler Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate in the solum; rapid or very rapid in the substratum
Landform: Outwash plains and stream terraces
Parent material: Loamy deposits underlain by sandy or sandy and gravelly glacial outwash
Slope range: 0 to 3 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Tipler sandy loam (fig. 22), 0 to 3 percent slopes, approximately 2,100 feet east and 400 feet north of the southwest corner of sec. 22, T. 38 N., R. 16 E.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) sandy loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; many very fine and fine and few medium roots; very strongly acid; abrupt wavy boundary.

E—2 to 4 inches; brown (7.5YR 5/2) sandy loam, pinkish gray (7.5YR 6/2) dry; moderate medium and coarse subangular blocky structure; friable; many very fine and fine and few medium roots; common dark brown (7.5YR 3/2) wormcasts; very strongly acid; abrupt wavy boundary.

Bs1—4 to 8 inches; dark reddish brown (5YR 3/4) sandy loam; moderate medium subangular blocky structure; friable; many very fine and fine and few medium roots; very strongly acid; clear wavy boundary.

Bs2—8 to 15 inches; brown (7.5YR 4/4) sandy loam; moderate medium and coarse subangular blocky structure; friable; common very fine and fine roots; strongly acid; clear wavy boundary.

E/B—15 to 22 inches; 70 percent brown (7.5YR 5/3) sandy loam (E´), pink (7.5YR 7/3) dry; weak very thick platy structure; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) sandy loam (Bt); moderate medium subangular blocky structure; friable; few very fine and fine roots; about 5 percent gravel; strongly acid; clear wavy boundary.

B/E—22 to 31 inches; 70 percent brown (7.5YR 4/4) sandy loam (Bt); moderate medium subangular blocky structure; friable; few faint dark brown (7.5YR 3/4) clay films on faces of some peds; penetrated by tongues of brown (7.5YR 5/3) sandy loam (E´), pink (7.5YR 7/3) dry; moderate fine subangular blocky structure; friable; few fine prominent yellowish brown (10YR 5/8) masses of iron accumulation; about 5 percent gravel; strongly acid; abrupt wavy boundary.

2C—31 to 60 inches; brown (10YR 5/3 and 4/3), stratified sand and gravelly coarse sand; single grain; loose; few fine prominent yellowish brown (10YR 5/8) masses of iron accumulation; about 15 percent gravel; slightly acid.

Range in Characteristics

Thickness of the solum: 24 to 40 inches
Thickness of the loamy mantle: 24 to 40 inches
Content of gravel: 0 to 15 percent in the upper part of the solum; 3 to 35 percent in the lower part of the solum; 3 to 50 percent in the substratum
Content of cobbles: 0 to 5 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—sandy loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam

E´ part of E/B and B/E horizons:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—sandy loam or fine sandy loam

Bt part of E/B and B/E horizons:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—sandy loam, fine sandy loam, or loam

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—stratified sand or coarse sand or the gravelly or very gravelly analogs of these textures

Vanzile Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate or moderately slow in the solum; rapid or very rapid in the substratum
Landform: Outwash plains, stream terraces, drumlins, and moraines
Parent material: Silty deposits underlain by sandy or sandy and gravelly glacial outwash
Slope range: 0 to 6 percent

Taxonomic classification: Coarse-silty over sandy or sandy-skeletal, mixed, frigid Alfic Haplorthods

Typical Pedon

Vanzile silt loam (fig. 23), 0 to 6 percent slopes, approximately 1,700 feet east and 100 feet north of the southwest corner of sec. 2, T. 38 N., R. 15 E.

A—0 to 1 inch; black (10YR 2/1) silt loam, gray (10YR 5/1) dry; weak fine granular structure; friable; many fine and few medium roots; very strongly acid; abrupt smooth boundary.
E—1 to 4 inches; brown (7.5YR 5/2) silt loam, pinkish gray (7.5YR 7/2) dry; weak thin platy structure; friable; many fine and few medium roots; very strongly acid; abrupt irregular boundary.
Bs1—4 to 9 inches; dark brown (7.5YR 3/4) silt loam; moderate medium and coarse subangular blocky structure; friable; many fine and few medium roots; strongly acid; clear wavy boundary.
Bs2—9 to 13 inches; brown (7.5YR 4/4) silt loam; moderate medium and coarse subangular blocky structure; friable; few fine roots; very strongly acid; clear wavy boundary.
E´—13 to 17 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak thin platy structure; friable; about 1 percent gravel; strongly acid; clear wavy boundary.
B/E—17 to 33 inches; 70 percent brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; few faint dark brown (7.5YR 3/4) clay films on faces of some peds; penetrated by tongues of brown (10YR 5/3) silt loam (E´), very pale brown (10YR 7/3) dry; moderate medium subangular blocky structure; friable; few medium prominent yellowish brown (10YR 5/8) masses of iron accumulation; about 1 percent gravel; very strongly acid; clear wavy boundary.
2C—33 to 60 inches; dark yellowish brown (10YR 4/4), stratified sand and gravelly coarse sand; single grain; loose; about 3 percent gravel; strongly acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Thickness of the silty mantle: 20 to 40 inches
Content of gravel: 0 to 5 percent in the solum; 3 to 45 percent in the substratum
Content of cobbles: 0 to 5 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N

Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or silt

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

E´ horizon and E´ part of B/E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or silt

Bt part of B/E horizon:
Hue—7.5YR or 5YR
Value—4
Chroma—4
Texture—silt loam

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—stratified sand or coarse sand or the gravelly or very gravelly analogs of these textures

Vilas Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Landform: Outwash plains, stream terraces, eskers, kames, and moraines
Parent material: Primarily sandy glacial outwash
Slope range: 0 to 35 percent

Taxonomic classification: Sandy, mixed, frigid Entic Haplorthods

Typical Pedon

Vilas loamy sand (fig. 24), 0 to 6 percent slopes, approximately 500 feet south and 100 feet west of the northeast corner of sec. 14, T. 38 N., R. 17 E.

Oi—0 to 2 inches; very dark grayish brown (10YR 3/2) (broken face and rubbed) peat (fibric material, which is a mat of partially decomposed forest litter); about 90 percent fiber, 40 percent rubbed; massive; very friable; many fine and medium roots; very strongly acid (pH 5.0 in water 1:1); abrupt smooth boundary.

A—2 to 4 inches; black (N 2.5/0) loamy sand, very dark gray (N 3/0) dry; weak medium granular structure; very friable; many fine and medium roots; many uncoated sand grains; few charcoal fragments; very strongly acid; clear wavy boundary.

E—4 to 5 inches; brown (7.5YR 4/2) loamy sand, brown (7.5YR 5/2) dry; weak fine and medium subangular blocky structure; very friable; many fine and medium roots; very strongly acid; abrupt broken boundary.

Bs1—5 to 8 inches; dark reddish brown (5YR 3/4) loamy sand; weak medium subangular blocky structure; very friable; many fine and medium roots; very strongly acid; clear wavy boundary.

Bs2—8 to 19 inches; brown (7.5YR 4/4) loamy sand; weak coarse subangular blocky structure; very friable; common fine and medium roots; very strongly acid; clear wavy boundary.

BC—19 to 37 inches; strong brown (7.5YR 4/6) sand; weak coarse subangular blocky structure; very friable; few medium and coarse roots; slightly acid; clear wavy boundary.

C—37 to 62 inches; yellowish brown (10YR 5/4) sand; single grain; loose; slightly acid.

Range in Characteristics

Thickness of the solum: 18 to 40 inches
Thickness of the loamy sand mantle: 10 to 20 inches
Content of gravel: 0 to 15 percent throughout the profile
Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric, hemic, or fibric material

A horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 3
Texture—loamy sand

E horizon:
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—2
Texture—loamy sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—loamy sand or sand

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—4 or 6
Texture—sand

Wabeno Series

Depth class: Moderately deep to a fragipan
Drainage class: Moderately well drained
Permeability: Moderate in the upper layers, slow in the fragipan, and moderate in the substratum
Landform: Drumlins and moraines
Parent material: Primarily silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 1 to 15 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Oxyaquic Fragiorthods

Typical Pedon

Wabeno silt loam, in an area of Wabeno-Goodwit silt loams, 1 to 6 percent slopes, very stony, approximately 600 feet west and 1,100 feet north of the southeast corner of sec. 26, T. 40 N., R. 15 E.

Oa—0 to 3 inches; black (10YR 2/1) (broken face and rubbed) muck (sapric material, which is a mat of partially decomposed forest litter); about 20 percent fiber, 5 percent rubbed; weak fine granular structure; very friable; many fine and few medium roots; strongly acid (pH 5.3 in water 1:1); abrupt wavy boundary.

E—3 to 5 inches; brown (10YR 5/3) silt loam, pink (7.5YR 7/3) dry; weak thin platy structure; friable; many fine and few medium roots; about 1 percent gravel and 5 percent cobbles; strongly acid; clear broken boundary.

Bs—5 to 11 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; many fine and few medium roots; about 1 percent gravel and 5 percent cobbles; very strongly acid; clear wavy boundary.

E´—11 to 15 inches; brown (10YR 5/3) silt, very pale brown (10YR 7/3) dry; moderate thin platy structure; friable; common fine and medium roots; about 1 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

B/E—15 to 24 inches; about 65 percent dark brown (7.5YR 3/4) silt loam (Bt); moderate fine subangular and angular blocky structure; friable; few distinct reddish brown (5YR 4/4) clay films on faces of peds; penetrated by tongues of brown (10YR 5/3) silt loam (E´), very pale brown (10YR 7/3) dry; moderate fine subangular blocky structure; friable; common fine and medium roots; few fine and medium prominent yellowish red (5YR 5/6) masses of iron accumulation; about 1 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

2Btx1—24 to 29 inches; dark brown (7.5YR 3/4) gravelly sandy loam; strong coarse prismatic structure parting to moderate fine and medium subangular and angular blocky; firm; brittle; few fine roots; few prominent yellowish red (5YR 4/6) clay films on faces of some peds and in some pores; common very fine vesicular pores; about 15 percent gravel and 5 percent cobbles; strongly acid; gradual irregular boundary.

2Btx2—29 to 55 inches; dark brown (7.5YR 3/4) gravelly sandy loam with strata of brown (7.5YR 4/4) gravelly loamy sand and sand 1/2 inch to 1 1/2 inches thick; moderate coarse prismatic structure; firm; brittle; breaks to strong medium plates of depositional strata; common very fine vesicular pores; few prominent yellowish red (5YR 4/6) clay films on faces of peds; about 16 percent gravel and 5 percent cobbles; strongly acid; gradual irregular boundary.

2C—55 to 63 inches; dark brown (7.5YR 3/4) gravelly sandy loam with strata of brown (7.5YR 4/4) gravelly loamy sand and sand 1/2 inch to 1 1/2 inches thick; massive; friable; common very fine vesicular pores in the sandy loam; about 15 percent gravel and 5 percent cobbles; moderately acid.

Range in Characteristics

Thickness of the solum: 35 to more than 60 inches
Thickness of the silty mantle: 12 to 36 inches
Depth to the fragipan: 20 to 40 inches
Content of gravel: 0 to 10 percent in the upper part of the solum; 5 to 25 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 10 percent in the upper part of the solum; 0 to 20 percent in the lower part of the solum and in the substratum

Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0 percent
Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon (if it occurs):
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

E´ horizon and E´ part of B/E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or silt

Bt part of B/E horizon:
Hue—10YR or 7.5YR
Value—3 or 4
Chroma—4 or 6
Texture—silt loam

2Btx horizon:
Hue—10YR or 7.5YR
Value—3 to 6
Chroma—4 or 6
Texture—sandy loam or loam or the gravelly or cobbly analogs of these textures

2C horizon:
Hue—10YR or 7.5YR
Value—3 to 6
Chroma—4 or 6
Texture—sandy loam or loamy sand or the gravelly or cobbly analogs of these textures

Wakefield Series

Depth class: Shallow to a fragipan
Drainage class: Moderately well drained
Permeability: Moderate in the upper layers, very slow in the fragipan, and moderate in the lower layers
Landform: Moraines
Parent material: Silty deposits underlain by loamy glacial till
Slope range: 1 to 15 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Oxyaquic Fragiorthods

Typical Pedon

Wakefield silt loam, 1 to 6 percent slopes, very stony, approximately 700 feet west and 2,500 feet south of the northeast corner of sec. 22, T. 40 N., R. 17 E.

A—0 to 5 inches; dark reddish brown (5YR 3/2) silt loam, pinkish gray (5YR 6/2) dry; moderate fine and medium granular structure; friable; many very fine and fine and common medium and coarse roots; about 3 percent gravel; very strongly acid; clear wavy boundary.

E—5 to 6 inches; brown (7.5YR 5/3) silt loam, pink (7.5YR 7/3) dry; weak medium platy structure; friable; many very fine and fine and common medium and coarse roots; about 3 percent gravel; very strongly acid; abrupt broken boundary.

Bs—6 to 16 inches; dark reddish brown (5YR 3/4) silt loam; moderate medium subangular blocky structure; friable; common very fine and fine and few medium and coarse roots; about 3 percent gravel; very strongly acid; abrupt smooth boundary.

2E/Bx—16 to 20 inches; 80 percent reddish brown (5YR 5/3) fine sandy loam (2E´), pink (5YR 7/3) dry; moderate thick platy structure; firm; brittle; tonguing into and surrounding remnants of dark reddish brown (2.5YR 3/4) loam (2Bt); moderate thick platy structure; firm; brittle; few fine roots; few fine prominent yellowish red (5YR 5/8) masses of iron accumulation; about 8 percent gravel; very strongly acid; clear wavy boundary.

2B/Ex—20 to 27 inches; 80 percent dark reddish brown (2.5YR 3/4) loam (2Bt); moderate medium subangular blocky structure; firm; brittle; many faint dark reddish brown (2.5YR 3/3) clay films on faces of peds; penetrated by tongues of reddish brown (5YR 5/3) fine sandy loam (2E´), pink (5YR 7/3) dry; moderate medium subangular blocky structure; firm; brittle; few fine roots; few fine prominent yellowish red (5YR 5/8) masses of iron

accumulation; about 8 percent gravel and 2 percent cobbles; strongly acid; clear wavy boundary.

2Bt—27 to 50 inches; dark reddish brown (2.5YR 3/4) loam; strong medium and coarse subangular blocky structure; firm; few fine roots; many faint dark reddish brown (2.5YR 3/3) clay films on faces of peds; about 8 percent gravel and 2 percent cobbles; moderately acid; clear wavy boundary.

2C—50 to 60 inches; reddish brown (2.5YR 4/3) loam; massive; friable; about 8 percent gravel and 2 percent cobbles; slightly acid.

Range in Characteristics

Thickness of the solum: 30 to 64 inches
Thickness of the silty mantle: 12 to 18 inches
Depth to the fragipan: 12 to 20 inches
Content of gravel: 3 to 15 percent throughout the profile
Content of cobbles: 0 to 5 percent throughout the profile
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0 percent

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—7.5YR or 5YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

2E´ part of 2E/Bx and 2B/Ex horizons:
Hue—5YR or 2.5YR
Value—4 or 5
Chroma—2 or 3
Texture—fine sandy loam or sandy loam

2Bt horizon and 2Bt part of 2E/Bx and 2B/Ex horizons:
Hue—5YR or 2.5YR
Value—3 or 4
Chroma—3 or 4
Texture—loam or clay loam

2C horizon:
Hue—5YR or 2.5YR
Value—4 or 5
Chroma—3 or 4
Texture—loam or fine sandy loam

Worcester Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate in the upper layers; rapid or very rapid in the lower layers
Landform: Outwash plains and stream terraces
Parent material: Primarily loamy deposits underlain by sandy or sandy and gravelly glacial outwash
Slope range: 0 to 3 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Argic Endoaquods

Typical Pedon

Worcester sandy loam, 0 to 3 percent slopes, approximately 1,800 feet east and 400 feet south of the northwest corner of sec. 27, T. 38 N., R. 16 E.

Oa—0 to 2 inches; black (10YR 2/1) (broken face and rubbed) muck (sapric material, which is a mat of partially decomposed forest litter); about 25 percent fiber, 10 percent rubbed; weak fine granular structure; very friable; many very fine and fine and common medium and coarse roots; common charcoal fragments; extremely acid (pH 4.3 in water 1:1); abrupt wavy boundary.

E—2 to 5 inches; reddish gray (5YR 5/2) sandy loam, pinkish gray (5YR 7/2) dry; weak medium platy structure; very friable; common very fine, fine, medium, and coarse roots; about 1 percent gravel; very strongly acid; abrupt wavy boundary.

Bs1—5 to 9 inches; dark reddish brown (5YR 3/4) sandy loam; weak medium subangular blocky structure; very friable; common very fine, fine, medium, and coarse roots; about 1 percent gravel; strongly acid; clear wavy boundary.

Bs2—9 to 21 inches; brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; common very fine and fine and few medium and coarse roots; few fine distinct strong brown (7.5YR 4/6) masses of iron accumulation; about 1 percent gravel; moderately acid; clear wavy boundary.

B/E—21 to 30 inches; 60 percent brown (7.5YR 4/4)

sandy loam (Bt); moderate medium subangular blocky structure; friable; common faint dark brown (7.5YR 4/3) clay films on faces of peds; penetrated by tongues of brown (7.5YR 5/3) sandy loam (E´), pink (7.5YR 7/3) dry; weak medium platy structure; friable; few very fine, fine, medium, and coarse roots; many fine and medium distinct strong brown (7.5YR 5/6) masses of iron accumulation and few fine faint brown (7.5YR 5/2) iron depletions; about 2 percent gravel; very strongly acid; clear wavy boundary.

2Bt—30 to 34 inches; brown (7.5YR 4/4) gravelly loamy sand; moderate medium and coarse subangular blocky structure; very friable; few very fine, fine, medium, and coarse roots; common faint dark brown (7.5YR 3/4) clay bridging between sand grains; many fine and medium prominent yellowish red (5YR 4/6 and 5/8) masses of iron accumulation and few fine distinct brown (7.5YR 5/2) iron depletions; about 15 percent gravel; moderately acid; clear wavy boundary.

2C—34 to 62 inches; dark yellowish brown (10YR 4/4), stratified sand and gravelly coarse sand; single grain; loose; many medium prominent yellowish red (5YR 4/6) masses of iron accumulation; about 25 percent gravel; moderately acid.

Range in Characteristics

Thickness of the solum: 24 to 40 inches

Thickness of the loamy mantle: 24 to 40 inches

Content of gravel: 0 to 15 percent in the upper part of the solum; 3 to 50 percent in the lower part of the solum and in the substratum

Content of cobbles: 0 to 5 percent throughout the profile

Note: Unless otherwise indicated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 3
Texture—sandy loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam

E´ part of B/E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 or 3
Texture—sandy loam, fine sandy loam, or loamy sand

Bt part of B/E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—sandy loam, fine sandy loam, or loam or the gravelly analogs of these textures

2Bt horizon:
Hue—10YR, 7.5YR, or 5YR
Value—3 to 6
Chroma—4 or 6
Texture—loamy sand or loamy coarse sand or the gravelly or very gravelly analogs of these textures

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—stratified sand or coarse sand or the gravelly or very gravelly analogs of these textures

Formation of the Soils

This section describes the geology and underlying material in Florence County, relates the factors of soil formation to the soils in the county, and explains the processes of soil formation.

Geology and Underlying Material

Thomas J. Alvarez and Michael T. McCawley, geologists, Natural Resources Conservation Service, helped prepare this section.

Florence County, which is in the Northern Highland of Wisconsin, is underlain by a variety of igneous and metamorphic rock types that formed during the Precambrian (Clayton, 1986). These rocks are overlain in most places by glacial till, glacial outwash, or lacustrine deposits deposited during the Pleistocene. The surface of the Precambrian rock in Florence County is irregular, with relief of over 655 feet. As a result, the thickness of the Pleistocene material is irregular, ranging from 0 to more than 160 feet within a distance of less than a mile. Similarly, the lithologic composition of the Pleistocene material changes conspicuously within short distances, depending on the nature of the Precambrian or Pleistocene material the glacier overrode.

Bedrock outcrops occur mostly in a zone about 9 miles wide extending from the northeast corner of the county, to the center of the county, and then to the southeast corner of the county. Rock types exposed in this zone range mainly from dense metavolcanic rocks in the northeastern part to slaty metasediments in the middle part to schists and various metamorphic rocks in the southeastern part (fig. 25).

Florence County was glaciated many times during the Pleistocene epoch, but little is known about any but the last few of these events. During the last part of the Wisconsin glaciation, the ice sheet readvanced several times, reaching Langlade County (southwest of Florence County) between about 20,000 and 15,000 years ago. The ice sheet then wasted back across the survey area, with several minor readvances between about 14,000 and 12,000 years ago. During this time, the Langlade Lobe deposited units of the Copper Falls Formation in western Florence County and the Green Bay Lobe deposited units of the Kewaunee Formation in the eastern part of the county.

The Copper Falls Formation, which occurs over about the western two-thirds of the survey area, consists of two units—the Nashville Member and Member W. The glacial till of these two units is associated with the early Mountain advances of late Wisconsin glaciation. The Nashville Member consists mainly of glacial till and glacial outwash deposits. The texture of the Nashville till is mainly sandy loam or loamy sand or the gravelly analogs of these textures. In the glacial outwash deposits, the amount of sand and gravel varies widely. In north-central Florence County just west of the community of Florence, the glacial till of the Nashville Member grades laterally into the glacial till of Member W. This till contains slightly more clay, is a little redder, and contains more rock fragments than the adjacent Nashville till.

The Kewaunee Formation, which occurs over about the eastern third of Florence County, consists of three units—the Florence Member, Member E, and the Silver Cliff Member. The Florence Member and Member E were deposited during the middle Mountain advance of the late Wisconsin glaciation, and the Silver Cliff Member is associated with the late Mountain and early Athelstane advances. The Florence Member is interpreted to be glacial till with dark reddish brown or reddish brown colors and a dominant texture of silty clay loam. It is typically leached of carbonates to a depth of about 40 inches. Member E of the Kewaunee Formation resembles Member W to the west in color and texture but contains more dolomite. Throughout Florence County, Member E is apparently overlain by the Silver Cliff Member. The Silver Cliff Member consists mainly of glacial till, glacial outwash, and lacustrine deposits. The glacial till is generally sandy loam, loam, or loamy sand or the gravelly analogs of these textures. Both the glacial till and glacial outwash of the Silver Cliff Member have typically been leached of carbonates to a depth of more than 80 inches. The lacustrine material consists of sand, silt, and clay, which in some places are overlain by windblown sand.

Figure 25.—A recumbent fold in the slate bedrock south of Florence.

Factors of Soil Formation

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; the physical and mineralogical composition of the parent material; and the length of time the forces of soil formation have acted on the soil material (Jenny, 1941).

Climate and plant and animal life, chiefly plants, are the active factors of soil formation. They act on the parent material that has accumulated through the weathering or physical disintegration of rocks and slowly change it into a natural body that has genetically related horizons. Relief conditions the effects of climate and plant and animal life. The parent material affects the kind of soil profile that forms; in some areas it is almost entirely responsible for the kind of soil profile that forms. Finally, time is needed for the transformation of the parent material into a soil. Some time is always required for the differentiation of soil horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four. Many of the processes of soil development are still unknown.

Climate

Climate directly affects soil formation through the weathering of rocks. It also alters the parent material through the mechanical action of freezing and thawing. It indirectly affects the accumulation of organic matter by supplying energy and a suitable environment for the growth of both plant and animal organisms.

Precipitation and temperature are the chief elements of climate responsible for soil features. These elements determine the amount of water available for percolation and the formation and decomposition of organic matter, the major processes in the formation of soils.

Percolating water from rainfall and snowmelt affects both the solution and hydration of mineral material and the organic substances. The movement of this water also controls the distribution of substances throughout the soil.

Florence County has a continental type of climate in which variations in temperature are great from summer to winter. During the winter the soil-forming processes are largely inactive, although some alternate freezing and thawing activity continues.

The physical action of frost heave also affects profile development. The high temperature in summer increases the evaporation and transpiration of moisture, thus limiting the amount of percolating water available for soil formation. Temperature also affects the growth and decomposition of organic matter. Decomposition is much slower in cooler climates than in warmer ones.

Wind indirectly affects the moisture content of soils by influencing the rate of evaporation. In addition, the wind often blows away particles of soil and organic material, thereby eroding the surface layer. These particles are deposited elsewhere as new parent material.

Climate is modified by variations in slope aspect. The soils on south- or west-facing slopes are warmed and dried by the sun and wind more thoroughly than those on north- and east-facing slopes. The soils on cooler, more humid north- and east-facing slopes generally contain more moisture and are frozen for a longer period.

Plant and Animal Life

Living organisms, such as plants, bacteria, fungi, insects, earthworms, and rodents, influence the formation of soils. Plants generally have the greatest influence on soil formation. Plant roots penetrate the soil body, thereby creating channels for percolating water. The roots excrete a number of acid substances that act on rocks and minerals and bring nutrients or mineral substances into solution. These nutrients are absorbed and translocated upward to stems and leaves. When the plants die, the translocated minerals are released to the upper soil layers. The organic acids formed from the decaying plant residue accelerate soil formation by reacting with rock and mineral constituents.

Plants indirectly affect soil formation by modifying the effects of climate. For example, they reduce the force of winds, thereby influencing the evaporation rate of percolating water and the deposition of windblown parent material. Most of the soils in Florence County formed under forest vegetation. As a result, they have a lighter colored or a thinner surface layer than the soils that formed under grass.

Animals burrow into the soil and mix the material of the different layers. Roots and percolating water follow the channels created by the animals. Animal life affects soil structure, helps to decompose organic matter, and carries nutrients upward in the soil profile. When these animals die, they contribute to the supply of organic matter in the soil.

Human activities recently have had important effects on the soils in the county. The original condition of some soils has been altered by these activities, which include removing the native vegetation, mixing the upper layers through cultivation, and planting crops that are different from the native vegetation. Removal of the native vegetation has accelerated erosion on sloping soils. Applications of lime and fertilizer have altered the pH value and fertility of soils. Some cropping practices have reduced the content of organic matter. The content of soil moisture has been altered by irrigation and artificial drainage. Some of the effects of human activities, such as the addition of fertilizer, pesticide, herbicide, and fungicide, may not be known for many years.

Relief and Drainage

Relief influences soil formation by affecting the amount of precipitation absorbed in the soil, by influencing the erosion rate, and by directing the

movement of materials in suspension or solution from one part of the profile to another. Generally, the steeper soils have a thinner solum and less well developed profiles than gently sloping soils, which have more water percolating through the profile.

Relief directly affects external and internal drainage in the soils. In Florence County, the Vilas, Croswell, Au Gres, and Kinross soils form a drainage sequence. The excessively drained Vilas soils are on linear and slightly convex summits, toeslopes, and side slopes and are nearly level to steep. The moderately well drained Croswell soils are in linear areas, on toeslopes, and on footslopes and are nearly level and gently sloping. The somewhat poorly drained Au Gres soils and the poorly drained Kinross soils are in linear areas and in depressions and drainageways and are nearly level.

Parent Material

The parent material of most soils in Florence County was deposited by glaciers or by meltwater as the glaciers receded. The parent material of some soils on flood plains is recent alluvium. The parent material of organic soils consists of plant remains that accumulated and were preserved under water in swamps or shallow lakes. Some soils formed in more than one kind of parent material. The nature of the parent material has much to do with the texture, mineral composition, and chemical properties of the soil.

Glacial outwash was deposited by running water from melting glaciers. The size of the particles that make up outwash varies, depending on the speed of the stream of water that carried the material. As the swiftly flowing water slowed down, the coarser particles were deposited. The more slowly moving water could carry the finer particles, such as very fine sand and silt. Glacial outwash deposits generally are stratified, and the layers contain particles of similar size (fig. 26). Padus soils formed in loamy deposits underlain by sandy or sandy and gravelly glacial outwash. Vilas soils formed primarily in sandy glacial outwash.

The glacial till soils formed in unsorted, nonstratified glacial drift consisting of clay, silt, sand, gravel, cobbles, stones, and boulders transported and deposited by glacial ice. Most glacial till in Florence County is loamy sand or sandy loam or the gravelly analogs of these textures. The glacial till in some parts of eastern Florence County is predominantly silty clay loam, but a small area of till that is mainly loam occurs in the north-central part of the county. Glacial mudflow sediment is material that was let down from the ice surface and has undergone some flow or mass movement. Ellwood, Crossett, and Wakefield soils are examples of soils that formed in silty deposits underlain by glacial till.

Lacustrine deposits were laid down in still water in former glacial lake basins. These deposits are characterized by stratified deposits ranging from sand to clay. Fence and Gastrow soils are examples of soils that formed primarily in silty deposits underlain by stratified lacustrine deposits. Cublake soils formed in sandy glacial outwash underlain by stratified lacustrine deposits.

Organic material consists of deposits of plant remains. After the glaciers receded from Florence County, water stood in depressions. Grasses, reeds, sedges, and trees grew and died at the edges of these bodies of water, and their remains fell to the bottom. These bodies of water were eventually filled with organic material and thus developed into areas of peat. In some areas the peat subsequently decomposed to muck. In other areas it has changed little since deposition. Cathro soils formed in herbaceous organic material 16 to 51 inches thick over loamy or silty deposits. Loxley soils formed in sphagnum moss and herbaceous organic material more than 51 inches thick.

Alluvial deposits are of recent origin. They were deposited on flood plains and in drainageways by floodwater. Soils that formed in alluvium generally show little or no horizon development. Fordum soils formed primarily in loamy alluvium underlain by sandy or sandy and gravelly deposits.

Time

Time is needed for the parent material to change into a soil. Some time is always required for horizon differentiation. Soils can have horizons that are well developed, horizons that are poorly developed, or horizons that are somewhere in between, depending on the length of time the soil-forming factors have been active. Padus soils, for example, have moderately distinct horizons and are considered to be fairly mature. Soils that formed in recently deposited alluvium, on the other hand, show little or no horizon development. Fordum soils are examples.

Processes of Soil Formation

Horizons are differentiated in a soil as a result of the action of certain basic soil-forming processes. These processes are gains, losses, transfers, and transformations. They generally do not act alone. Some changes promote horizon differentiation, and

Figure 26.—A pit exposure of stratified glacial outwash. The amount of sand and gravel varies widely in these deposits.

others retard or offset it. The balance among the changes determines the nature of the soil at any given point.

The interaction among these soil-forming processes is evident in Vanzile soils. These soils formed in silty deposits underlain by sandy or sandy and gravelly glacial outwash. The climate of Florence County favored the growth of plants. Plants and animals contribute to the accumulation of organic matter and organic acids, and they mixed the soil to some extent. These processes accelerated as more and higher forms of organisms grew in the soil and produced more organic residue and acids. The decomposed organic matter darkened the surface layer of these soils.

While organic matter was being decomposed, minerals within the Vanzile soils were being chemically weathered by organic acids. Also, iron was being oxidized. Percolating water then translocated the weathered minerals, oxidized iron, and some organic matter to the lower parts of the profile. The result was the formation of a thin, bleached, brown subsurface layer and a subsoil of accumulated dark brown minerals.

The percolating water also translocated suspended particles of clay downward. As a result, the lower part of the subsoil has more clay than other parts of the profile. The underlying glacial outwash, which typically is at a depth of about 33 inches, is unweathered. It has changed little since it was deposited.

The processes that were active in the formation of the Vanzile soils were gains in the organic matter in the surface layer, loss of weathered minerals and clay from the upper part of the soil and the subsequent transfer of these to the upper and lower parts of the subsoil, and the transformation of iron compounds in the subsoil. All of these processes have been active in the soils of Florence County. The kinds of parent material and the relief to a great extent have determined the kinds of processes that are dominant in the formation of all the soils. These processes, in turn, largely determine the differences and similarities among the soils.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Board foot. A unit of measurement represented by a board 1 foot wide, 1 foot long, and 1 inch thick.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clayey. General term for the soil textural classes clay, silty clay, and sandy clay.

Clearcutting. The removal of all the timber in a stand when trees are harvested.

Climax plant community. The stabilized plant

community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Cord. A unit of measurement of stacked wood. A standard cord occupies 128 cubic feet with dimensions of 4 feet by 4 feet by 8 feet.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cradle-knoll. A small mound made up of soil material that temporarily clung to the roots when a tree was uprooted.

Critical-area planting. Planting stabilizing vegetation in highly erodible or critically eroding areas. The areas typically cannot be stabilized by ordinary conservation treatment and management, and leaving them untreated can result in severe erosion or in damage from sediment.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cut area. A special symbol used on the soil maps to

indicate a small area where the soil has been altered by the removal of more than about a foot of soil material.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep to water (in tables). The soil is deep to a permanent water table (typically more than 5 feet) during the dry season.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depression, closed. A special symbol used on the soil maps to indicate a small, concave area the middle of which is generally at least 5 feet lower in elevation than the surrounding map unit.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Droughty (in tables). The soil holds too little water for plants during dry periods.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Dry spot. A special symbol used on the soil maps to indicate a small area of mineral soil within an area of organic soils.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Esker. A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Eutrophication. The aging process of lakes in which aquatic plants become abundant and waters become deficient in oxygen. The process is usually accelerated by enrichment of waters with surface runoff containing nitrogen and phosphorus.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess humus (in tables). The content of organic matter is so high that it adversely affects the specified use.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field border. A strip of perennial vegetation established at the edge of a field.

Field windbreak. A strip of trees or shrubs established within or adjacent to a field.

Fill area. A special symbol used on the soil maps to indicate a small area covered with 1 foot to several feet of graded or filled soil material.

Fine textured soil. Sandy clay, silty clay, or clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest cover type. The dominant tree species in a tract of forest land.

Forest habitat type. An association of dominant trees and ground flora species in a climax plant community.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial mudflow sediment (geology). Clay, silt, sand, gravel, cobbles, stones, and boulders that were let down from the surface of glacial ice and have undergone some flow or mass movement.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-chroma zones. Zones having chroma of 3 or more. Typical color in areas of iron accumulations.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive

characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

Iron accumulations. High-chroma zones having a high content of iron and manganese oxide but having a clay content similar to that of the adjacent matrix.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops.

Kame. An irregular, short ridge or hill of stratified glacial drift.

Knoll. A small, low, rounded hill rising above adjacent landforms.

K_{sat}. Saturated hydraulic conductivity. (See Permeability.)

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy. General term for the soil textural classes very fine sandy loam, fine sandy loam, sandy loam, coarse sandy loam, loam, clay loam, and sandy clay loam.

Low strength. The soil is not strong enough to support loads.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and

manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

No water (in tables). The ground water is too deep for the specified use.

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Organic soil. A soil that contains 12 percent to more than 18 percent organic carbon, depending on the content of mineral materials, and is 16 or more inches thick.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace. An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Perched water table. A water table that exists in the soil above an unsaturated zone.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Impermeable	less than 0.0015 inch
Very slow	0.0015 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitted outwash. An outwash area characterized by many irregular depressions, such as kettles, shallow pits, and potholes.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poletimber. Hardwood trees ranging from 5 to 11 inches in diameter at breast height; coniferous trees ranging from 5 to 9 inches in diameter at breast height.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after

exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. A special symbol used on the soil maps to indicate a small exposure of bedrock.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandy. General term for the soil textural classes loamy very fine sand, loamy fine sand, loamy sand, loamy coarse sand, very fine sand, fine sand, sand, and coarse sand.

Sapling. A tree ranging from 1 inch to 5 inches in diameter at breast height.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sawtimber. Hardwood trees more than 11 inches in diameter at breast height; coniferous trees more than 9 inches in diameter at breast height.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seedling. A tree less than 1 inch in diameter at breast height.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shelterwood cut. A method of tree harvest in which enough large trees are left to protect the younger and shorter trees from windthrow and other damage.

Short steep slope. A special symbol used on the soil maps to indicate a narrow, elongated area in which the slope is at least two classes greater than that of the surrounding area.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Silty. General term for the soil textural classes silt, silt loam, and silty clay loam.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then

multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, the slope classes are as follows:

Nearly level	0 to 2 percent
Gently sloping	2 to 6 percent
Sloping	6 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 35 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil blowing (in tables). The soil is easily moved by the wind.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strip cut. A method of tree harvest in which the timber is clearcut in strips, commonly 50 to 100 feet wide.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsides (in tables). The settlement of organic soils or soils containing semifluid layers.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Succession. The replacement of one plant community by another. Shade-tolerant plant species commonly replace shade-intolerant species.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The A and Ap horizons and those E, Oi, Oe, and Oa horizons that extend all the way to the land surface. The Oi, Oe, and Oa horizons in soils that are excessively drained, somewhat excessively drained, well drained, moderately well drained, or somewhat poorly drained are considered organic layers rather than surface layers.

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage

has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tiers. Layers used to define the control section in the classification of organic soils. The organic material is divided into three tiers. The surface tier is the upper 12 inches, the subsurface tier is the next 24 inches, and the bottom tier is the lower 16 inches.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Too sandy (in tables). The soil is soft and loose, droughty, and low in fertility.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1951-84 at Brule Island, Wisconsin)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	20.8	-2.4	9.2	42	-34	0	1.14	0.47	1.71	4	13.4
February---	26.3	-.1	13.1	49	-34	0	.98	.34	1.50	3	9.8
March------	36.1	11.1	23.6	60	-25	0	1.68	.69	2.50	5	10.9
April------	51.4	26.3	38.9	82	3	0	2.57	1.67	3.38	6	3.6
May--------	65.8	37.0	51.4	89	19	149	3.28	1.98	4.44	7	.4
June-------	74.5	46.2	60.4	92	29	316	3.91	2.26	5.37	8	.0
July-------	79.3	51.2	65.3	94	36	474	3.72	2.05	5.19	7	.0
August-----	76.5	49.7	63.1	92	33	406	3.83	1.98	5.43	7	.0
September--	65.9	41.8	53.9	88	24	136	3.67	1.76	5.32	8	.0
October----	55.2	33.0	44.1	79	15	38	2.36	.96	3.53	6	.4
November---	38.4	21.5	30.0	62	-4	0	1.79	.91	2.54	5	6.1
December---	25.8	6.8	16.3	47	-28	0	1.49	.86	2.05	5	14.4
Yearly:											
Average---	51.3	27.1	39.1	---	---	---	---	---	---	---	---
Extreme---	---	---	---	96	-37	---	---	---	---	---	---
Total-----	---	---	---	---	---	1,519	30.42	26.48	34.22	71	59.0

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1951-84 at Brule Island, Wisconsin)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 22	June 3	June 18
2 years in 10 later than--	May 18	May 29	June 14
5 years in 10 later than--	May 10	May 20	June 4
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 18	Sept. 10	Aug. 18
2 years in 10 earlier than--	Sept. 24	Sept. 15	Aug. 26
5 years in 10 earlier than--	Oct. 7	Sept. 25	Sept. 10

Table 3.--Growing Season

(Recorded in the period 1951-84 at Brule Island, Wisconsin)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	127	107	67
8 years in 10	134	114	77
5 years in 10	149	128	97
2 years in 10	164	141	116
1 year in 10	172	148	127

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
AnB	Annalake fine sandy loam, 0 to 6 percent slopes	1,920	0.6
AnC	Annalake fine sandy loam, 6 to 15 percent slopes	403	0.1
Au	Au Gres loamy sand, 0 to 2 percent slopes	658	0.2
Ca	Capitola muck, 0 to 2 percent slopes, very stony	996	0.3
CoA	Crossett silt loam, 0 to 3 percent slopes	490	0.2
CrA	Croswell loamy sand, 0 to 3 percent slopes	1,667	0.5
CuA	Cublake loamy sand, 0 to 3 percent slopes	1,570	0.5
EdB	Ellwood silt loam, 1 to 6 percent slopes	1,252	0.4
EdC	Ellwood silt loam, 6 to 15 percent slopes	144	*
ElB	Ellwood-Crossett silt loams, 0 to 6 percent slopes	1,354	0.4
EmB	Ellwood-Iosco-Morganlake complex, 0 to 6 percent slopes	1,525	0.5
EnC	Ellwood-Iosco-Vilas complex, 0 to 15 percent slopes	2,864	0.9
EoD	Ellwood-Vilas-Padus complex, 10 to 30 percent slopes	1,513	0.5
Ep	Epiaquents and Epiaquods, nearly level	1,219	0.4
FeB	Fence silt loam, 0 to 6 percent slopes	1,795	0.6
Fm	Fordum loam, 0 to 2 percent slopes	3,295	1.0
GaA	Gastrow silt loam, 0 to 3 percent slopes	670	0.2
GmC	Goodman silt loam, 6 to 15 percent slopes, very stony	3,070	1.0
GmD	Goodman silt loam, 15 to 25 percent slopes, very stony	628	0.2
GwB	Goodwit silt loam, 1 to 6 percent slopes, very stony	7,386	2.3
IsA	Iosco loamy fine sand, 0 to 3 percent slopes	689	0.2
Kr	Kinross muck, 0 to 2 percent slopes	449	0.1
Lo	Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes	5,179	1.6
Lu	Lupton, Cathro, and Markey mucks, 0 to 1 percent slopes	37,659	11.8
MaA	Manitowish sandy loam, 0 to 3 percent slopes	1,377	0.4
Mn	Minocqua muck, 0 to 2 percent slopes	2,147	0.7
MrB	Morganlake loamy fine sand, 0 to 6 percent slopes	468	0.1
MuB	Mudlake silt loam, 1 to 6 percent slopes, very stony	3,470	1.1
M-W	Miscellaneous water	18	*
PaB	Padus sandy loam, 0 to 6 percent slopes	9,209	2.9
PaC	Padus sandy loam, 6 to 15 percent slopes	14,902	4.7
PaD	Padus sandy loam, 15 to 35 percent slopes	2,678	0.8
PeB	Padus-Pence sandy loams, 0 to 6 percent slopes	7,421	2.3
PeC	Padus-Pence sandy loams, 6 to 15 percent slopes	12,878	4.0
PeD	Padus-Pence sandy loams, 15 to 35 percent slopes	18,716	5.9
PnB	Pence sandy loam, 0 to 6 percent slopes	7,023	2.2
PnC	Pence sandy loam, 6 to 15 percent slopes	6,180	1.9
PnD	Pence sandy loam, 15 to 35 percent slopes	4,150	1.3
PsB	Pence-Vilas complex, 0 to 6 percent slopes	3,641	1.1
PsC	Pence-Vilas complex, 6 to 15 percent slopes	4,627	1.5
PsD	Pence-Vilas complex, 15 to 35 percent slopes	3,438	1.1
Pt	Pits, gravel	103	*
Px	Pits, mine	74	*
Rb	Robago fine sandy loam, 0 to 2 percent slopes	1,055	0.3
RkC	Rock outcrop-Ishpeming-Vilas complex, 1 to 15 percent slopes	1,545	0.5
RkD	Rock outcrop-Ishpeming-Vilas complex, 15 to 35 percent slopes	469	0.1
RmC	Rock outcrop-Metonga-Sarona complex, 1 to 15 percent slopes	4,831	1.5
RmD	Rock outcrop-Metonga-Sarona complex, 15 to 35 percent slopes	3,905	1.2
RsB	Rousseau loamy fine sand, 0 to 6 percent slopes	165	0.1
RsC	Rousseau loamy fine sand, 6 to 15 percent slopes	173	0.1
SaB	Sarona fine sandy loam, 1 to 6 percent slopes, very stony	7,297	2.3
SaC	Sarona fine sandy loam, 6 to 15 percent slopes, very stony	3,346	1.1
SaD	Sarona fine sandy loam, 15 to 25 percent slopes, very stony	821	0.3
SdB	Sarona-Padus complex, 0 to 6 percent slopes, very stony	4,659	1.5
SdC	Sarona-Padus complex, 6 to 15 percent slopes, very stony	6,846	2.2
SdD	Sarona-Padus complex, 15 to 30 percent slopes, very stony	3,208	1.0
SlB	Sarona-Vilas complex, 0 to 6 percent slopes, very stony	4,487	1.4
SlC	Sarona-Vilas complex, 6 to 15 percent slopes, very stony	5,224	1.6
SlD	Sarona-Vilas complex, 15 to 30 percent slopes, very stony	2,203	0.7
SnB	Sayner loamy sand, 0 to 6 percent slopes	798	0.3
SnC	Sayner loamy sand, 6 to 15 percent slopes	976	0.3
SnD	Sayner loamy sand, 15 to 30 percent slopes	1,706	0.5

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
SoD	Soperton-Goodman silt loams, 15 to 35 percent slopes, very stony	781	0.2
StC	Stambaugh silt loam, 6 to 15 percent slopes	12,757	4.0
StD	Stambaugh silt loam, 15 to 25 percent slopes	482	0.2
SuC	Stambaugh-Goodman silt loams, 6 to 15 percent slopes, very stony	3,463	1.1
SuD	Stambaugh-Goodman silt loams, 15 to 35 percent slopes, very stony	842	0.3
TpA	Tipler sandy loam, 0 to 3 percent slopes	3,605	1.1
VaB	Vanzile silt loam, 0 to 6 percent slopes	20,895	6.6
VgB	Vanzile-Goodwit silt loams, 0 to 6 percent slopes, very stony	2,937	0.9
VsB	Vilas loamy sand, 0 to 6 percent slopes	5,932	1.9
VsC	Vilas loamy sand, 6 to 15 percent slopes	5,287	1.7
VsD	Vilas loamy sand, 15 to 30 percent slopes	3,294	1.0
W	Water	7,599	2.4
WaC	Wabeno-Goodman silt loams, 6 to 15 percent slopes, very stony	2,190	0.7
WbB	Wabeno-Goodwit silt loams, 1 to 6 percent slopes, very stony	5,506	1.7
WkB	Wakefield silt loam, 1 to 6 percent slopes, very stony	2,901	0.9
WkC	Wakefield silt loam, 6 to 15 percent slopes, very stony	1,286	0.4
WrA	Worcester sandy loam, 0 to 3 percent slopes	3,829	1.2
	Total	318,215	100.0

* Less than 0.05 percent.

Table 5.--Woodland Management and Productivity

(Only the soils suitable for production of commercial trees are listed. See text for definitions of terms used in this table. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
AnB, AnC-------- Annalake	3L	Slight	Slight	Slight	Moderate	Sugar maple---------	61	38	White spruce, red pine, eastern white pine.
						Red maple----------	---	---	
						Yellow birch--------	---	---	
						Balsam fir----------	---	---	
						Paper birch---------	---	---	
						American basswood---	---	---	
						Eastern hemlock-----	---	---	
						Quaking aspen-------	---	---	
Au---------- Au Gres	6W	Slight	Moderate	Severe	Severe	Quaking aspen-------	70	81	White spruce, red pine, eastern white pine.
						Bigtooth aspen------	---	---	
						Balsam fir----------	---	---	
						Paper birch---------	---	---	
						Yellow birch--------	---	---	
						Red maple----------	65	40	
						Eastern hemlock-----	---	---	
						Eastern white pine--	---	---	
						Northern whitecedar-	---	---	
						Jack pine----------	51	69	
						Red pine----------	61	104	
						Northern red oak----	---	---	
Ca---------- Capitola	7W	Slight	Severe	Severe	Severe	Balsam fir----------	52	100	Balsam fir, red maple, white ash, black spruce, white spruce.
						Red maple----------	56	36	
						Black ash----------	48	32	
						Quaking aspen-------	---	---	
						Northern whitecedar-	---	---	
						Tamarack----------	---	---	
						American elm--------	---	---	
						Eastern hemlock-----	---	---	
CoA---------- Crossett	3W	Slight	Moderate	Severe	Severe	Red maple----------	65	40	Eastern white pine, white spruce.
						Sugar maple---------	---	---	
						White spruce--------	---	---	
						American elm--------	---	---	
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
						Eastern hemlock-----	---	---	
						Balsam fir----------	---	---	
CrA---------- Croswell	5S	Slight	Slight	Moderate	Moderate	Quaking aspen-------	68	78	Red pine, eastern white pine, white spruce.
						Red pine----------	55	88	
						Jack pine----------	53	73	
						Northern red oak----	---	---	
						Black cherry--------	---	---	
						Eastern white pine--	---	---	
						Bigtooth aspen------	69	80	
						Red maple----------	---	---	
						Paper birch---------	54	55	
CuA---------- Cublake	7S	Slight	Slight	Moderate	Moderate	Red pine----------	60	101	Red pine, eastern white pine, jack pine.
						Red maple----------	---	---	
						Northern red oak----	---	---	
						Paper birch---------	---	---	
						Eastern white pine--	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
EdB, EdC-------- Ellwood	3L	Slight	Slight	Moderate	Severe	Sugar maple---------	62	39	White spruce, eastern white pine.
						Yellow birch--------	---	---	
						Red maple----------	---	---	
						American basswood---	---	---	
						Eastern hemlock-----	---	---	
						White spruce--------	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Balsam fir----------	---	---	
ElB:									
Ellwood--------	3L	Slight	Slight	Moderate	Severe	Sugar maple---------	62	39	White spruce, eastern white pine.
						Yellow birch--------	---	---	
						Red maple----------	---	---	
						American basswood---	---	---	
						Eastern hemlock-----	---	---	
						White spruce--------	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Balsam fir----------	---	---	
Crossett-------	3W	Slight	Moderate	Severe	Severe	Red maple----------	65	40	Eastern white pine, white spruce.
						Sugar maple---------	---	---	
						White spruce--------	---	---	
						American elm--------	---	---	
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
						Eastern hemlock-----	---	---	
						Balsam fir----------	---	---	
EmB:									
Ellwood--------	3L	Slight	Slight	Moderate	Severe	Sugar maple---------	62	39	White spruce, eastern white pine.
						Yellow birch--------	---	---	
						Red maple----------	---	---	
						American basswood---	---	---	
						Eastern hemlock-----	---	---	
						White spruce--------	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Balsam fir----------	---	---	
Iosco----------	5W	Slight	Moderate	Severe	Severe	Quaking aspen-------	65	73	Eastern white pine, white spruce.
						White ash----------	---	---	
						Red maple----------	---	---	
						Yellow birch--------	---	---	
						Northern pin oak----	---	---	
						Eastern white pine--	---	---	
						Balsam fir----------	55	107	
						Paper birch---------	58	62	
						White spruce--------	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Wind-throw hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
EmB:									
Morganlake-----	6S	Slight	Slight	Moderate	Moderate	Quaking aspen-------	74	86	Red pine, white spruce, eastern white pine.
						Sugar maple---------	---	---	
						American basswood---	---	---	
						Northern red oak----	63	56	
						White ash-----------	77	76	
						Black cherry--------	---	---	
						Paper birch---------	---	---	
						Bigtooth aspen------	76	89	
						Yellow birch--------	---	---	
						Red pine-----------	62	107	
						Balsam fir----------	---	---	
EnC:									
Ellwood--------	3L	Slight	Slight	Moderate	Severe	Sugar maple---------	62	39	White spruce, eastern white pine.
						Yellow birch--------	---	---	
						Red maple-----------	---	---	
						American basswood---	---	---	
						Eastern hemlock-----	---	---	
						White spruce--------	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Balsam fir----------	---	---	
Iosco----------	5W	Slight	Moderate	Severe	Severe	Quaking aspen-------	65	73	Eastern white pine, white spruce.
						White ash-----------	---	---	
						Red maple-----------	---	---	
						Yellow birch--------	---	---	
						Northern pin oak----	---	---	
						Eastern white pine--	---	---	
						Balsam fir----------	55	107	
						Paper birch---------	58	62	
						White spruce--------	---	---	
Vilas----------	6A	Slight	Slight	Slight	Slight	Red pine-----------	57	93	Red pine, jack pine, eastern white pine.
						Jack pine-----------	65	94	
						Eastern white pine--	56	109	
						Northern pin oak----	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	
						Northern red oak----	---	---	
						Red maple-----------	---	---	
						Paper birch---------	---	---	
EoD:									
Ellwood--------	3L	Slight	Slight	Moderate	Severe	Sugar maple---------	62	39	White spruce, eastern white pine.
						Yellow birch--------	---	---	
						Red maple-----------	---	---	
						American basswood---	---	---	
						Eastern hemlock-----	---	---	
						White spruce--------	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Balsam fir----------	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
EoD:									
Vilas	6R	Moderate	Slight	Slight	Slight	Red pine	57	93	Red pine, jack pine, eastern white pine.
						Jack pine	65	94	
						Eastern white pine	56	109	
						Northern pin oak	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Northern red oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
Padus	3R	Moderate	Slight	Slight	Moderate	Sugar maple	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak	70	66	
						Bigtooth aspen	78	91	
						White ash	---	---	
						American basswood	---	---	
						Red pine	---	---	
						Red maple	---	---	
						Eastern hemlock	---	---	
Ep:									
Epiaquents	2W	Slight	Severe	Severe	Severe	Red maple	56	36	Red maple, balsam fir, white ash, black spruce, white spruce.
						Balsam fir	---	---	
						White ash	---	---	
						Black spruce	---	---	
						Quaking aspen	---	---	
						Tamarack	---	---	
						Black ash	---	---	
						White spruce	---	---	
						Northern whitecedar	---	---	
Epiaquods	2W	Slight	Severe	Severe	Severe	Red maple	56	36	Red maple, balsam fir, white ash, black spruce, white spruce.
						Balsam fir	---	---	
						White ash	---	---	
						Black spruce	---	---	
						Quaking aspen	---	---	
						Tamarack	---	---	
						Black ash	---	---	
						White spruce	---	---	
						Northern whitecedar	---	---	
FeB Fence	3L	Slight	Slight	Slight	Severe	Sugar maple	65	40	Red pine, eastern white pine, white spruce.
						Yellow birch	---	---	
						American basswood	---	---	
						Quaking aspen	---	---	
						Bigtooth aspen	---	---	
						Red maple	---	---	
						Eastern hemlock	---	---	
						Balsam fir	---	---	
						Paper birch	---	---	
Fm Fordum	2W	Slight	Severe	Severe	Severe	Silver maple	80	34	Silver maple, red maple, white ash.
						Red maple	---	---	
						White ash	---	---	
						Northern whitecedar	---	---	
						Tamarack	---	---	
						Black spruce	---	---	
						Balsam fir	---	---	
						White spruce	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Wind-throw hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
GaA---------- Gastrow	3W	Slight	Moderate	Severe	Severe	Sugar maple---------	61	38	White spruce, eastern white pine, northern whitecedar.
						Red maple----------	---	---	
						Yellow birch--------	---	---	
						Balsam fir----------	---	---	
						Paper birch---------	---	---	
						Eastern hemlock-----	---	---	
						Quaking aspen-------	---	---	
GmC---------- Goodman	3L	Slight	Slight	Slight	Severe	Sugar maple---------	69	42	Eastern white pine, red pine, white spruce.
						Yellow birch--------	---	---	
						American basswood---	68	63	
						Bigtooth aspen------	---	---	
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
GmD---------- Goodman	3R	Moderate	Slight	Slight	Severe	Sugar maple---------	69	42	Eastern white pine, red pine, white spruce.
						Yellow birch--------	---	---	
						American basswood---	68	63	
						Bigtooth aspen------	---	---	
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
GwB---------- Goodwit	3L	Slight	Slight	Slight	Severe	Sugar maple---------	69	42	Eastern white pine, red pine, white spruce.
						Yellow birch--------	---	---	
						American basswood---	68	63	
						Bigtooth aspen------	---	---	
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
						White ash----------	---	---	
						Black cherry--------	---	---	
						Eastern hophornbeam-	---	---	
IsA---------- Iosco	5W	Slight	Moderate	Severe	Severe	Quaking aspen-------	65	73	Eastern white pine, white spruce.
						White ash----------	---	---	
						Red maple----------	---	---	
						Yellow birch--------	---	---	
						Northern pin oak----	---	---	
						Eastern white pine--	---	---	
						Balsam fir----------	55	107	
						Paper birch---------	58	62	
						White spruce--------	---	---	
Kr---------- Kinross	2W	Slight	Severe	Severe	Severe	Quaking aspen-------	45	32	---
						Black spruce--------	---	---	
						Tamarack----------	---	---	
						Northern whitecedar-	---	---	
						Balsam fir----------	---	---	
						Red maple----------	---	---	
						Jack pine----------	---	---	
						Eastern white pine--	---	---	
						Paper birch---------	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Wind-throw hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
Lu:									
Lupton	6W	Slight	Severe	Severe	Severe	Balsam fir	46	86	---
						Black spruce	20	29	
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Tamarack	---	---	
						Red maple	---	---	
						Quaking aspen	---	---	
						White spruce	---	---	
Cathro	5W	Slight	Severe	Severe	Severe	Balsam fir	40	71	White spruce.
						Northern whitecedar	---	---	
						Tamarack	---	---	
						Paper birch	---	---	
						Red maple	---	---	
						Black spruce	---	---	
						White spruce	---	---	
Markey	7W	Slight	Severe	Severe	Severe	Balsam fir	52	100	---
						Quaking aspen	---	---	
						Black spruce	---	---	
						Tamarack	---	---	
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Red maple	---	---	
						White spruce	---	---	
MaA Manitowish	3A	Slight	Slight	Slight	Moderate	Sugar maple	60	38	Red pine, eastern white pine, jack pine.
						Red pine	59	99	
						Quaking aspen	---	---	
						Eastern white pine	---	---	
						Paper birch	---	---	
						Red maple	---	---	
Mn Minocqua	7W	Slight	Severe	Severe	Severe	Balsam fir	54	105	Red maple, white ash, white spruce, black spruce.
						Red maple	55	35	
						White ash	---	---	
						Black ash	---	---	
						Tamarack	55	50	
						Northern whitecedar	---	---	
						Quaking aspen	---	---	
MrB Morganlake	6S	Slight	Slight	Moderate	Moderate	Quaking aspen	74	86	Red pine, white spruce, eastern white pine.
						Sugar maple	---	---	
						American basswood	---	---	
						Northern red oak	63	56	
						White ash	77	76	
						Black cherry	---	---	
						Paper birch	---	---	
						Bigtooth aspen	76	89	
						Yellow birch	---	---	
						Red pine	62	107	
						Balsam fir	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
MuB---------- Mudlake	3W	Slight	Moderate	Severe	Severe	Red maple----------	63	39	Red maple, white ash, white spruce, eastern white pine, red pine.
						Yellow birch--------	---	---	
						Sugar maple---------	---	---	
						White ash----------	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	
						Eastern hemlock-----	---	---	
						Paper birch---------	---	---	
PaB, PaC-------- Padus	3L	Slight	Slight	Slight	Moderate	Sugar maple---------	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak----	70	66	
						Bigtooth aspen------	78	91	
						White ash----------	---	---	
						American basswood---	---	---	
						Red pine----------	---	---	
						Red maple----------	---	---	
						Eastern hemlock-----	---	---	
PaD---------- Padus	3R	Moderate	Slight	Slight	Moderate	Sugar maple---------	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak----	70	66	
						Bigtooth aspen------	78	91	
						White ash----------	---	---	
						American basswood---	---	---	
						Red pine----------	---	---	
						Red maple----------	---	---	
						Eastern hemlock-----	---	---	
PeB, PeC:									
Padus----------	3L	Slight	Slight	Slight	Moderate	Sugar maple---------	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak----	70	66	
						Bigtooth aspen------	78	91	
						White ash----------	---	---	
						American basswood---	---	---	
						Red pine----------	---	---	
						Red maple----------	---	---	
						Eastern hemlock-----	---	---	
Pence----------	3A	Slight	Slight	Slight	Slight	Sugar maple---------	59	37	Red pine, eastern white pine, jack pine.
						Red pine----------	59	99	
						Eastern white pine--	57	112	
						American basswood---	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
						Yellow birch--------	---	---	
						Red maple----------	---	---	
						Northern red oak----	---	---	
						White ash----------	---	---	
						Eastern hemlock-----	---	---	
PeD:									
Padus----------	3R	Moderate	Slight	Slight	Moderate	Sugar maple---------	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak----	70	66	
						Bigtooth aspen------	78	91	
						White ash----------	---	---	
						American basswood---	---	---	
						Red pine----------	---	---	
						Red maple----------	---	---	
						Eastern hemlock-----	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Wind-throw hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
PeD:									
Pence	3R	Moderate	Slight	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						Northern red oak	---	---	
						White ash	---	---	
						Eastern hemlock	---	---	
PnB, PnC	3A	Slight	Slight	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
Pence						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						Northern red oak	---	---	
						White ash	---	---	
						Eastern hemlock	---	---	
PnD	3R	Moderate	Slight	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
Pence						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						Northern red oak	---	---	
						White ash	---	---	
						Eastern hemlock	---	---	
PsB, PsC:									
Pence	3A	Slight	Slight	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						Northern red oak	---	---	
						White ash	---	---	
						Eastern hemlock	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
PsB, PsC:									
Vilas	6A	Slight	Slight	Slight	Slight	Red pine	57	93	Red pine, jack pine, eastern white pine.
						Jack pine	65	94	
						Eastern white pine	56	109	
						Northern pin oak	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Northern red oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
PsD:									
Pence	3R	Moderate	Slight	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						Northern red oak	---	---	
						White ash	---	---	
						Eastern hemlock	---	---	
Vilas	6R	Moderate	Slight	Slight	Slight	Red pine	57	93	Red pine, jack pine, eastern white pine.
						Jack pine	65	94	
						Eastern white pine	56	109	
						Northern pin oak	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Northern red oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
Rb Robago	3W	Slight	Moderate	Severe	Severe	Sugar maple	61	38	White spruce, northern whitecedar, eastern white pine.
						Red maple	---	---	
						Yellow birch	---	---	
						Balsam fir	---	---	
						Paper birch	---	---	
						Eastern hemlock	---	---	
						Quaking aspen	---	---	
RkC:									
Rock outcrop.									
Ishpeming	5D	Slight	Slight	Moderate	Slight	Quaking aspen	63	70	Red pine, jack pine.
						Balsam fir	---	---	
						Red maple	---	---	
						Eastern hemlock	---	---	
						Paper birch	60	65	
						Bigtooth aspen	68	78	
						Sugar maple	---	---	
						Yellow birch	---	---	
						American basswood	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Wind-throw hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
RkC:									
Vilas----------	6A	Slight	Slight	Slight	Slight	Red pine----------	57	93	Red pine, jack pine, eastern white pine.
						Jack pine----------	65	94	
						Eastern white pine--	56	109	
						Northern pin oak----	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	
						Northern red oak----	---	---	
						Red maple----------	---	---	
						Paper birch---------	---	---	
RkD:									
Rock outcrop.									
Ishpeming------	5R	Moderate	Slight	Moderate	Slight	Quaking aspen-------	63	70	Red pine, jack pine.
						Balsam fir----------	---	---	
						Red maple----------	---	---	
						Eastern hemlock-----	---	---	
						Paper birch---------	60	65	
						Bigtooth aspen------	68	78	
						Sugar maple---------	---	---	
						Yellow birch--------	---	---	
						American basswood---	---	---	
Vilas----------	6R	Moderate	Slight	Slight	Slight	Red pine----------	57	93	Red pine, jack pine, eastern white pine.
						Jack pine----------	65	94	
						Eastern white pine--	56	109	
						Northern pin oak----	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	
						Northern red oak----	---	---	
						Red maple----------	---	---	
						Paper birch---------	---	---	
RmC:									
Rock outcrop.									
Metonga--------	3D	Slight	Slight	Moderate	Moderate	Sugar maple---------	60	38	White spruce, eastern white pine.
						Red maple----------	---	---	
						Paper birch---------	---	---	
						Yellow birch--------	60	38	
						Balsam fir----------	---	---	
						Bigtooth aspen------	---	---	
						Eastern hemlock-----	---	---	
						White spruce--------	---	---	
						Black cherry--------	---	---	
						Northern red oak----	---	---	
						American basswood---	---	---	
						Quaking aspen-------	---	---	
Sarona---------	3L	Slight	Slight	Slight	Moderate	Sugar maple---------	64	40	Red pine, eastern white pine, white spruce.
						Northern red oak----	72	69	
						American basswood---	70	66	
						Quaking aspen-------	---	---	
						White ash----------	75	73	
						Eastern hemlock-----	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Wind-throw hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
RmD:									
Rock outcrop.									
Metonga	3R	Moderate	Slight	Moderate	Moderate	Sugar maple	60	38	White spruce, eastern white pine.
						Red maple	---	---	
						Paper birch	---	---	
						Yellow birch	60	38	
						Balsam fir	---	---	
						Bigtooth aspen	---	---	
						Eastern hemlock	---	---	
						White spruce	---	---	
						Black cherry	---	---	
						Northern red oak	---	---	
						American basswood	---	---	
						Quaking aspen	---	---	
Sarona	3R	Moderate	Slight	Slight	Moderate	Sugar maple	64	40	Red pine, eastern white pine, white spruce.
						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	
						Eastern hemlock	---	---	
RsB, RsC	5A	Slight	Slight	Slight	Moderate	Quaking aspen	65	73	Red pine, jack pine.
Rousseau						Red maple	60	38	
						Balsam fir	---	---	
						Northern red oak	---	---	
						Eastern hemlock	---	---	
						Red pine	---	---	
						Jack pine	62	89	
						Paper birch	65	73	
						Yellow birch	---	---	
						Bigtooth aspen	66	75	
SaB, SaC	3L	Slight	Slight	Slight	Moderate	Sugar maple	64	40	Red pine, white spruce, eastern white pine.
Sarona						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	
						Eastern hemlock	---	---	
SaD	3R	Moderate	Slight	Slight	Moderate	Sugar maple	64	40	Red pine, white spruce, eastern white pine.
Sarona						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	
						Eastern hemlock	---	---	
SdB, SdC:									
Sarona	3L	Slight	Slight	Slight	Moderate	Sugar maple	64	40	Red pine, white spruce, eastern white pine.
						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	
						Eastern hemlock	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
SdB, SdC:									
Padus	3L	Slight	Slight	Slight	Moderate	Sugar maple	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak	70	66	
						Bigtooth aspen	78	91	
						White ash	---	---	
						American basswood	---	---	
						Red pine	---	---	
						Red maple	---	---	
						Eastern hemlock	---	---	
SdD:									
Sarona	3R	Moderate	Slight	Slight	Moderate	Sugar maple	64	40	Red pine, white spruce, eastern white pine.
						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	
						Eastern hemlock	---	---	
Padus	3R	Moderate	Slight	Slight	Moderate	Sugar maple	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak	70	66	
						Bigtooth aspen	78	91	
						White ash	---	---	
						American basswood	---	---	
						Red pine	---	---	
						Red maple	---	---	
						Eastern hemlock	---	---	
SlB, SlC:									
Sarona	3L	Slight	Slight	Slight	Moderate	Sugar maple	64	40	Red pine, white spruce, eastern white pine.
						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	
						Eastern hemlock	---	---	
Vilas	6A	Slight	Slight	Slight	Slight	Red pine	57	93	Red pine, jack pine, eastern white pine.
						Jack pine	65	94	
						Eastern white pine	56	109	
						Northern pin oak	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Northern red oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
SlD:									
Sarona	3R	Moderate	Slight	Slight	Moderate	Sugar maple	64	40	Red pine, white spruce, eastern white pine.
						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	
						Eastern hemlock	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Wind-throw hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
SlD:									
Vilas	6R	Moderate	Slight	Slight	Slight	Red pine	57	93	Red pine, jack pine, eastern white pine.
						Jack pine	65	94	
						Eastern white pine	56	109	
						Northern pin oak	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Northern red oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
SnB, SnC Sayner	7A	Slight	Slight	Slight	Slight	Red pine	59	99	Red pine, jack pine, eastern white pine.
						Jack pine	---	---	
						Eastern white pine	57	112	
						Northern red oak	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Red maple	---	---	
SnD Sayner	7R	Moderate	Slight	Slight	Slight	Red pine	59	99	Red pine, jack pine, eastern white pine.
						Jack pine	---	---	
						Eastern white pine	57	112	
						Northern red oak	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Red maple	---	---	
SoD:									
Soperton	3R	Moderate	Slight	Moderate	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood	74	72	
						Yellow birch	72	44	
						White ash	78	78	
						Eastern hemlock	56	---	
Goodman	3R	Moderate	Slight	Slight	Severe	Sugar maple	69	42	Eastern white pine, red pine, white spruce.
						Yellow birch	---	---	
						American basswood	68	63	
						Bigtooth aspen	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
StC Stambaugh	3L	Slight	Slight	Slight	Severe	Sugar maple	61	38	Eastern white pine, white spruce, red pine.
						Yellow birch	---	---	
						American basswood	---	---	
						Eastern hemlock	---	---	
						Eastern white pine	---	---	
						Red maple	---	---	
						Balsam fir	---	---	
StD Stambaugh	3R	Moderate	Slight	Slight	Severe	Sugar maple	61	38	Eastern white pine, white spruce, red pine.
						Yellow birch	---	---	
						American basswood	---	---	
						Eastern hemlock	---	---	
						Eastern white pine	---	---	
						Red maple	---	---	
						Balsam fir	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Wind-throw hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
SuC:									
Stambaugh------	3L	Slight	Slight	Slight	Severe	Sugar maple---------	61	38	Eastern white
						Yellow birch--------	---	---	pine, white
						American basswood---	---	---	spruce, red
						Eastern hemlock-----	---	---	pine.
						Eastern white pine--	---	---	
						Red maple----------	---	---	
						Balsam fir----------	---	---	
Goodman--------	3L	Slight	Slight	Slight	Severe	Sugar maple---------	69	42	Eastern white
						Yellow birch--------	---	---	pine, red
						American basswood---	68	63	pine, white
						Bigtooth aspen------	---	---	spruce.
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
SuD:									
Stambaugh------	3R	Moderate	Slight	Slight	Severe	Sugar maple---------	61	38	Eastern white
						Yellow birch--------	---	---	pine, white
						American basswood---	---	---	spruce, red
						Eastern hemlock-----	---	---	pine.
						Eastern white pine--	---	---	
						Red maple----------	---	---	
						Balsam fir----------	---	---	
Goodman--------	3R	Moderate	Slight	Slight	Severe	Sugar maple---------	69	42	Eastern white
						Yellow birch--------	---	---	pine, red
						American basswood---	68	63	pine, white
						Bigtooth aspen------	---	---	spruce.
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
TpA---------- Tipler	3L	Slight	Slight	Slight	Moderate	Sugar maple---------	67	41	Red pine,
						Northern red oak----	70	66	eastern white
						American basswood---	---	---	pine, white
						White ash----------	---	---	spruce.
						Eastern hemlock-----	---	---	
						Red maple----------	---	---	
VaB---------- Vanzile	3L	Slight	Slight	Slight	Severe	Sugar maple---------	61	38	Eastern white
						Yellow birch--------	---	---	pine, red
						American basswood---	---	---	pine, white
						Eastern hemlock-----	---	---	spruce.
						Eastern white pine--	---	---	
VgB:									
Vanzile--------	3L	Slight	Slight	Slight	Severe	Sugar maple---------	61	38	Eastern white
						Yellow birch--------	---	---	pine, red
						American basswood---	---	---	pine, white
						Eastern hemlock-----	---	---	spruce.
						Eastern white pine--	---	---	
Goodwit--------	3L	Slight	Slight	Slight	Severe	Sugar maple---------	69	42	Eastern white
						Yellow birch--------	---	---	pine, red
						American basswood---	68	63	pine, white
						Bigtooth aspen------	---	---	spruce.
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
						White ash----------	---	---	
						Black cherry--------	---	---	
						Eastern hophornbeam-	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
VsB, VsC-------- Vilas	6A	Slight	Slight	Slight	Slight	Red pine----------	57	93	Red pine, jack pine, eastern white pine.
						Jack pine----------	65	94	
						Eastern white pine--	56	109	
						Northern pin oak----	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	
						Northern red oak----	---	---	
						Red maple----------	---	---	
						Paper birch---------	---	---	
VsD---------- Vilas	6R	Moderate	Slight	Slight	Slight	Red pine----------	57	93	Red pine, jack pine, eastern white pine.
						Jack pine----------	65	94	
						Eastern white pine--	56	109	
						Northern pin oak----	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	
						Northern red oak----	---	---	
						Red maple----------	---	---	
						Paper birch---------	---	---	
WaC:									
Wabeno---------	3L	Slight	Slight	Moderate	Moderate	Sugar maple---------	67	41	White spruce, red pine.
						American basswood---	74	72	
						Yellow birch--------	72	44	
						White ash----------	78	78	
Goodman--------	3L	Slight	Slight	Slight	Severe	Sugar maple---------	69	42	Eastern white pine, red pine, white spruce.
						Yellow birch--------	---	---	
						American basswood---	68	63	
						Bigtooth aspen------	---	---	
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
WbB:									
Wabeno---------	3L	Slight	Slight	Moderate	Moderate	Sugar maple---------	67	41	White spruce, red pine.
						American basswood---	74	72	
						Yellow birch--------	72	44	
						White ash----------	78	78	
Goodwit--------	3L	Slight	Slight	Slight	Severe	Sugar maple---------	69	42	Eastern white pine, red pine, white spruce.
						Yellow birch--------	---	---	
						American basswood---	68	63	
						Bigtooth aspen------	---	---	
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
						White ash----------	---	---	
						Black cherry--------	---	---	
						Eastern hophornbeam-	---	---	
WkB, WkC-------- Wakefield	3W	Slight	Moderate	Severe	Severe	Sugar maple---------	61	38	White spruce, eastern white pine, jack pine, red pine.
						American basswood---	---	---	
						Yellow birch--------	---	---	
						Balsam fir----------	---	---	
						Eastern hemlock-----	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
WrA---------- Worcester	2W	Slight	Moderate	Severe	Severe	Red maple----------	55	35	Red maple, white spruce, eastern white pine.
						Sugar maple---------	---	---	
						Yellow birch--------	---	---	
						Balsam fir----------	---	---	
						White spruce--------	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Eastern hemlock-----	---	---	

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of the mean annual increment for fully stocked natural stands.

Table 6.--Woodland Equipment Use

(Only the soils suitable for the production of commercial trees are listed. Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Ratings for the most limiting season: Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
AnB Annalake	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
AnC Annalake	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Au Au Gres	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter.
Ca Capitola	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
CoA Crossett	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.*
CrA Croswell	Slight	Slight	Slight	Slight	Year round.
CuA Cublake	Slight	Slight	Slight	Slight	Year round.
EdB Ellwood	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
EdC Ellwood	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
ElB:					
Ellwood	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
Crossett	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.*
EmB:					
Ellwood	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
Iosco	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter.
Morganlake	Slight	Slight	Slight	Slight	Year round.
EnC:					
Ellwood	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
Iosco	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter.

See footnote at end of table.

Table 6.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season: Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
EnC:					
Vilas	Slight	Moderate: slope.	Slight	Slight	Year round.
EoD:					
Ellwood	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
Vilas	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
Padus	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.
Ep:					
Epiaquents	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
Epiaquods	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
FeB Fence	Severe: low strength.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Summer, fall, winter.*
Fm Fordum	Severe: wetness, low strength.	Severe: wetness, flooding, low strength.	Severe: wetness, flooding, low strength.	Severe: wetness, low strength.	Winter.
GaA Gastrow	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.*
GmC Goodman	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
GmD Goodman	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.*
GwB Goodwit	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
IsA Iosco	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, fall.
Kr Kinross	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter.
Lu:					
Lupton	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
Cathro	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.

See footnote at end of table.

Table 6.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season: Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
Lu:					
Markey	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
MaA Manitowish	Slight	Slight	Slight	Slight	Year round.
Mn Minocqua	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
MrB Morganlake	Slight	Slight	Slight	Slight	Year round.
MuB Mudlake	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.*
PaB Padus	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
PaC Padus	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
PaD Padus	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.
PeB:					
Padus	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Pence	Slight	Slight	Slight	Slight	Year round.
PeC:					
Padus	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Pence	Slight	Moderate: slope.	Slight	Slight	Year round.
PeD:					
Padus	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.
Pence	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
PnB Pence	Slight	Slight	Slight	Slight	Year round.
PnC Pence	Slight	Moderate: slope.	Slight	Slight	Year round.
PnD Pence	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.

See footnote at end of table.

Table 6.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season: Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
PsB:					
Pence	Slight	Slight	Slight	Slight	Year round.
Vilas	Slight	Slight	Slight	Slight	Year round.
PsC:					
Pence	Slight	Moderate: slope.	Slight	Slight	Year round.
Vilas	Slight	Moderate: slope.	Slight	Slight	Year round.
PsD:					
Pence	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
Vilas	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
Rb Robago	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.
RkC:					
Rock outcrop.					
Ishpeming	Severe: rock outcrop.	Severe: rock outcrop.	Severe: rock outcrop.	Severe: rock outcrop.	Year round.
Vilas	Severe: rock outcrop.	Severe: rock outcrop.	Severe: rock outcrop.	Severe: rock outcrop.	Year round.
RkD:					
Rock outcrop.					
Ishpeming	Severe: rock outcrop.	Severe: rock outcrop, slope.	Severe: rock outcrop.	Severe: rock outcrop.	Year round.
Vilas	Severe: rock outcrop.	Severe: rock outcrop, slope.	Severe: rock outcrop.	Severe: rock outcrop.	Year round.
RmC:					
Rock outcrop.					
Metonga	Severe: rock outcrop.	Severe: rock outcrop.	Moderate: rock outcrop.	Severe: rock outcrop.	Summer, fall, winter.
Sarona	Severe: rock outcrop.	Severe: rock outcrop.	Severe: rock outcrop.	Severe: rock outcrop.	Summer, fall, winter.
RmD:					
Rock outcrop.					
Metonga	Severe: rock outcrop.	Severe: rock outcrop, slope.	Severe: rock outcrop.	Severe: rock outcrop.	Summer, fall, winter.
Sarona	Severe: rock outcrop.	Severe: rock outcrop, slope.	Severe: rock outcrop.	Severe: rock outcrop.	Summer, fall, winter.

See footnote at end of table.

Table 6.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season: Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
RsB Rousseau	Slight	Slight	Slight	Slight	Year round.
RsC Rousseau	Slight	Moderate: slope.	Slight	Slight	Year round.
SaB Sarona	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
SaC Sarona	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
SaD Sarona	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.
SdB:					
Sarona	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Padus	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
SdC:					
Sarona	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Padus	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
SdD:					
Sarona	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.
Padus	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.
SlB:					
Sarona	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Vilas	Slight	Slight	Slight	Slight	Year round.
SlC:					
Sarona	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Vilas	Slight	Moderate: slope.	Slight	Slight	Year round.
SlD:					
Sarona	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.

See footnote at end of table.

Table 6.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season: Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
SlD:					
Vilas	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
SnB Sayner	Slight	Slight	Slight	Slight	Year round.
SnC Sayner	Slight	Moderate: slope.	Slight	Slight	Year round.
SnD Sayner	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
SoD:					
Soperton	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.*
Goodman	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.*
StC Stambaugh	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
StD Stambaugh	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.*
SuC:					
Stambaugh	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
Goodman	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
SuD:					
Stambaugh	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.*
Goodman	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.*
TpA Tipler	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
VaB Vanzile	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
VgB:					
Vanzile	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
Goodwit	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*

See footnote at end of table.

Table 6.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season: Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
VsB Vilas	Slight	Slight	Slight	Slight	Year round.
VsC Vilas	Slight	Moderate: slope.	Slight	Slight	Year round.
VsD Vilas	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
WaC:					
Wabeno	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
Goodman	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
WbB:					
Wabeno	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
Goodwit	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
WkB, WkC Wakefield	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter.*
WrA Worcester	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.

* Equipment operations may be severely restricted after a heavy rainfall because the soil has a high content of silt. The soil is slippery when wet and can easily become rutted.

Table 7.--Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Bromegrass-alfalfa hay	Timothy-red clover hay	Kentucky bluegrass	Irish potatoes
		Bu	Tons	Bu	Tons	Tons	AUM*	Cwt
AnB---------- Annalake	IIe	70	11	65	4.0	2.8	2.9	---
AnC---------- Annalake	IIIe	65	10	60	3.8	2.6	2.7	---
Au---------- Au Gres	IVw	50	8	45	2.5	2.5	2.2	---
Ca---------- Capitola	VIIw	---	---	---	---	---	---	---
CoA---------- Crossett	IIw	75	12	70	3.5	3.0	1.3	---
CrA---------- Croswell	IVs	50	8	45	2.5	2.0	2.0	---
CuA---------- Cublake	IVs	55	9	55	2.8	2.5	2.1	---
EdB---------- Ellwood	IIe	80	13	75	4.5	3.5	3.6	---
EdC---------- Ellwood	IIIe	75	12	70	4.3	3.3	3.4	---
ElB---------- Ellwood-Crossett	IIe	80	13	75	4.1	3.3	3.0	---
EmB---------- Ellwood-Iosco-Morganlake	IIe	70	11	65	4.0	3.0	3.0	---
EnC---------- Ellwood-Iosco-Vilas	IIIe	65	10	55	3.5	2.6	2.6	---
EoD---------- Ellwood-Vilas-Padus	VIe	---	---	---	---	---	2.3	---
Ep---------- Epiaquents and Epiaquods	VIw	---	---	---	---	---	---	---
FeB---------- Fence	IIe	75	12	70	4.0	3.5	3.6	---
Fm---------- Fordum	VIw	---	---	---	---	---	---	---
GaA---------- Gastrow	IIw	75	12	70	3.5	3.0	3.2	---

See footnotes at end of table.

Table 7.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Bromegrass-alfalfa hay	Timothy-red clover hay	Kentucky bluegrass	Irish potatoes
		Bu	Tons	Bu	Tons	Tons	AUM*	Cwt
GmC---------- Goodman	IIIe**	75	12	70	4.3	3.3	3.4	---
GmD---------- Goodman	VIIe	---	---	---	---	---	3.0	---
GwB---------- Goodwit	IIe**	80	13	75	4.5	3.5	3.6	---
IsA---------- Iosco	IIIw	70	11	65	3.0	2.5	2.7	---
Kr---------- Kinross	VIw	---	---	---	---	---	---	---
Lo---------- Loxley, Beseman, and Dawson	VIIw	---	---	---	---	---	---	---
Lu---------- Lupton, Cathro, and Markey	VIw	---	---	---	---	---	---	---
MaA---------- Manitowish	IIIs	65	10	60	3.5	3.0	2.6	250
Mn---------- Minocqua	VIw	---	---	---	---	---	---	---
MrB---------- Morganlake	IIIs	65	10	65	4.0	2.5	3.2	---
MuB---------- Mudlake	IIe**	75	12	70	3.5	3.0	3.2	---
PaB---------- Padus	IIe	70	11	70	4.0	3.0	3.2	375
PaC---------- Padus	IIIe	65	10	65	3.8	2.8	3.0	350
PaD---------- Padus	VIe	---	---	---	---	---	2.1	---
PeB---------- Padus-Pence	IIIe	65	10	65	3.7	2.8	2.8	275
PeC---------- Padus-Pence	IVe	60	10	60	3.5	2.5	2.6	250
PeD---------- Padus-Pence	VIIe	---	---	---	---	---	2.0	---
PnB---------- Pence	IIIe	60	10	55	3.5	2.5	2.5	250
PnC---------- Pence	IVe	55	9	50	3.3	2.3	2.3	225

See footnotes at end of table.

Table 7.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Bromegrass-alfalfa hay	Timothy-red clover hay	Kentucky bluegrass	Irish potatoes
		Bu	Tons	Bu	Tons	Tons	AUM*	Cwt
PnD---------- Pence	VIIe	---	---	---	---	---	1.7	---
PsB---------- Pence-Vilas	IVs	55	9	50	2.9	2.1	2.2	225
PsC---------- Pence-Vilas	VIs	50	8	45	2.7	1.9	1.8	200
PsD---------- Pence-Vilas	VIIe	---	---	---	---	---	1.3	---
Pt. Pits, gravel								
Px. Pits, mine								
Rb---------- Robago	IIw	70	11	65	3.5	2.5	2.7	---
RkC---------- Rock outcrop-Ishpeming-Vilas	VIs	---	---	---	---	---	---	---
RkD---------- Rock outcrop-Ishpeming-Vilas	VIIs	---	---	---	---	---	---	---
RmC---------- Rock outcrop-Metonga-Sarona	VIs	---	---	---	---	---	---	---
RmD---------- Rock outcrop-Metonga-Sarona	VIIs	---	---	---	---	---	---	---
RsB---------- Rousseau	IIIs	55	9	55	3.0	2.2	2.2	225
RsC---------- Rousseau	IIIe	50	8	50	2.8	2.0	2.0	200
SaB---------- Sarona	IIe**	75	12	70	4.0	3.1	3.3	---
SaC---------- Sarona	IIIe**	70	11	65	3.8	2.9	3.1	---
SaD---------- Sarona	VIIe	---	---	---	---	---	2.5	---
SdB---------- Sarona-Padus	IIe**	75	12	70	4.0	3.1	3.3	---
SdC---------- Sarona-Padus	IIIe**	70	11	65	3.8	2.9	3.1	---

See footnotes at end of table.

Table 7.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Bromegrass-alfalfa hay	Timothy-red clover hay	Kentucky bluegrass	Irish potatoes
		Bu	Tons	Bu	Tons	Tons	AUM*	Cwt
SdD---------- Sarona-Padus	VIIe	---	---	---	---	---	2.4	---
SlB---------- Sarona-Vilas	IIIe**	60	10	60	3.0	2.5	2.6	---
SlC---------- Sarona-Vilas	IVe**	55	9	55	2.8	2.3	2.4	---
SlD---------- Sarona-Vilas	VIIe	---	---	---	---	---	1.9	---
SnB---------- Sayner	IVs	45	7	40	2.5	1.7	1.3	200
SnC---------- Sayner	VIs	40	6	35	2.3	1.4	1.0	175
SnD---------- Sayner	VIIs	---	---	---	---	---	0.3	---
SoD---------- Soperton-Goodman	VIIe	---	---	---	---	---	2.8	---
StC---------- Stambaugh	IIIe	70	11	70	4.0	3.5	3.4	350
StD---------- Stambaugh	VIe	---	---	---	---	---	3.0	---
SuC---------- Stambaugh-Goodman	IIIe**	70	11	70	4.1	3.5	3.4	---
SuD---------- Stambaugh-Goodman	VIIe	---	---	---	---	---	3.0	---
TpA---------- Tipler	IIs	75	12	70	4.0	3.0	3.2	375
VaB---------- Vanzile	IIe	75	12	75	4.2	3.5	3.6	375
VgB---------- Vanzile-Goodwit	IIe**	75	12	75	4.4	3.5	3.6	---
VsB---------- Vilas	IVs	50	8	45	2.5	1.9	1.8	200
VsC---------- Vilas	VIs	45	7	40	2.3	1.7	1.5	175
VsD---------- Vilas	VIIs	---	---	---	---	---	1.1	---
WaC---------- Wabeno-Goodman	IIIe**	75	12	70	3.3	2.8	3.2	---

See footnotes at end of table.

Table 7.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Bromegrass-alfalfa hay	Timothy-red clover hay	Kentucky bluegrass	Irish potatoes
		Bu	Tons	Bu	Tons	Tons	AUM*	Cwt
WbB---------- Wabeno-Goodwit	IIe**	80	13	75	3.5	3.0	3.4	---
WkB---------- Wakefield	IIe**	75	12	65	3.5	3.0	3.4	---
WkC---------- Wakefield	IIIe**	70	11	60	3.3	2.8	3.2	---
WrA---------- Worcester	IIw	70	11	70	3.8	3.0	3.4	---

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** In areas where stones have been removed.

Table 8.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
AnB	Annalake fine sandy loam, 0 to 6 percent slopes
Ca	Capitola muck, 0 to 2 percent slopes, very stony (where drained)
CoA	Crossett silt loam, 0 to 3 percent slopes (where drained)
EdB	Ellwood silt loam, 1 to 6 percent slopes
ElB	Ellwood-Crossett silt loams, 0 to 6 percent slopes (where drained)
FeB	Fence silt loam, 0 to 6 percent slopes
GaA	Gastrow silt loam, 0 to 3 percent slopes (where drained)
GwB	Goodwit silt loam, 1 to 6 percent slopes, very stony
Mn	Minocqua muck, 0 to 2 percent slopes (where drained)
MuB	Mudlake silt loam, 1 to 6 percent slopes, very stony (where drained)
PaB	Padus sandy loam, 0 to 6 percent slopes
Rb	Robago fine sandy loam, 0 to 2 percent slopes (where drained)
SaB	Sarona fine sandy loam, 1 to 6 percent slopes, very stony
SdB	Sarona-Padus complex, 0 to 6 percent slopes, very stony
TpA	Tipler sandy loam, 0 to 3 percent slopes
VaB	Vanzile silt loam, 0 to 6 percent slopes
VgB	Vanzile-Goodwit silt loams, 0 to 6 percent slopes, very stony
WbB	Wabeno-Goodwit silt loams, 1 to 6 percent slopes, very stony
WrA	Worcester sandy loam, 0 to 3 percent slopes (where drained)

Table 9.--Windbreaks and Environmental Plantings

(Only the soils suitable for windbreaks and environmental plantings are listed. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
AnB, AnC Annalake	---	Arrowwood, nannyberry viburnum, Siberian peashrub, lilac, silky dogwood, American cranberrybush.	White spruce, Norway spruce, Manchurian crabapple.	Eastern white pine, red pine.	Imperial Carolina poplar.
Au Au Gres	---	American cranberrybush, Amur maple, common ninebark, nannyberry viburnum, northern whitecedar.	White spruce, Manchurian crabapple.	Jack pine, Norway spruce, green ash, eastern white pine.	Imperial Carolina poplar.
CoA Crossett	---	Northern whitecedar, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
CrA Croswell	Manyflower cotoneaster.	Amur maple, lilac, Siberian peashrub, northern whitecedar.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
CuA Cublake	Manyflower cotoneaster.	Siberian peashrub, lilac, smooth sumac, staghorn sumac, northern whitecedar.	Manchurian crabapple, Austrian pine.	Eastern white pine, red pine, jack pine.	---
EdB, EdC Ellwood	---	Northern whitecedar, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
ElB:					
Ellwood	---	Northern whitecedar, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
ElB:					
Crossett	---	Northern whitecedar, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
EmB:					
Ellwood	---	Northern whitecedar, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
Iosco	---	Common ninebark, northern whitecedar, American cranberrybush, nannyberry viburnum, lilac, silky dogwood.	White spruce, Manchurian crabapple, Norway spruce.	Green ash, eastern white pine, red pine.	Imperial Carolina poplar.
Morganlake	---	Lilac, nannyberry viburnum, northern whitecedar.	White spruce, Norway spruce, Manchurian crabapple.	Eastern white pine, red pine, jack pine.	Imperial Carolina poplar.
EnC:					
Ellwood	---	Northern whitecedar, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
Iosco	---	Common ninebark, northern whitecedar, American cranberrybush, nannyberry viburnum, lilac, silky dogwood.	White spruce, Manchurian crabapple, Norway spruce.	Green ash, eastern white pine, red pine.	Imperial Carolina poplar.
Vilas	Manyflower cotoneaster.	Northern whitecedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
EoD:					
Ellwood	---	Northern whitecedar, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
Vilas	Manyflower cotoneaster.	Northern whitecedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Padus	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, eastern redcedar, northern whitecedar.	Norway spruce	Jack pine, red pine, eastern white pine.	---
FeB Fence	---	Northern whitecedar, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
GaA Gastrow	---	Common ninebark, nannyberry viburnum, northern whitecedar, Amur maple, lilac, silky dogwood, American cranberrybush.	White spruce	Red pine, eastern white pine, white ash, red maple, silver maple.	Imperial Carolina poplar.
GmC, GmD Goodman	---	Amur maple, northern whitecedar, gray dogwood, lilac, American cranberrybush.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---
GwB Goodwit	---	Amur maple, northern whitecedar, gray dogwood, lilac, American cranberrybush.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
IsA Iosco	---	Common ninebark, northern whitecedar, American cranberrybush, nannyberry viburnum, lilac, silky dogwood.	White spruce, Manchurian crabapple, Norway spruce.	Green ash, eastern white pine, red pine.	Imperial Carolina poplar.
MaA Manitowish	Manyflower cotoneaster.	Northern whitecedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
MrB Morganlake	---	Lilac, nannyberry viburnum, northern whitecedar.	White spruce, Norway spruce, Manchurian crabapple.	Eastern white pine, red pine, jack pine.	Imperial Carolina poplar.
MuB Mudlake	---	Silky dogwood, northern whitecedar, nannyberry viburnum, redosier dogwood, lilac, American cranberrybush.	White spruce	Red maple, eastern white pine, white ash, silver maple.	---
PaB, PaC, PaD Padus	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, northern whitecedar.	Norway spruce	Jack pine, red pine, eastern white pine.	---
PeB, PeC, PeD:					
Padus	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, northern whitecedar.	Norway spruce	Jack pine, red pine, eastern white pine.	---
Pence	Manyflower cotoneaster.	Northern whitecedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
PnB, PnC, PnD----- Pence	Manyflower cotoneaster.	Northern whitecedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
PsB, PsC, PsD:					
Pence----------	Manyflower cotoneaster.	Northern whitecedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
Vilas----------	Manyflower cotoneaster.	Northern whitecedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
Rb---------- Robago	---	Northern whitecedar, American cranberrybush, silky dogwood, lilac, nannyberry viburnum, common ninebark, Amur maple.	White spruce------	Red maple, eastern white pine, green ash.	Imperial Carolina poplar.
RkC, RkD:					
Rock outcrop.					
Ishpeming--------	Manyflower cotoneaster.	Northern whitecedar, Amur maple, Siberian peashrub, lilac.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
Vilas----------	Manyflower cotoneaster.	Northern whitecedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
RmC, RmD: Rock outcrop.					
Metonga	Manyflower cotoneaster.	Lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Sarona	Manyflower cotoneaster.	Northern whitecedar, Siberian peashrub, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
RsB, RsC Rousseau	Manyflower cotoneaster.	Siberian crabapple, silky dogwood, Amur privet.	White spruce, Norway spruce.	Red pine, eastern white pine, jack pine.	Imperial Carolina poplar.
SaB, SaC, SaD Sarona	Manyflower cotoneaster.	Northern whitecedar, Siberian peashrub, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
SdB, SdC, SdD:					
Sarona	Manyflower cotoneaster.	Northern whitecedar, Siberian peashrub, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Padus	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, northern whitecedar.	Norway spruce	Jack pine, red pine, eastern white pine.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
SlB, SlC, SlD:					
Sarona	Manyflower cotoneaster.	Northern whitecedar, Siberian peashrub, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Vilas	Manyflower cotoneaster.	Northern whitecedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
SnB, SnC, SnD Sayner	Manyflower cotoneaster.	Siberian peashrub, lilac, Amur maple, American cranberrybush, silky dogwood, gray dogwood, northern whitecedar.	Norway spruce	Eastern white pine, red pine, jack pine.	---
SoD:					
Soperton	---	Amur maple, Siberian peashrub, lilac, gray dogwood, northern whitecedar.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash.	---
Goodman	---	Amur maple, northern whitecedar, gray dogwood, lilac, American cranberrybush.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---
StC, StD Stambaugh	---	Nannyberry viburnum, lilac, Amur maple, Siberian peashrub, silky dogwood, common ninebark, northern whitecedar, American cranberrybush, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
SuC, SuD:					
Stambaugh	---	Nannyberry viburnum, lilac, Amur maple, Siberian peashrub, silky dogwood, common ninebark, northern whitecedar, American cranberrybush, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Goodman	---	Amur maple, northern whitecedar, gray dogwood, lilac, American cranberrybush.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---
TpA Tipler	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, northern whitecedar.	Norway spruce	Jack pine, red pine, eastern white pine.	---
VaB Vanzile	---	Silky dogwood, American cranberrybush, gray dogwood, lilac, Amur maple, northern whitecedar.	Norway spruce, white spruce.	Eastern white pine, red pine, red maple, white ash.	---
VgB:					
Vanzile	---	Silky dogwood, American cranberrybush, gray dogwood, lilac, Amur maple, northern whitecedar.	Norway spruce, white spruce.	Eastern white pine, red pine, red maple, white ash.	---
Goodwit	---	Amur maple, northern whitecedar, gray dogwood, lilac, American cranberrybush.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---
VsB, VsC, VsD Vilas	Manyflower cotoneaster.	Northern whitecedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
WaC:					
Wabeno	---	Siberian peashrub, lilac, common ninebark, Amur maple, northern whitecedar.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash.	---
Goodman	---	Amur maple, northern whitecedar, gray dogwood, lilac, American cranberrybush.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---
WbB:					
Wabeno	---	Siberian peashrub, lilac, common ninebark, Amur maple, northern whitecedar.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash.	---
Goodwit	---	Amur maple, northern whitecedar, gray dogwood, lilac, American cranberrybush.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---
WkB, WkC Wakefield	---	Lilac, American cranberrybush, silky dogwood, arrowwood, common ninebark, nannyberry viburnum.	White spruce, Norway spruce.	Eastern white pine, red pine, red maple.	---
WrA Worcester	---	Common ninebark, northern whitecedar, nannyberry viburnum, American cranberrybush, redosier dogwood, silky dogwood, lilac.	White spruce	Eastern white pine, silver maple, red maple, white ash.	---

Table 10.--Recreational Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AnB Annalake	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
AnC Annalake	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Au Au Gres	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ca Capitola	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
CoA Crossett	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
CrA Croswell	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: small stones, too sandy, wetness.	Moderate: too sandy.	Moderate: droughty.
CuA Cublake	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: small stones, too sandy, wetness.	Moderate: too sandy.	Moderate: droughty.
EdB Ellwood	Moderate: wetness.	Moderate: wetness.	Moderate: slope, small stones, wetness.	Severe: erodes easily.	Moderate: large stones, wetness.
EdC Ellwood	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, wetness, slope.
ElB:					
Ellwood	Moderate: wetness.	Moderate: wetness.	Moderate: slope, small stones, wetness.	Severe: erodes easily.	Moderate: large stones, wetness.
Crossett	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
EmB:					
Ellwood	Moderate: wetness.	Moderate: wetness.	Moderate: slope, small stones, wetness.	Severe: erodes easily.	Moderate: large stones, wetness.
Iosco	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Morganlake	Moderate: wetness, percs slowly.	Moderate: wetness, too sandy.	Moderate: slope, too sandy, wetness.	Moderate: wetness, too sandy.	Moderate: wetness, droughty.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
EnC:					
Ellwood	Moderate: wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, wetness, slope.
Iosco	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Vilas	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
EoD:					
Ellwood	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, wetness, slope.
Vilas	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
Padus	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Ep:					
Epiaquents	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Epiaquods	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
FeB Fence	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
Fm Fordum	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
GaA Gastrow	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
GmC Goodman	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
GmD Goodman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
GwB Goodwit	Slight	Slight	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: large stones.
IsA Iosco	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Kr Kinross	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, excess humus.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Lo:					
Loxley	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Beseman	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Dawson	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Lu:					
Lupton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Cathro	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Markey	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
MaA Manitowish	Slight	Slight	Moderate: small stones.	Slight	Moderate: large stones, droughty.
Mn Minocqua	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
MrB Morganlake	Moderate: wetness, percs slowly.	Moderate: wetness, too sandy.	Moderate: slope, too sandy, wetness.	Moderate: wetness, too sandy.	Moderate: wetness, droughty.
MuB Mudlake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
PaB Padus	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, large stones.
PaC Padus	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones, slope.
PaD Padus	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
PeB:					
Padus	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, large stones.
Pence	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
PeC:					
Padus	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones, slope.
Pence	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
PeD:					
Padus	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Pence	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PnB	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
Pence					
PnC	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
Pence					
PnD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pence					
PsB:					
Pence	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
Vilas	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
PsC:					
Pence	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
Vilas	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
PsD:					
Pence	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vilas	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pt.					
Pits, gravel					
Px.					
Pits, mine					

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Rb---------- Robago	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
RkC:					
Rock outcrop.					
Ishpeming----------	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: large stones, droughty, slope.
Vilas----------	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
RkD:					
Rock outcrop.					
Ishpeming----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vilas----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RmC:					
Rock outcrop.					
Metonga----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: large stones, slope, depth to rock.
Sarona----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: large stones, droughty, slope.
RmD:					
Rock outcrop.					
Metonga----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sarona----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RsB---------- Rousseau	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
RsC---------- Rousseau	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
SaB---------- Sarona	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Moderate: large stones, droughty.
SaC---------- Sarona	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: large stones, droughty, slope.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SaD: Sarona	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
SdB:					
Sarona	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
Padus	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, large stones.
SdC:					
Sarona	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
Padus	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones, slope.
SdD:					
Sarona	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Padus	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
SlB:					
Sarona	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
Vilas	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
SlC:					
Sarona	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
Vilas	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
SlD:					
Sarona	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Vilas	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
SnB: Sayner	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Severe: droughty.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SnC: Sayner	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Severe: droughty.
SnD: Sayner	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: droughty, slope.
SoD:					
Soperton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Goodman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
StC: Stambaugh	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
StD: Stambaugh	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
SuC:					
Stambaugh	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
Goodman	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
SuD:					
Stambaugh	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Goodman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
TpA: Tipler	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, large stones.
VaB: Vanzile	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Moderate: large stones.
VgB:					
Vanzile	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Moderate: large stones.
Goodwit	Slight	Slight	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: large stones.
VsB: Vilas	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
VsC: Vilas	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
VsD: Vilas	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
WaC:					
Wabeno	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, wetness, slope.
Goodman	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
WbB:					
Wabeno	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Severe: erodes easily.	Moderate: large stones, wetness.
Goodwit	Slight	Slight	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: large stones.
WkB: Wakefield	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: large stones, wetness.
WkC: Wakefield	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: large stones, wetness, slope.
WrA: Worcester	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

Table 11.--Wildlife Habitat

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AnB---------- Annalake	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
AnC---------- Annalake	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Au---------- Au Gres	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Ca---------- Capitola	Very poor.	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
CoA---------- Crossett	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CrA---------- Croswell	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
CuA---------- Cublake	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
EdB---------- Ellwood	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
EdC---------- Ellwood	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ElB:										
Ellwood----------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Crossett----------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
EmB:										
Ellwood----------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Iosco----------	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Morganlake--------	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
EnC:										
Ellwood----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Iosco----------	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Vilas----------	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
EoD:										
Ellwood----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Vilas----------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Padus----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ep:										
Epiaquents	Very poor.	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
Epiaquods	Very poor.	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
FeB Fence	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Fm Fordum	Very poor.	Very poor.	Poor	Fair	Fair	Good	Good	Very poor.	Fair	Good.
GaA Gastrow	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
GmC, GmD Goodman	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
GwB Goodwit	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
IsA Iosco	Poor	Poor	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Kr Kinross	Very poor.	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
Lo:										
Loxley	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Beseman	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Dawson	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Lu:										
Lupton	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Cathro	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Markey	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
MaA Manitowish	Fair	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Mn Minocqua	Very poor.	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
MrB Morganlake	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
MuB Mudlake	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
PaB, PaC Padus	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
PaD Padus	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
PeB, PeC:										
Padus	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Pence	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
PeD:										
Padus	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Pence	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
PnB, PnC Pence	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
PnD Pence	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
PsB, PsC:										
Pence	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Vilas	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
PsD:										
Pence	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Vilas	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Pt. Pits, gravel										
Px. Pits, mine										
Rb Robago	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RkC:										
Rock outcrop.										
Ishpeming	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Vilas	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
RkD:										
Rock outcrop.										
Ishpeming	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Vilas	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
RmC:										
Rock outcrop.										
Metonga	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Sarona	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
RmD:										
Rock outcrop.										
Metonga	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Sarona	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
RsB Rousseau	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
RsC Rousseau	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
SaB, SaC, SaD Sarona	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
SdB, SdC:										
Sarona	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Padus	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SdD:										
Sarona	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Padus	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
SlB, SlC:										
Sarona	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Vilas	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
SlD:										
Sarona	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Vilas	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
SnB, SnC Sayner	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
SnD Sayner	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
SoD:										
Soperton	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Goodman	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
StC: Stambaugh	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
StD: Stambaugh	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
SuC:										
Stambaugh	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Goodman	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
SuD:										
Stambaugh	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Goodman	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
TpA: Tipler	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
VaB: Vanzile	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
VgB:										
Vanzile	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Goodwit	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
VsB, VsC: Vilas	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
VsD: Vilas	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
WaC:										
Wabeno	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Goodman	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
WbB:										
Wabeno	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
Goodwit	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
WkB: Wakefield	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
WkC---------- Wakefield	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
WrA---------- Worcester	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

Table 12.--Building Site Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AnB---------- Annalake	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Moderate: frost action.	Moderate: droughty.
AnC---------- Annalake	Severe: cutbanks cave.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
Au---------- Au Gres	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ca---------- Capitola	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
CoA---------- Crossett	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
CrA---------- Croswell	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty.
CuA---------- Cublake	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
EdB---------- Ellwood	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Moderate: large stones, wetness.
EdC---------- Ellwood	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: large stones, wetness, slope.
ElB:						
Ellwood----------	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Moderate: large stones, wetness.
Crossett---------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
EmB:						
Ellwood----------	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Moderate: large stones, wetness.
Iosco----------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
EmB:						
Morganlake	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
EnC:						
Ellwood	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: large stones, wetness, slope.
Iosco	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Vilas	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
EoD:						
Ellwood	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: large stones, wetness, slope.
Vilas	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Padus	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ep:						
Epiaquents	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
Epiaquods	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, excess humus.
FeB Fence	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Severe: frost action.	Slight.
Fm Fordum	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding, frost action.	Severe: ponding, flooding.
GaA Gastrow	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
GmC Goodman	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
GmD Goodman	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
GwB: Goodwit	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: large stones.
IsA: Iosco	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Kr: Kinross	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, excess humus.
Lo:						
Loxley	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Beseman	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Dawson	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Lu:						
Lupton	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Cathro	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Markey	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
MaA: Manitowish	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: large stones, droughty.
Mn: Minocqua	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
MrB: Morganlake	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
MuB: Mudlake	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
PaB: Padus	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: small stones, large stones.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PaC: Padus	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, large stones, slope.
PaD: Padus	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PeB:						
Padus	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: small stones, large stones.
Pence	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: large stones, droughty.
PeC:						
Padus	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, large stones, slope.
Pence	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
PeD:						
Padus	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pence	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PnB: Pence	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: large stones, droughty.
PnC: Pence	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
PnD: Pence	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PsB:						
Pence	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: large stones, droughty.
Vilas	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PsC:						
Pence	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
Vilas	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
PsD:						
Pence	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vilas	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pt.						
Pits, gravel						
Px.						
Pits, mine						
Rb	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: too acid, wetness.
RkC:						
Rock outcrop.						
Ishpeming	Severe: depth to rock, cutbanks cave.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Moderate: large stones, droughty, slope.
Vilas	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
RkD:						
Rock outcrop.						
Ishpeming	Severe: depth to rock, cutbanks cave, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vilas	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RmC:						
Rock outcrop.						
Metonga	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Moderate: large stones, slope, depth to rock.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
RmC:						
Sarona	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
RmD:						
Rock outcrop.						
Metonga	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sarona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RsB	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
Rousseau						
RsC	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Rousseau						
SaB	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones, droughty.
Sarona						
SaC	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
Sarona						
SaD	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sarona						
SdB:						
Sarona	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones, droughty.
Padus	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: small stones, large stones.
SdC:						
Sarona	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
Padus	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, large stones, slope.
SdD:						
Sarona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SdD:						
Padus	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SlB:						
Sarona	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones, droughty.
Vilas	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
SlC:						
Sarona	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
Vilas	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
SlD:						
Sarona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vilas	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SnB	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
Sayner						
SnC	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Sayner						
SnD	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Sayner						
SoD:						
Soperton	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Goodman	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
StC	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
Stambaugh						
StD	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Stambaugh						
SuC:						
Stambaugh	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SuC:						
Goodman	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
SuD:						
Stambaugh	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Goodman	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
TpA Tipler	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: small stones, large stones.
VaB Vanzile	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones.
VgB:						
Vanzile	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones.
Goodwit	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: large stones.
VsB Vilas	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
VsC Vilas	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
VsD Vilas	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WaC:						
Wabeno	Severe: cutbanks cave, wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: wetness, slope, frost action.	Moderate: large stones, wetness, slope.
Goodman	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
WbB:						
Wabeno	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness.
Goodwit	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: large stones.
WkB Wakefield	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: low strength, wetness.	Moderate: large stones, wetness.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
WkC---------- Wakefield	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, slope.	Moderate: low strength, wetness, slope.	Moderate: large stones, wetness, slope.
WrA---------- Worcester	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.

Table 13.--Sanitary Facilities

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "moderate," "poor," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AnB: Annalake	Severe: wetness.	Severe: wetness.	Severe: too sandy.	Moderate: wetness.	Poor: too sandy.
AnC: Annalake	Severe: wetness.	Severe: slope, wetness.	Severe: too sandy.	Moderate: wetness, slope.	Poor: too sandy.
Au: Au Gres	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Ca: Capitola	Severe: ponding, percs slowly.	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding.	Poor: seepage, small stones, ponding.
CoA: Crossett	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
CrA: Croswell	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
CuA: Cublake	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
EdB: Ellwood	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, small stones.
EdC: Ellwood	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Moderate: wetness, slope.	Fair: too clayey, small stones, slope.
ElB:					
Ellwood	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, small stones.
Crossett	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
EmB:					
Ellwood	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, small stones.
Iosco	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EmB:					
Morganlake	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage.	Fair: too clayey, wetness.
EnC:					
Ellwood	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Moderate: wetness, slope.	Fair: too clayey, small stones, slope.
Iosco	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Vilas	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
EoD:					
Ellwood	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Moderate: wetness, slope.	Fair: too clayey, small stones, slope.
Vilas	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Padus	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Ep:					
Epiaquents	Severe: ponding, percs slowly, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: too sandy, ponding.
Epiaquods	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: too sandy, ponding.
FeB	Severe: wetness, percs slowly.	Severe: wetness.	Severe: too sandy.	Moderate: wetness.	Fair: too sandy, wetness.
Fm	Severe: flooding, ponding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, small stones.
GaA	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy, wetness.
Fordum					
Gastrow					

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GmC---------- Goodman	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Poor: seepage, small stones.
GmD---------- Goodman	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: seepage, small stones, slope.
GwB---------- Goodwit	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Poor: small stones.
IsA---------- Iosco	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Kr---------- Kinross	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Lo:					
Loxley----------	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Beseman----------	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Dawson----------	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Lu:					
Lupton----------	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Cathro----------	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
Markey----------	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
MaA---------- Manitowish	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
Mn---------- Minocqua	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, small stones.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MrB---------- Morganlake	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage.	Fair: too clayey, wetness.
MuB---------- Mudlake	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, small stones, wetness.
PaB---------- Padus	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
PaC---------- Padus	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
PaD---------- Padus	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
PeB:					
Padus----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Pence----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
PeC:					
Padus----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Pence----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
PeD:					
Padus----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Pence----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
PnB---------- Pence	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
PnC: Pence	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
PnD: Pence	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
PsB:					
Pence	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Vilas	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
PsC:					
Pence	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Vilas	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
PsD:					
Pence	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Vilas	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Pt. Pits, gravel					
Px. Pits, mine					
Rb: Robago	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy, wetness.
RkC:					
Rock outcrop.					
Ishpeming	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, seepage, too sandy.
Vilas	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RkD:					
Rock outcrop.					
Ishpeming	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, seepage, too sandy.
Vilas	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
RmC:					
Rock outcrop.					
Metonga	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
Sarona	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.
RmD:					
Rock outcrop.					
Metonga	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Sarona	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
RsB	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
RsC	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
SaB	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
SaC	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.
SaD	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
SdB:					
Sarona	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Padus	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SdC:					
Sarona	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Padus	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
SdD:					
Sarona	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
Padus	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
SlB:					
Sarona	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Vilas	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
SlC:					
Sarona	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Vilas	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
SlD:					
Sarona	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
Vilas	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
SnB	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
SnC	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
SnD	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SoD:					
Soperton	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
Goodman	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: seepage, small stones, slope.
StC	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: too sandy, small stones.
StD	Severe: percs slowly, poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
SuC:					
Stambaugh	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Goodman	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Poor: seepage, small stones.
SuD:					
Stambaugh	Severe: percs slowly, poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Goodman	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: seepage, small stones, slope.
TpA	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
VaB	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
VgB:					
Vanzile	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Goodwit	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Poor: small stones.
VsB	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
VsC: Vilas	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
VsD: Vilas	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
WaC:					
Wabeno	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness, slope.	Poor: seepage, small stones.
Goodman	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Poor: seepage, small stones.
WbB:					
Wabeno	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: wetness.	Moderate: wetness.	Poor: seepage, small stones.
Goodwit	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Poor: small stones.
WkB: Wakefield	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
WkC: Wakefield	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
WrA: Worcester	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.

Table 14.--Construction Materials

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "fair," "poor," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AnB: Annalake	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
AnC: Annalake	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer, slope.
Au: Au Gres	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Ca: Capitola	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
CoA: Crossett	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
CrA: Croswell	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
CuA: Cublake	Fair: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
EdB, EdC: Ellwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
ElB:				
Ellwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Crossett	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
EmB:				
Ellwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Iosco	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Morganlake	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
EnC:				
Ellwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Iosco	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EnC:				
Vilas	Good	Probable	Improbable: too sandy.	Poor: too sandy.
EoD:				
Ellwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Vilas	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Padus	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Ep:				
Epiaquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, small stones, wetness.
Epiaquods	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
FeB	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Fm	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
GaA	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
GmC	Good	Probable	Probable	Poor: small stones, area reclaim.
GmD	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
GwB	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
IsA	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Kr	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Lo:				
Loxley	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Beseman	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Dawson	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Lu:				
Lupton	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Markey	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
MaA Manitowish	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Mn Minocqua	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
MrB Morganlake	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
MuB Mudlake	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
PaB, PaC Padus	Good	Probable	Probable	Poor: small stones, area reclaim.
PaD Padus	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
PeB, PeC:				
Padus	Good	Probable	Probable	Poor: small stones, area reclaim.
Pence	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
PeD:				
Padus	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Pence	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
PnB, PnC Pence	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
PnD Pence	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
PsB, PsC:				
Pence	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Vilas	Good	Probable	Improbable: too sandy.	Poor: too sandy.
PsD:				
Pence	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Vilas	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Pt. Pits, gravel				
Px. Pits, mine				
Rb Robago	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
RkC:				
Rock outcrop.				
Ishpeming	Poor: depth to rock.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, large stones.
Vilas	Good	Probable	Improbable: too sandy.	Poor: too sandy.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RkD:				
Rock outcrop.				
Ishpeming	Poor: depth to rock, slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, large stones, slope.
Vilas	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
RmC:				
Rock outcrop.				
Metonga	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones, slope.
Sarona	Good	Probable	Probable	Poor: small stones, area reclaim.
RmD:				
Rock outcrop.				
Metonga	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Sarona	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
RsB, RsC	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Rousseau				
SaB, SaC	Good	Probable	Probable	Poor: small stones, area reclaim.
Sarona				
SaD	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Sarona				
SdB, SdC:				
Sarona	Good	Probable	Probable	Poor: small stones, area reclaim.
Padus	Good	Probable	Probable	Poor: small stones, area reclaim.
SdD:				
Sarona	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SdD:				
Padus	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
SlB, SlC:				
Sarona	Good	Probable	Probable	Poor: small stones, area reclaim.
Vilas	Good	Probable	Improbable: too sandy.	Poor: too sandy.
SlD:				
Sarona	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Vilas	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
SnB, SnC	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
SnD	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
SoD:				
Soperton	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Goodman	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
StC	Good	Probable	Probable	Poor: small stones, area reclaim.
StD	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
SuC:				
Stambaugh	Good	Probable	Probable	Poor: small stones, area reclaim.
Goodman	Good	Probable	Probable	Poor: small stones, area reclaim.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SuD:				
Stambaugh	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Goodman	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
TpA Tipler	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
VaB Vanzile	Good	Probable	Probable	Poor: small stones, area reclaim.
VgB:				
Vanzile	Good	Probable	Probable	Poor: small stones, area reclaim.
Goodwit	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
VsB, VsC Vilas	Good	Probable	Improbable: too sandy.	Poor: too sandy.
VsD Vilas	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
WaC:				
Wabeno	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
Goodman	Good	Probable	Probable	Poor: small stones, area reclaim.
WbB:				
Wabeno	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
Goodwit	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
WkB, WkC Wakefield	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
WrA---------- Worcester	Poor: wetness.	Probable----------	Probable----------	Poor: small stones, area reclaim, wetness.

Table 15.--Water Management

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
AnB Annalake	Moderate: seepage, slope.	Severe: piping.	Slope, cutbanks cave.	Slope, wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
AnC Annalake	Severe: slope.	Severe: piping.	Slope, cutbanks cave.	Slope, wetness, droughty.	Slope, wetness, too sandy.	Slope, droughty.
Au Au Gres	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Ca Capitola	Moderate: seepage.	Severe: seepage, piping, ponding.	Ponding, frost action, cutbanks cave.	Ponding, soil blowing, rooting depth.	Large stones, erodes easily, ponding.	Large stones, wetness, erodes easily.
CoA Crossett	Slight	Severe: wetness.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
CrA Croswell	Severe: seepage.	Severe: seepage, piping.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
CuA Cublake	Severe: seepage.	Severe: seepage, piping.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
EdB Ellwood	Moderate: slope.	Moderate: wetness.	Slope	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
EdC Ellwood	Severe: slope.	Moderate: wetness.	Slope	Slope, wetness, erodes easily.	Slope, erodes easily, wetness.	Slope, erodes easily.
ElB:						
Ellwood	Moderate: slope.	Moderate: wetness.	Slope	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
Crossett	Slight	Severe: wetness.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
EmB:						
Ellwood	Moderate: slope.	Moderate: wetness.	Slope	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
Iosco	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty.	Erodes easily, wetness, too sandy.	Wetness, erodes easily, droughty.
Morganlake	Severe: seepage.	Moderate: piping, wetness.	Slope	Slope, wetness, droughty.	Erodes easily, wetness, soil blowing.	Erodes easily, droughty.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
EnC:						
Ellwood	Severe: slope.	Moderate: wetness.	Slope	Slope, wetness, erodes easily.	Slope, erodes easily, wetness.	Slope, erodes easily.
Iosco	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty.	Erodes easily, wetness, too sandy.	Wetness, erodes easily, droughty.
Vilas	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
EoD:						
Ellwood	Severe: slope.	Moderate: wetness.	Slope	Slope, wetness, erodes easily.	Slope, erodes easily, wetness.	Slope, erodes easily.
Vilas	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Padus	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
Ep:						
Epiaquents	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, frost action, cutbanks cave.	Ponding, soil blowing, rooting depth.	Ponding, too sandy, soil blowing.	Wetness, rooting depth.
Epiaquods	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, frost action, cutbanks cave.	Ponding, droughty, soil blowing.	Ponding, too sandy, soil blowing.	Wetness, droughty, rooting depth.
FeB Fence	Moderate: seepage, slope.	Severe: piping.	Frost action, slope, cutbanks cave.	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
Fm Fordum	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, flooding, frost action.	Ponding, droughty, flooding.	Erodes easily, ponding, too sandy.	Wetness, erodes easily, droughty.
GaA Gastrow	Moderate: seepage.	Severe: piping, wetness.	Frost action, cutbanks cave.	Wetness, erodes easily.	Erodes easily, wetness, too sandy.	Wetness, erodes easily.
GmC, GmD Goodman	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily, too sandy.	Slope, erodes easily.
GwB Goodwit	Moderate: seepage, slope.	Severe: seepage, piping.	Slope	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
IsA Iosco	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty.	Erodes easily, wetness, too sandy.	Wetness, erodes easily, droughty.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Kr: Kinross	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, cutbanks cave.	Ponding	Ponding, too sandy, soil blowing.	Wetness.
Lo:						
Loxley	Severe: seepage.	Severe: excess humus, ponding.	Ponding, subsides, frost action.	Ponding	Ponding	Wetness.
Beseman	Severe: seepage.	Severe: excess humus, ponding.	Ponding, subsides, frost action.	Ponding, rooting depth.	Ponding	Wetness, rooting depth.
Dawson	Severe: seepage.	Severe: excess humus, ponding.	Ponding, subsides, frost action.	Ponding, rooting depth.	Ponding	Wetness, rooting depth.
Lu:						
Lupton	Severe: seepage.	Severe: excess humus, ponding.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
Cathro	Severe: seepage.	Severe: piping, ponding.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
Markey	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, too sandy, soil blowing.	Wetness.
MaA: Manitowish	Severe: seepage.	Severe: seepage.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Droughty.
Mn: Minocqua	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, frost action, cutbanks cave.	Ponding, rooting depth.	Erodes easily, ponding, too sandy.	Wetness, erodes easily.
MrB: Morganlake	Severe: seepage.	Moderate: piping, wetness.	Slope	Slope, wetness, droughty.	Erodes easily, wetness, soil blowing.	Erodes easily, droughty.
MuB: Mudlake	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, slope, cutbanks cave.	Slope, wetness, erodes easily.	Large stones, erodes easily, wetness.	Large stones, wetness, erodes easily.
PaB: Padus	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty, rooting depth.
PaC, PaD: Padus	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
PeB:						
Padus	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty, rooting depth.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
PeB:						
Pence	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.
PeC, PeD:						
Padus	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
Pence	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
PnB	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.
PnC, PnD	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
PsB:						
Pence	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.
Vilas	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
PsC, PsD:						
Pence	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
Vilas	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Pt. Pits, gravel						
Px. Pits, mine						
Rb Robago	Moderate: seepage.	Severe: piping, wetness.	Frost action, cutbanks cave.	Wetness, soil blowing.	Wetness, too sandy, soil blowing.	Wetness.
RkC, RkD:						
Rock outcrop.						
Ishpeming	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, depth to rock, too sandy.	Slope, droughty, depth to rock.
Vilas	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
RmC, RmD:						
Rock outcrop.						
Metonga	Severe: slope.	Severe: piping.	Deep to water	Slope, soil blowing, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Sarona	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
RsB Rousseau	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
RsC Rousseau	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
SaB Sarona	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
SaC, SaD Sarona	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
SdB:						
Sarona	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Padus	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty, rooting depth.
SdC, SdD:						
Sarona	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Padus	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
SlB:						
Sarona	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Vilas	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
SlC, SlD:						
Sarona	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Vilas	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
SnB---------- Sayner	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty, rooting depth.
SnC, SnD---------- Sayner	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
SoD:						
Soperton---------	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty, percs slowly.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Goodman----------	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily, too sandy.	Slope, erodes easily.
StC, StD---------- Stambaugh	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily, too sandy.	Slope, erodes easily.
SuC, SuD:						
Stambaugh--------	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily, too sandy.	Slope, erodes easily.
Goodman----------	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily, too sandy.	Slope, erodes easily.
TpA---------- Tipler	Severe: seepage.	Severe: seepage, piping.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
VaB---------- Vanzile	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, rooting depth, erodes easily.	Erodes easily, too sandy.	Erodes easily, rooting depth.
VgB:						
Vanzile----------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, rooting depth, erodes easily.	Erodes easily, too sandy.	Erodes easily, rooting depth.
Goodwit----------	Moderate: seepage, slope.	Severe: seepage, piping.	Slope----------	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
VsB---------- Vilas	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
VsC, VsD---------- Vilas	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
WaC:						
Wabeno----------	Severe: slope.	Severe: seepage.	Percs slowly, large stones, slope.	Slope, wetness, droughty.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Goodman----------	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily, too sandy.	Slope, erodes easily.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
WbB:						
Wabeno	Moderate: seepage, slope.	Severe: seepage.	Percs slowly, large stones, slope.	Slope, wetness, droughty.	Large stones, erodes easily.	Large stones, erodes easily.
Goodwit	Moderate: seepage, slope.	Severe: seepage, piping.	Slope	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
WkB Wakefield	Moderate: seepage, slope.	Moderate: thin layer, piping, wetness.	Percs slowly, slope.	Slope, wetness, droughty.	Erodes easily, wetness.	Wetness, erodes easily.
WkC Wakefield	Severe: slope.	Moderate: thin layer, piping, wetness.	Percs slowly, slope.	Slope, wetness, droughty.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
WrA Worcester	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, cutbanks cave.	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Wetness, droughty, rooting depth.

Table 16.--Engineering Index Properties

(See text for explanations of terms used in this table. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
AnB, AnC------ Annalake	0-3	Fine sandy loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	90-100	85-100	50-95	25-60	<26	NP-8
	3-6	Fine sandy loam, sandy loam, loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	90-100	85-100	50-95	25-80	<26	NP-8
	6-17	Fine sandy loam, very fine sandy loam, sandy loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	90-100	85-100	50-95	25-65	<26	NP-8
	17-31	Fine sandy loam, sandy loam, loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	90-100	85-100	50-95	25-80	<26	NP-8
	31-39	Sandy loam, very fine sandy loam, loam.	SM, SC, CL, ML	A-2-4, A-4	0	0	90-100	85-100	50-95	25-80	18-28	3-9
	39-60	Stratified fine sand to silt loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	90-100	85-100	50-95	25-80	<26	NP-8
Au---------- Au Gres	0-7	Loamy sand----	SM, SP-SM, SC-SM	A-2-4, A-1-b	0	0	95-100	75-100	35-90	10-30	0-25	NP-7
	7-17	Sand, loamy sand.	SP-SM, SM, SC-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-90	0-30	0-25	NP-7
	17-62	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	95-100	75-100	35-90	0-15	0-14	NP
Ca---------- Capitola	0-5	Muck----------	PT	A-8	2-3	0-15	---	---	---	---	---	NP
	5-20	Silt loam, loam, sandy loam.	CL, ML, SM, SC	A-4, A-2-4	1-5	0-15	80-100	75-100	45-100	20-90	<28	NP-9
	20-34	Fine sandy loam, sandy loam, gravelly sandy loam.	SM, SC	A-4, A-1-b, A-2-4	0-10	0-25	65-100	55-95	35-85	15-50	<26	NP-8
	34-60	Fine sandy loam, sandy loam, gravelly sandy loam.	SM, SP-SM	A-4, A-1-b, A-2-4	0-10	0-25	65-100	55-95	20-85	8-50	<21	NP-4
CoA---------- Crossett	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	0-8	80-100	75-100	60-100	50-90	20-35	4-15
	9-19	Silt loam, silty clay loam, loam.	CL	A-6	0-1	0-8	80-100	75-100	55-100	45-95	30-40	10-20
	19-38	Silty clay loam, clay loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	60-100	50-95	35-45	15-25
	38-80	Silty clay loam, clay loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	60-100	50-95	35-45	15-25

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
CrA---------- Croswell	0-5	Loamy sand----	SM, SP-SM, SC-SM	A-2, A-1-b	0	0	90-100	75-100	40-90	10-30	0-25	NP-7
	5-21	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-90	3-30	0-14	NP
	21-27	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-90	3-30	0-14	NP
	27-62	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-90	3-15	0-14	NP
CuA---------- Cublake	0-3	Loamy sand----	SM, SP-SM	A-2-4, A-1-b	0	0	80-100	75-100	30-75	10-35	<20	NP-4
	3-4	Loamy sand, sand, loamy fine sand.	SM, SP-SM	A-4, A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-95	5-50	<20	NP-4
	4-23	Loamy sand, sand, loamy fine sand.	SM, SP-SM	A-4, A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-95	5-50	<20	NP-4
	23-48	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-85	5-35	---	NP
	48-60	Stratified sandy loam to silt loam.	SC, SC-SM, CL, CL-ML	A-4, A-6, A-2-4, A-2-6	0	0	95-100	90-100	50-85	25-60	20-35	4-15
EdB, EdC------ Ellwood	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	0-8	80-100	75-100	60-100	55-90	20-35	4-15
	8-15	Clay loam, silty clay loam, silt loam.	CL	A-6	0-1	0-8	80-100	75-100	55-100	50-95	30-40	10-20
	15-35	Clay loam, silty clay loam, silt loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	55-100	50-95	35-45	15-25
	35-80	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	55-100	50-95	35-45	15-25
ElB:												
Ellwood------	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	0-8	80-100	75-100	60-100	55-90	20-35	4-15
	8-15	Clay loam, silty clay loam, silt loam.	CL	A-6	0-1	0-8	80-100	75-100	55-100	50-95	30-40	10-20
	15-35	Clay loam, silty clay loam, silt loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	55-100	50-95	35-45	15-25
	35-80	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	55-100	50-95	35-45	15-25

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
ElB:												
Crossett-----	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	0-8	80-100	75-100	60-100	50-90	20-35	4-15
	9-19	Silt loam, silty clay loam, loam.	CL	A-6	0-1	0-8	80-100	75-100	55-100	45-95	30-40	10-20
	19-38	Silty clay loam, clay loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	60-100	50-95	35-45	15-25
	38-80	Silty clay loam, clay loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	60-100	50-95	35-45	15-25
EmB:												
Ellwood------	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	0-8	80-100	75-100	60-100	55-90	20-35	4-15
	8-15	Clay loam, silty clay loam, silt loam.	CL	A-6	0-1	0-8	80-100	75-100	55-100	50-95	30-40	10-20
	15-35	Clay loam, silty clay loam, silt loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	55-100	50-95	35-45	15-25
	35-80	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	55-100	50-95	35-45	15-25
Iosco--------	0-11	Loamy fine sand.	SM, SP-SM	A-2-4, A-1-b	0	0-8	90-100	75-100	35-85	10-35	---	NP
	11-33	Loamy sand, sand, loamy fine sand.	SM, SP-SM, SC-SM	A-2-4, A-3, A-1-b	0	0-8	90-100	75-100	35-85	5-35	<25	NP-7
	33-44	Silty clay loam, loam, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6, A-7, A-2	0	0-8	90-100	85-100	65-95	30-90	25-45	5-25
	44-60	Silty clay loam, clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	0-8	90-100	85-100	70-95	50-90	25-45	5-25
Morganlake---	0-7	Loamy fine sand.	SM, SC-SM	A-4, A-2-4	0	0	95-100	90-100	65-95	20-50	<25	NP-6
	7-8	Loamy fine sand, sand.	SM, SC-SM, SP-SM	A-4, A-2-4, A-3, A-1-b	0	0	95-100	90-100	25-95	5-50	<25	NP-6
	8-26	Loamy fine sand, sand.	SM, SC-SM, SP-SM	A-4, A-2-4, A-3, A-1-b	0	0	95-100	90-100	25-95	5-50	<25	NP-6
	26-31	Loamy fine sand, sand.	SM, SC-SM, SP-SM	A-4, A-2-4, A-3, A-1-b	0	0	95-100	90-100	25-95	5-50	<25	NP-6
	31-40	Silty clay loam, silt loam, clay loam.	CL	---	0	0	80-95	75-95	60-95	50-90	25-45	10-20
	40-60	Silty clay loam, clay loam.	CL	---	0	0	80-95	75-95	60-95	50-90	25-45	10-20

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
EnC:												
Ellwood------	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	0-8	80-100	75-100	60-100	55-90	20-35	4-15
	8-15	Clay loam, silty clay loam, silt loam.	CL	A-6	0-1	0-8	80-100	75-100	55-100	50-95	30-40	10-20
	15-35	Clay loam, silty clay loam, silt loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	55-100	50-95	35-45	15-25
	35-80	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	55-100	50-95	35-45	15-25
Iosco--------	0-11	Loamy sand----	SM, SP-SM	A-2-4, A-1-b	0	0-8	90-100	75-100	35-85	10-35	---	NP
	11-33	Loamy sand, sand, loamy fine sand.	SM, SP-SM, SC-SM	A-2-4, A-3, A-1-b	0	0-8	90-100	75-100	35-85	5-35	<25	NP-7
	33-44	Silty clay loam, loam, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6, A-7, A-2	0	0-8	90-100	85-100	65-95	30-90	25-45	5-25
	44-60	Silty clay loam, clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	0-8	90-100	85-100	70-95	50-90	25-45	5-25
Vilas--------	0-4	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-90	10-35	---	NP
	4-5	Loamy sand, sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-35	---	NP
	5-8	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-90	10-35	---	NP
	8-37	Sand, loamy sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-35	---	NP
	37-62	Sand----------	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-25	---	NP
EoD:												
Ellwood------	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	0-8	80-100	75-100	60-100	55-90	20-35	4-15
	8-15	Clay loam, silty clay loam, silt loam.	CL	A-6	0-1	0-8	80-100	75-100	55-100	50-95	30-40	10-20
	15-35	Clay loam, silty clay loam, silt loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	55-100	50-95	35-45	15-25
	35-80	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-1	0-8	80-100	75-100	55-100	50-95	35-45	15-25

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
EoD:												
Vilas--------	0-4	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-90	10-35	---	NP
	4-5	Loamy sand, sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-35	---	NP
	5-8	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-90	10-35	---	NP
	8-37	Sand, loamy sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-35	---	NP
	37-62	Sand----------	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-25	---	NP
Padus--------	0-2	Sandy loam----	SM	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-90	15-50	<21	NP-4
	2-3	Sandy loam, fine sandy loam, loam.	ML, CL-ML, SM, SC-SM	A-4, A-2, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<23	NP-6
	3-19	Sandy loam, loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<26	NP-8
	19-38	Sandy loam, gravelly loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-9	55-100	50-100	30-95	15-80	<28	NP-9
	38-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0	0-9	30-100	25-95	7-65	1-25	---	NP
Ep:												
Epiaquents---	0-8	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	8-11	Fine sandy loam, mucky loamy sand, silt loam.	SM, SC, ML, CL	A-4, A-6, A-2	0-1	0-3	90-100	85-100	50-95	15-90	<35	NP-15
	11-60	Gravelly very fine sandy loam, silty clay loam, sand.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	0-2	0-7	75-100	70-100	20-100	3-95	<40	NP-18
Epiaquods----	0-8	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	8-12	Fine sandy loam, sand, loam.	SC, SM, ML, CL	A-4, A-2-4, A-3, A-1	0-1	0-3	90-100	85-100	25-95	5-80	<30	NP-11
	12-23	Fine sandy loam, sand, loam.	SC, SM, ML, CL	A-4, A-2-4, A-3, A-1	0-2	0-5	90-100	85-100	25-95	5-80	<30	NP-11
	23-60	Sandy loam, gravelly sand, loam.	SM, SC-SM, ML, CL-ML	A-4, A-2-4, A-3, A-1	0-2	0-7	75-100	70-100	20-95	3-80	<25	NP-7

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
FeB---------- Fence	0-2	Silt loam-----	ML, CL-ML, CL	A-4	0	0	100	96-100	90-100	80-100	20-30	3-9
	2-6	Silt loam, very fine sandy loam, silt.	ML, CL-ML	A-4	0	0	100	96-100	90-100	80-100	<25	NP-7
	6-14	Silt loam, fine sandy loam, loamy very fine sand.	ML, CL-ML	A-4	0	0	100	96-100	90-100	80-100	15-25	NP-7
	14-25	Silt loam, very fine sandy loam, silt.	ML, CL-ML	A-4	0	0	100	96-100	90-100	80-100	15-25	NP-7
	25-42	Silt loam, very fine sandy loam, loamy very fine sand.	ML, CL-ML, CL	A-4	0	0	100	96-100	85-100	70-100	20-30	3-9
	42-60	Stratified silt to very fine sand.	ML, CL-ML	A-4	0	0	100	96-100	75-100	50-90	15-25	NP-7
Fm---------- Fordum	0-9	Loam----------	ML, CL, SM, SC	A-4, A-6	0	0-15	80-100	75-100	55-100	45-85	20-35	3-15
	9-29	Silt loam, very fine sandy loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-15	30-100	25-100	20-100	10-90	<30	3-10
	29-60	Sand, very gravelly loamy fine sand.	SP, SM, GP, SM	A-3, A-2, A-1	0	0-15	30-100	25-100	7-95	1-50	---	NP
GaA---------- Gastrow	0-3	Silt loam-----	ML, CL-ML	A-4	0	0	100	100	80-100	60-90	0-25	NP-7
	3-6	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0	100	100	80-100	50-65	0-25	NP-7
	6-10	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0	100	100	80-100	50-70	0-25	NP-7
	10-31	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0	100	100	80-100	50-80	0-25	NP-7
	31-37	Fine sandy loam, silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0	100	100	75-100	50-80	18-25	3-7
	37-60	Stratified silt loam to fine sand.	SM, SC-SM, ML, CL-ML	A-4	0	0	100	100	65-95	35-80	0-25	NP-7

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
GmC, GmD------ Goodman	0-4	Silt loam-----	ML, CL-ML	A-4	2-3	0-10	90-100	85-100	85-100	75-100	<23	NP-6
	4-20	Silt loam-----	ML, CL-ML	A-4	2-5	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	20-31	Silt loam, silt.	ML, CL-ML	A-4	2-5	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	31-35	Sandy loam, gravelly loamy sand, loam.	ML, CL-ML, SM, SP-SM	A-4, A-1-b, A-2-4	2-10	0-10	65-100	55-95	20-90	8-75	<23	NP-6
	35-62	Loamy sand, fine sandy loam, gravelly sandy loam.	SC-SM, SM, SP-SM	A-4, A-1-b, A-2-4	2-10	0-10	65-100	55-95	20-85	8-50	<23	NP-6
GwB---------- Goodwit	0-5	Silt loam-----	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	<23	NP-6
	5-6	Silt loam, silt.	ML	A-4	2-3	0-15	90-100	85-100	70-100	60-100	<21	NP-4
	6-17	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-90	<25	NP-7
	17-40	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-90	<25	NP-7
	40-47	Loam, sandy loam, gravelly fine sandy loam.	ML, CL, SM, SC	A-4, A-1-b, A-2-4	2-10	0-15	60-100	55-95	35-90	15-75	<28	NP-9
	47-62	Gravelly loamy sand, sandy loam, gravelly sandy loam.	SC-SM, SM, SP-SM	A-3, A-1, A-2-4	2-10	0-15	60-100	55-95	20-75	8-45	<23	NP-6
IsA---------- Iosco	0-11	Loamy fine sand.	SM, SP-SM	A-2-4, A-1-b	0	0-8	90-100	75-100	35-85	10-35	---	NP
	11-33	Loamy sand, sand, loamy fine sand.	SM, SP-SM, SC-SM	A-2-4, A-3, A-1-b	0	0-8	90-100	75-100	35-85	5-35	<25	NP-7
	33-44	Silty clay loam, loam, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6, A-7, A-2	0	0-8	90-100	85-100	65-95	30-90	25-45	5-25
	44-60	Silty clay loam, clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	0-8	90-100	85-100	70-95	50-90	25-45	5-25
Kr---------- Kinross	0-2	Muck----------	PT	A-8	0	0	---	---	---	---	---	NP
	2-17	Sand, fine sand, loamy sand.	SP-SM, SM	A-3, A-2-4	0	0	100	90-100	50-80	5-30	---	NP
	17-60	Sand, fine sand.	SP-SM, SM	A-3, A-2-4	0	0	100	90-100	50-80	5-30	---	NP
Lo:												
Loxley-------	0-9	Peat----------	PT	A-8	0	0	---	---	---	---	---	---
	9-60	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
Beseman------	0-12	Peat----------	PT	A-8	0	0	---	---	---	---	---	---
	12-36	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	36-60	Loam, sandy loam, silt loam.	CL, ML, SM, SC	A-2, A-4, A-6	0	0-2	75-100	65-100	40-95	25-75	15-30	NP-12

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
Lo:												
Dawson-------	0-10	Peat----------	PT	A-8	0	0	---	---	---	---	---	---
	10-44	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	44-60	Sand, gravelly sand, very gravelly very fine sand.	SP, SM, SC, GP	A-2, A-3, A-1, A-4	0	0	45-100	35-100	15-90	0-45	<20	NP-10
Lu:												
Lupton-------	0-6	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	6-60	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
Cathro-------	0-8	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	8-30	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	30-60	Loam, silt loam, sandy loam.	SC-SM, CL-ML, SC, CL	A-4, A-6	0	0-5	80-100	65-100	60-100	35-90	20-40	4-20
Markey-------	0-36	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	36-60	Sand, fine sand, gravelly loamy sand.	SP, SM, SP-SM	A-2, A-3, A-1	0	0	95-100	60-100	30-75	0-30	---	NP
MaA---------- Manitowish	0-4	Sandy loam----	SM, ML	A-4	0	0-15	80-100	75-100	50-85	35-55	<21	NP-4
	4-13	Sandy loam, loam, gravelly fine sandy loam.	SM, SC-SM, ML, CL-ML	A-4, A-2-4	0	0-15	55-100	50-100	35-95	20-75	<25	NP-7
	13-29	Loamy sand, gravelly sand, sand.	SM, SC-SM, GM, GM-GC	A-2, A-1, A-3, A-4	0	0-15	55-100	50-90	20-90	5-50	<25	NP-6
	29-62	Stratified sand to gravelly coarse sand.	SP, SP-SM	A-1, A-3, A-2	0	0-15	55-100	50-75	20-70	0-12	---	NP
Mn---------- Minocqua	0-5	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	5-21	Silt loam, fine sandy loam, gravelly loam.	SC, SM, CL, ML	A-2, A-4, A-6	0-1	0-9	80-100	75-100	45-100	25-90	<35	NP-13
	21-25	Gravelly loamy coarse sand, loamy sand, very gravelly coarse sand.	SM, GM, GP, SP	A-2, A-1, A-3, A-4	0-1	0-9	40-100	35-100	5-70	2-40	<20	NP-4
	25-60	Coarse sand, sand, very gravelly sand.	SP, SM, GP, GM	A-1, A-3, A-2	0-1	0-9	30-100	25-100	5-70	0-30	---	NP

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
MrB---------- Morganlake	0-7	Loamy fine sand.	SM, SC-SM	A-4, A-2-4	0	0	95-100	90-100	65-95	20-50	<25	NP-6
	7-8	Loamy fine sand, sand.	SM, SC-SM, SP-SM	A-4, A-2-4, A-3, A-1-b	0	0	95-100	90-100	25-95	5-50	<25	NP-6
	8-26	Loamy fine sand, sand.	SM, SC-SM, SP-SM	A-4, A-2-4, A-3, A-1-b	0	0	95-100	90-100	25-95	5-50	<25	NP-6
	26-31	Loamy fine sand, sand.	SM, SC-SM, SP-SM	A-4, A-2-4, A-3, A-1-b	0	0	95-100	90-100	25-95	5-50	<25	NP-6
	31-40	Silty clay loam, silt loam, clay loam.	CL	---	0	0	80-95	75-95	60-95	50-90	25-45	10-20
	40-60	Silty clay loam, clay loam.	CL	---	0	0	80-95	75-95	60-95	50-90	25-45	10-20
MuB---------- Mudlake	0-4	Silt loam-----	ML, CL-ML	A-4	2-3	0-15	80-100	75-100	55-95	50-90	15-25	NP-6
	4-5	Silt loam, silt.	ML, CL-ML	A-4	1-5	0-15	80-100	75-100	55-95	50-90	<25	NP-6
	5-12	Silt loam-----	ML, CL-ML	A-4	0-8	0-15	80-100	75-100	55-95	50-90	15-25	NP-6
	12-34	Silt loam-----	ML, CL-ML	A-4	0-8	0-15	80-100	75-100	55-95	50-90	15-25	NP-7
	34-43	Sandy loam, gravelly sandy loam, loam.	SM, SC, CL, ML	A-2-4, A-4, A-1-b	0-10	0-25	60-95	55-95	35-90	15-75	15-25	NP-9
	43-70	Sandy loam, gravelly loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-10	0-25	60-95	55-95	20-75	8-45	15-25	NP-6
PaB, PaC, PaD- Padus	0-2	Sandy loam----	SM	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-90	15-50	<21	NP-4
	2-3	Sandy loam, fine sandy loam, loam.	ML, CL-ML, SM, SC-SM	A-4, A-2, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<23	NP-6
	3-19	Sandy loam, loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<26	NP-8
	19-38	Sandy loam, gravelly loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-9	55-100	50-100	30-95	15-80	<28	NP-9
	38-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0	0-9	30-100	25-95	7-65	1-25	---	NP

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
PeB, PeC, PeD:												
Padus--------	0-2	Sandy loam----	SM	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-90	15-50	<21	NP-4
	2-3	Sandy loam, fine sandy loam, loam.	ML, CL-ML, SM, SC-SM	A-4, A-2, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<23	NP-6
	3-19	Sandy loam, loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<26	NP-8
	19-38	Sandy loam, gravelly loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-9	55-100	50-100	30-95	15-80	<28	NP-9
	38-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0	0-9	30-100	25-95	7-65	1-25	---	NP
Pence--------	0-4	Sandy loam----	SM, ML	A-4, A-2-4, A-1-b	0	0-15	85-100	75-100	45-85	20-55	<21	NP-4
	4-15	Gravelly sandy loam, sandy loam, loam.	SM, ML, CL-ML, SC-SM	A-4, A-2-4, A-1-b	0-4	0-15	55-100	50-100	30-95	15-75	<25	NP-7
	15-31	Gravelly coarse sand, loamy sand, sand.	SM, SP-SM, GM, GP-GM	A-3, A-1-b	0-4	0-15	55-100	50-100	25-75	2-30	---	NP
	31-60	Gravelly coarse sand, sand, very gravelly sand.	SP, SM	A-3, A-1-b	0-4	0-15	55-90	35-90	15-55	2-15	---	NP
PnB, PnC, PnD-Pence	0-4	Sandy loam----	SM, ML	A-4, A-2-4, A-1-b	0	0-15	85-100	75-100	45-85	20-55	<21	NP-4
	4-15	Gravelly sandy loam, sandy loam, loam.	SM, ML, CL-ML, SC-SM	A-4, A-2-4, A-1-b	0-4	0-15	55-100	50-100	30-95	15-75	<25	NP-7
	15-31	Gravelly coarse sand, loamy sand, sand.	SM, SP-SM, GM, GP-GM	A-3, A-1-b	0-4	0-15	55-100	50-100	25-75	2-30	---	NP
	31-60	Gravelly coarse sand, sand, very gravelly sand.	SP, SM	A-3, A-1-b	0-4	0-15	55-90	35-90	15-55	2-15	---	NP

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
PsB, PsC, PsD:												
Pence--------	0-4	Sandy loam----	SM, ML	A-4, A-2-4, A-1-b	0	0-15	85-100	75-100	45-85	20-55	<21	NP-4
	4-15	Gravelly sandy loam, sandy loam, loam.	SM, ML, CL-ML, SC-SM	A-4, A-2-4, A-1-b	0-4	0-15	55-100	50-100	30-95	15-75	<25	NP-7
	15-31	Gravelly coarse sand, loamy sand, sand.	SM, SP-SM, GM, GP-GM	A-3, A-1-b	0-4	0-15	55-100	50-100	25-75	2-30	---	NP
	31-60	Gravelly coarse sand, sand, very gravelly sand.	SP, SM	A-3, A-1-b	0-4	0-15	55-90	35-90	15-55	2-15	---	NP
Vilas--------	0-4	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-90	10-35	---	NP
	4-5	Loamy sand, sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-35	---	NP
	5-8	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-90	10-35	---	NP
	8-37	Sand, loamy sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-35	---	NP
	37-62	Sand----------	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-25	---	NP
Pt---------- Pits, gravel	0-60	Sand and gravel.	GP, SP, GP-GM, SP-SM	---	---	0-10	---	---	---	---	---	---
Px. Pits, mine												
Rb---------- Robago	0-7	Fine sandy loam.	SM, SC-SM	A-2-4, A-4	0	0	80-100	75-100	50-90	25-50	<26	NP-8
	7-17	Fine sandy loam, sandy loam, loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	80-100	75-100	50-95	25-80	<26	NP-8
	17-27	Fine sandy loam, sandy loam, loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	80-100	75-100	50-95	25-80	<26	NP-8
	27-38	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-2-4, A-4	0	0	80-100	75-100	50-95	25-80	18-28	3-9
	38-62	Stratified fine sand to silt loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	80-100	75-100	50-95	25-80	<26	NP-8

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
RkC, RkD: Rock outcrop.												
Ishpeming----	0-4	Loamy sand----	SM, SP-SM, SC-SM	A-2-4, A-1-b, A-4	0	0-15	90-100	85-100	40-100	10-50	0-25	NP-7
	4-32	Loamy sand, loamy fine sand, sand.	SM, SP-SM, SC-SM	A-1-b, A-2-4, A-3, A-4	0	0-15	90-100	85-100	40-100	5-50	0-25	NP-7
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Vilas--------	0-4	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-75	10-35	---	NP
	4-5	Loamy sand, sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-75	5-35	---	NP
	5-8	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-75	10-35	---	NP
	8-37	Sand, loamy sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-75	5-35	---	NP
	37-62	Sand----------	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
RmC, RmD: Rock outcrop.												
Metonga------	0-2	Fine sandy loam.	SM	A-4	0	0-9	95-100	90-100	65-90	35-50	<20	NP-4
	2-4	Very fine sandy loam, silt loam, fine sandy loam.	SM, ML, SC-SM, CL-ML	A-4	0	0-9	95-100	90-100	65-95	35-85	<25	NP-7
	4-17	Very fine sandy loam, silt loam, fine sandy loam.	SM, ML, SC-SM, CL-ML	A-4	0-1	0-9	95-100	90-100	65-95	35-85	<25	NP-7
	17-39	Sandy loam, gravelly sandy loam.	SM	A-2-4, A-4, A-1-b	0-2	0-15	55-95	50-90	30-80	15-50	<20	NP-4
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
RmC, RmD:												
Sarona-------	0-1	Fine sandy loam.	SM, SC-SM	A-2, A-4	0	0-15	80-100	75-98	55-90	30-55	<25	NP-7
	1-3	Fine sandy loam, sandy loam, loamy sand.	ML, CL-ML, SM, SP-SM	A-4, A-2, A-1	0	0-15	80-100	75-98	30-90	10-55	<23	NP-6
	3-16	Fine sandy loam, sandy loam, gravelly loam.	SM, SC-SM, ML, CL-ML	A-2, A-4, A-1	0-1	0-15	55-100	50-98	30-90	13-55	<23	NP-6
	16-41	Sandy loam, gravelly fine sandy loam.	SC, SM, SC-SM	A-2, A-1, A-4	0-2	0-15	55-100	50-98	30-90	12-45	<28	NP-9
	41-60	Loamy sand, sandy loam, gravelly sandy loam.	SM, SC-SM, SP-SM	A-2, A-1, A-4, A-3	0-2	0-15	55-100	50-98	20-75	7-45	<25	NP-7
RsB, RsC------ Rousseau	0-6	Loamy fine sand.	SM	A-2-4, A-4	0	0	100	100	75-95	25-45	---	NP
	6-36	Fine sand, loamy fine sand.	SM	A-2-4	0	0	100	100	65-100	20-35	---	NP
	36-60	Fine sand, sand.	SP-SM, SM	A-2-4, A-3	0	0	100	100	50-100	5-35	---	NP
SaB, SaC, SaD- Sarona	0-3	Fine sandy loam.	SC-SM, SM	A-4, A-2-4, A-1-b	2-3	0-15	80-100	75-98	45-90	20-50	0-23	NP-6
	3-17	Fine sandy loam, sandy loam, gravelly loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4, A-1-b	2-3	0-15	55-100	50-98	30-90	13-55	0-23	NP-6
	17-48	Fine sandy loam, gravelly sandy loam, gravelly loamy sand.	SM, SC-SM	A-2-4, A-1-b, A-4	0-15	0-15	70-100	50-98	30-90	12-45	0-25	NP-7
	48-66	Gravelly sandy loam, fine sandy loam.	SM, SC-SM, SC	A-2-4, A-1-b, A-4	0-15	0-15	55-100	50-98	30-90	12-45	0-28	NP-9
	66-73	Gravelly sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-1-b, A-4	0-15	0-15	55-100	50-98	20-90	7-45	0-25	NP-7

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
SdB, SdC, SdD:												
Sarona-------	0-3	Fine sandy loam.	SC-SM, SM	A-4, A-2-4, A-1-b	2-3	0-15	80-100	75-98	45-90	20-50	0-23	NP-6
	3-17	Fine sandy loam, sandy loam, gravelly loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4, A-1-b	2-3	0-15	55-100	50-98	30-90	13-55	0-23	NP-6
	17-48	Fine sandy loam, gravelly sandy loam, gravelly loamy sand.	SM, SC-SM	A-2-4, A-1-b, A-4	0-15	0-15	70-100	50-98	30-90	12-45	0-25	NP-7
	48-66	Gravelly sandy loam, fine sandy loam.	SM, SC-SM, SC	A-2-4, A-1-b, A-4	0-15	0-15	55-100	50-98	30-90	12-45	0-28	NP-9
	66-73	Gravelly sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-1-b, A-4	0-15	0-15	55-100	50-98	20-90	7-45	0-25	NP-7
Padus--------	0-2	Sandy loam----	SM	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-90	15-50	<21	NP-4
	2-3	Sandy loam, fine sandy loam, loam.	ML, CL-ML, SM, SC-SM	A-4, A-2, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<23	NP-6
	3-19	Sandy loam, loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<26	NP-8
	19-38	Sandy loam, gravelly loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-9	55-100	50-100	30-95	15-80	<28	NP-9
	38-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0	0-9	30-100	25-95	7-65	1-25	---	NP
SlB, SlC, SlD:												
Sarona-------	0-3	Fine sandy loam.	SC-SM, SM	A-4, A-2-4, A-1-b	2-3	0-15	80-100	75-98	45-90	20-50	0-23	NP-6
	3-17	Fine sandy loam, sandy loam, gravelly loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4, A-1-b	2-3	0-15	55-100	50-98	30-90	13-55	0-23	NP-6
	17-48	Fine sandy loam, gravelly sandy loam, gravelly loamy sand.	SM, SC-SM	A-2-4, A-1-b, A-4	0-15	0-15	70-100	50-98	30-90	12-45	0-25	NP-7
	48-66	Gravelly sandy loam, fine sandy loam.	SM, SC-SM, SC	A-2-4, A-1-b, A-4	0-15	0-15	55-100	50-98	30-90	12-45	0-28	NP-9
	66-73	Gravelly sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-1-b, A-4	0-15	0-15	55-100	50-98	20-90	7-45	0-25	NP-7

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
SlB, SlC, SlD:												
Vilas--------	0-4	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-90	10-35	---	NP
	4-5	Loamy sand, sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-35	---	NP
	5-8	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-90	10-35	---	NP
	8-37	Sand, loamy sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-35	---	NP
	37-62	Sand----------	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-25	---	NP
SnB, SnC, SnD-												
Sayner	0-4	Loamy sand----	SM, SP-SM	A-1	0	0-15	80-100	75-100	30-75	10-35	---	NP
	4-17	Loamy sand, sand, gravelly sand.	SP, SM	A-1, A-3	0	0-15	50-100	50-100	15-75	2-35	---	NP
	17-27	Gravelly sand, loamy sand.	SM, SP	A-3, A-1	0-3	0-15	55-100	50-100	15-75	2-35	---	NP
	27-63	Stratified sand to gravel.	SP, SM	A-1	0-3	0-15	55-90	50-75	15-45	2-20	---	NP
SoD:												
Soperton-----	0-5	Silt loam-----	ML	A-4	2-3	5-15	90-100	85-100	70-100	60-85	<20	NP-4
	5-22	Silt loam, silt.	ML, CL-ML	A-4	1-5	0-15	90-100	85-100	70-100	60-85	<25	NP-6
	22-42	Gravelly sandy loam, sandy loam.	SM, SC, SC-SM	A-4, A-2, A-1-b	1-5	0-30	70-100	65-90	40-70	20-45	<25	NP-8
	42-61	Gravelly loamy sand, sandy loam.	SM, SP-SM	A-1, A-2, A-4	1-5	0-30	70-100	65-90	25-70	10-45	<20	NP-4
Goodman------	0-4	Silt loam-----	ML, CL-ML	A-4	2-3	0-10	90-100	85-100	85-100	75-100	<23	NP-6
	4-20	Silt loam-----	ML, CL-ML	A-4	2-5	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	20-31	Silt loam, silt.	ML, CL-ML	A-4	2-5	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	31-35	Sandy loam, gravelly loamy sand, loam.	ML, CL-ML, SM, SP-SM	A-4, A-1-b, A-2-4	2-10	0-10	65-100	55-95	20-90	8-75	<23	NP-6
	35-62	Loamy sand, fine sandy loam, gravelly sandy loam.	SC-SM, SM, SP-SM	A-4, A-1-b, A-2-4	2-10	0-10	65-100	55-95	20-85	8-50	<23	NP-6
StC, StD------												
Stambaugh	0-17	Silt loam-----	ML, CL-ML	A-4	0	0-8	95-100	90-100	80-100	55-90	<26	2-7
	17-33	Silt, silt loam, very fine sandy loam.	ML, CL-ML, CL	A-4	0	0-8	95-100	90-100	80-100	80-95	<30	2-9
	33-61	Sand, gravelly coarse sand.	SP, SP-SM	A-1	0	0-15	70-90	25-60	15-40	0-10	---	NP

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
SuC, SuD:												
Stambaugh----	0-17	Silt loam-----	ML, CL-ML	A-4	0	0-8	95-100	90-100	80-100	55-90	<26	2-7
	17-33	Silt, silt loam, very fine sandy loam.	ML, CL-ML, CL	A-4	0	0-8	95-100	90-100	80-100	80-95	<30	2-9
	33-61	Sand, gravelly coarse sand.	SP, SP-SM	A-1	0	0-15	70-90	25-60	15-40	0-10	---	NP
Goodman------	0-4	Silt loam-----	ML, CL-ML	A-4	2-3	0-10	90-100	85-100	85-100	75-100	<23	NP-6
	4-20	Silt loam-----	ML, CL-ML	A-4	2-5	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	20-31	Silt loam, silt.	ML, CL-ML	A-4	2-5	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	31-35	Sandy loam, gravelly loamy sand, loam.	ML, CL-ML, SM, SP-SM	A-4, A-1-b, A-2-4	2-10	0-10	65-100	55-95	20-90	8-75	<23	NP-6
	35-62	Loamy sand, fine sandy loam, gravelly sandy loam.	SC-SM, SM, SP-SM	A-4, A-1-b, A-2-4	2-10	0-10	65-100	55-95	20-85	8-50	<23	NP-6
TpA---------- Tipler	0-2	Sandy loam----	SM	A-2, A-4	0	0-9	55-100	50-100	30-80	15-50	<20	NP-4
	2-4	Sandy loam, gravelly fine sandy loam, loam.	SM	A-2, A-4	0	0-9	55-100	50-100	30-95	15-80	15-20	NP-4
	4-22	Sandy loam, loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<26	NP-8
	22-31	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-9	55-100	50-100	30-95	15-80	<30	NP-9
	31-60	Gravelly coarse sand, sand.	SP, SM, GP, GM	A-1, A-2, A-3	0	0-9	30-100	25-95	7-70	1-25	---	NP
VaB---------- Vanzile	0-1	Silt loam-----	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<25	NP-7
	1-4	Silt loam, silt.	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<25	NP-7
	4-13	Silt loam-----	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<30	NP-7
	13-17	Silt loam, silt.	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<30	NP-7
	17-33	Silt loam-----	ML, CL-ML, CL	A-4	0	0-9	95-100	90-100	85-100	80-95	<30	NP-9
	33-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-3	0	0-9	45-95	40-95	10-75	2-25	---	NP

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
VgB:												
Vanzile------	0-1	Silt loam-----	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<25	NP-7
	1-4	Silt loam, silt.	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<25	NP-7
	4-13	Silt loam-----	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<30	NP-7
	13-17	Silt loam, silt.	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<30	NP-7
	17-33	Silt loam-----	ML, CL-ML, CL	A-4	0	0-9	95-100	90-100	85-100	80-95	<30	NP-9
	33-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-3	0	0-9	45-95	40-95	10-75	2-25	---	NP
Goodwit------	0-5	Silt loam-----	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	<23	NP-6
	5-6	Silt loam, silt.	ML	A-4	2-3	0-15	90-100	85-100	70-100	60-100	<21	NP-4
	6-17	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-90	<25	NP-7
	17-40	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-90	<25	NP-7
	40-47	Loam, sandy loam, gravelly fine sandy loam.	ML, CL, SM, SC	A-4, A-1-b, A-2-4	2-10	0-15	60-100	55-95	35-90	15-75	<28	NP-9
	47-62	Gravelly loamy sand, sandy loam, gravelly sandy loam.	SC-SM, SM, SP-SM	A-3, A-1, A-2-4	2-10	0-15	60-100	55-95	20-75	8-45	<23	NP-6
VsB, VsC, VsD- Vilas	0-4	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-90	10-35	---	NP
	4-5	Loamy sand, sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-35	---	NP
	5-8	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-90	10-35	---	NP
	8-37	Sand, loamy sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-35	---	NP
	37-62	Sand----------	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-90	5-25	---	NP
WaC:												
Wabeno-------	0-5	Silt loam-----	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	0-25	NP-6
	5-11	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-95	0-25	NP-7
	11-15	Silt, silt loam.	ML, CL-ML	A-4	1-5	0-15	90-100	85-100	70-100	60-90	15-25	NP-6
	15-24	Silt loam-----	ML, CL, CL-ML	A-4	1-5	0-15	90-100	85-100	70-100	60-90	0-30	NP-10
	24-55	Gravelly sandy loam, loamy sand, cobbly sandy loam.	SM, SC, SP-SM, SC-SM	A-1, A-2-4	0-5	0-30	70-100	65-90	30-65	10-35	0-30	NP-10
	55-63	Gravelly sandy loam, cobbly loamy sand, loamy sand.	SM, SC-SM, SP-SM	A-1, A-2-4	0-5	0-30	70-90	65-90	25-70	10-25	0-23	NP-6

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
WaC:												
Goodman------	0-4	Silt loam-----	ML, CL-ML	A-4	2-3	0-10	90-100	85-100	85-100	75-100	<23	NP-6
	4-20	Silt loam-----	ML, CL-ML	A-4	2-5	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	20-31	Silt loam, silt.	ML, CL-ML	A-4	2-5	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	31-35	Sandy loam, gravelly loamy sand, loam.	ML, CL-ML, SM, SP-SM	A-4, A-1-b, A-2-4	2-10	0-10	65-100	55-95	20-90	8-75	<23	NP-6
	35-62	Loamy sand, fine sandy loam, gravelly sandy loam.	SC-SM, SM, SP-SM	A-4, A-1-b, A-2-4	2-10	0-10	65-100	55-95	20-85	8-50	<23	NP-6
WbB:												
Wabeno-------	0-5	Silt loam-----	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	0-25	NP-6
	5-11	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-95	0-25	NP-7
	11-15	Silt, silt loam.	ML, CL-ML	A-4	1-5	0-15	90-100	85-100	70-100	60-90	15-25	NP-6
	15-24	Silt loam-----	ML, CL, CL-ML	A-4	1-5	0-15	90-100	85-100	70-100	60-90	0-30	NP-10
	24-55	Gravelly sandy loam, loamy sand, cobbly sandy loam.	SM, SC, SP-SM, SC-SM	A-1, A-2-4	0-5	0-30	70-100	65-90	30-65	10-35	0-30	NP-10
	55-63	Gravelly sandy loam, cobbly loamy sand, loamy sand.	SM, SC-SM, SP-SM	A-1, A-2-4	0-5	0-30	70-90	65-90	25-70	10-25	0-23	NP-6
Goodwit------	0-5	Silt loam-----	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	<23	NP-6
	5-6	Silt loam, silt.	ML	A-4	2-3	0-15	90-100	85-100	70-100	60-100	<21	NP-4
	6-17	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-90	<25	NP-7
	17-40	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-90	<25	NP-7
	40-47	Loam, sandy loam, gravelly fine sandy loam.	ML, CL, SM, SC	A-4, A-1-b, A-2-4	2-10	0-15	60-100	55-95	35-90	15-75	<28	NP-9
	47-62	Gravelly loamy sand, sandy loam, gravelly sandy loam.	SC-SM, SM, SP-SM	A-3, A-1, A-2-4	2-10	0-15	60-100	55-95	20-75	8-45	<23	NP-6
WkB, WkC------ Wakefield	0-5	Silt loam-----	ML, CL-ML	A-4	2-3	0-9	80-100	75-95	60-95	50-85	18-25	3-7
	5-6	Silt loam-----	ML, CL-ML	A-4	2-5	0-9	80-100	75-95	60-95	50-85	18-25	3-7
	6-16	Silt loam, loam, fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4, A-2-4	1-5	0-9	80-100	75-95	55-95	30-85	18-25	3-7
	16-27	Fine sandy loam, loam.	SC, SC-SM	A-4, A-6, A-2-4, A-2-6	0-5	0-9	80-100	75-95	45-85	20-50	21-34	4-14
	27-50	Loam, clay loam.	CL	A-6	0-5	0-9	80-100	75-95	60-95	50-75	28-40	10-18
	50-60	Loam, fine sandy loam, very fine sandy loam.	CL-ML, CL, SC, SC-SM	A-4, A-2-4, A-6	0-5	0-9	80-100	75-95	55-90	30-60	21-30	4-11

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
WrA----------Worcester	0-5	Sandy loam----	SM, SC, SC-SM	A-4, A-2-4	0	0-9	80-100	75-100	45-90	25-50	<26	NP-8
	5-21	Sandy loam, loam, gravelly fine sandy loam.	SM, SC, SC-SM	A-4, A-2-4, A-1-b	0	0-9	55-100	50-100	35-95	12-45	<26	NP-8
	21-30	Sandy loam, fine sandy loam, gravelly loam.	SM, SC, SC-SM	A-4, A-2-4, A-1-b	0	0-9	55-100	50-100	35-95	12-45	18-28	3-9
	30-34	Gravelly loamy sand, very gravelly coarse sand, sand.	SM, GM	A-2-4, A-3, A-1-a	0	0-9	30-100	25-100	10-75	5-35	<18	NP-3
	34-62	Gravelly sand, gravelly coarse sand, sand.	SP, SM, GP, GM	A-3, A-1-a	0	0-9	30-100	25-100	7-70	1-25	---	NP

Table 17.--Physical and Chemical Properties of the Soils

(See text for definitions of terms used in this table. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH						Pct
AnB, AnC---------	0-3	5-15	1.25-1.55	0.6-2.0	0.08-0.18	4.5-7.8	Low----------	0.28	0.28	5	3	1-3
Annalake	3-6	2-15	1.30-1.60	0.6-2.0	0.11-0.22	4.5-7.8	Low----------	0.24	0.24			
	6-17	5-15	1.40-1.70	0.6-2.0	0.10-0.14	4.5-6.0	Low----------	0.24	0.24			
	17-31	5-15	1.40-1.70	0.6-2.0	0.10-0.14	4.5-7.3	Low----------	0.24	0.24			
	31-39	8-18	1.40-1.70	0.6-2.0	0.10-0.19	4.5-7.3	Low----------	0.24	0.24			
	39-60	5-15	1.45-1.70	0.6-2.0	0.10-0.15	5.1-8.4	Low----------	0.24	0.24			
Au----------	0-7	10-15	1.30-1.55	6.0-20	0.07-0.09	3.6-7.3	Low----------	0.10	0.10	5	2	2-4
Au Gres	7-17	1-15	1.50-1.70	6.0-20	0.06-0.09	3.6-7.3	Low----------	0.10	0.15			
	17-62	0-8	1.50-1.70	6.0-20	0.05-0.07	4.5-7.3	Low----------	0.10	0.15			
Ca----------	0-5	---	0.15-0.35	2.0-6.0	0.35-0.45	4.5-7.3	Low----------	0.37	0.37	5	2	50-80
Capitola	5-20	8-17	1.35-1.60	0.2-2.0	0.09-0.22	4.5-7.3	Low----------	0.43	0.43			
	20-34	8-16	1.40-1.90	0.2-2.0	0.07-0.16	4.5-7.3	Low----------	0.28	0.28			
	34-60	5-10	1.70-1.90	0.2-0.6	0.05-0.16	5.1-7.8	Low----------	0.28	0.28			
CoA----------	0-9	10-25	1.35-1.60	0.6-2.0	0.19-0.24	3.6-7.3	Low----------	0.43	0.43	5	5	1-3
Crossett	9-19	20-30	1.45-1.65	0.2-0.6	0.14-0.22	3.6-7.3	Moderate-----	0.43	0.43			
	19-38	27-35	1.50-1.65	0.2-0.6	0.12-0.20	5.1-7.8	Moderate-----	0.43	0.43			
	38-80	27-35	1.50-1.65	0.2-0.6	0.12-0.20	6.1-8.4	Moderate-----	0.43	0.43			
CrA----------	0-5	5-15	1.30-1.50	6.0-20	0.09-0.12	3.6-6.5	Low----------	0.10	0.10	5	2	.5-2
Croswell	5-21	0-10	1.40-1.60	6.0-20	0.06-0.10	3.6-7.3	Low----------	0.10	0.15			
	21-27	0-10	1.40-1.60	6.0-20	0.06-0.09	3.6-7.3	Low----------	0.10	0.15			
	27-62	0-10	1.50-1.65	6.0-20	0.05-0.07	3.6-8.4	Low----------	0.10	0.15			
CuA----------	0-3	1-10	1.35-1.60	2.0-6.0	0.08-0.12	3.6-6.0	Low----------	0.10	0.10	5	2	1-2
Cublake	3-4	0-10	1.35-1.65	2.0-20	0.05-0.12	3.6-6.0	Low----------	0.17	0.17			
	4-23	0-10	1.40-1.70	2.0-20	0.04-0.11	3.6-6.0	Low----------	0.17	0.17			
	23-48	0-5	1.45-1.70	2.0-20	0.04-0.11	3.6-7.3	Low----------	0.15	0.15			
	48-60	10-25	1.40-1.80	0.2-2.0	0.12-0.18	5.1-7.3	Low----------	0.32	0.32			
EdB, EdC---------	0-8	10-25	1.35-1.55	0.6-2.0	0.19-0.24	3.6-7.3	Low----------	0.43	0.43	5	5	1-3
Ellwood	8-15	20-32	1.45-1.65	0.2-0.6	0.14-0.22	3.6-7.3	Moderate-----	0.32	0.32			
	15-35	27-35	1.50-1.70	0.2-0.6	0.12-0.18	3.6-7.3	Moderate-----	0.32	0.32			
	35-80	27-35	1.50-1.70	0.2-0.6	0.12-0.18	6.1-8.4	Moderate-----	0.43	0.43			
ElB:												
Ellwood---------	0-8	10-25	1.35-1.55	0.6-2.0	0.19-0.24	3.6-7.3	Low----------	0.43	0.43	5	5	1-3
	8-15	20-32	1.45-1.65	0.2-0.6	0.14-0.22	3.6-7.3	Moderate-----	0.32	0.32			
	15-35	27-35	1.50-1.70	0.2-0.6	0.12-0.18	3.6-7.3	Moderate-----	0.32	0.32			
	35-80	27-35	1.50-1.70	0.2-0.6	0.12-0.18	6.1-8.4	Moderate-----	0.43	0.43			
Crossett--------	0-9	10-25	1.35-1.60	0.6-2.0	0.19-0.24	3.6-7.3	Low----------	0.43	0.43	5	5	1-3
	9-19	20-30	1.45-1.65	0.2-0.6	0.14-0.22	3.6-7.3	Moderate-----	0.43	0.43			
	19-38	27-35	1.50-1.65	0.2-0.6	0.12-0.20	5.1-7.8	Moderate-----	0.43	0.43			
	38-80	27-35	1.50-1.65	0.2-0.6	0.12-0.20	6.1-8.4	Moderate-----	0.43	0.43			
EmB:												
Ellwood---------	0-8	10-25	1.35-1.55	0.6-2.0	0.19-0.24	3.6-7.3	Low----------	0.43	0.43	5	5	1-3
	8-15	20-32	1.45-1.65	0.2-0.6	0.14-0.22	3.6-7.3	Moderate-----	0.32	0.32			
	15-35	27-35	1.50-1.70	0.2-0.6	0.12-0.18	3.6-7.3	Moderate-----	0.32	0.32			
	35-80	27-35	1.50-1.70	0.2-0.6	0.12-0.18	6.1-8.4	Moderate-----	0.43	0.43			
Iosco----------	0-11	10-15	1.25-1.40	6.0-20	0.10-0.12	5.1-7.3	Low----------	0.10	0.10	5	2	1-4
	11-33	0-15	1.35-1.60	6.0-20	0.06-0.11	5.1-6.5	Low----------	0.17	0.17			
	33-44	18-35	1.50-1.70	0.2-0.6	0.16-0.20	6.1-7.8	Moderate-----	0.37	0.37			
	44-60	15-35	1.50-1.70	0.2-0.6	0.17-0.20	6.6-8.4	Moderate-----	0.37	0.37			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH						Pct
EmB:												
Morganlake------	0-7	1-12	1.35-1.60	2.0-20	0.09-0.14	5.1-7.3	Low----------	0.15	0.15	5	2	1-3
	7-8	1-12	1.40-1.65	2.0-20	0.06-0.12	5.1-6.0	Low----------	0.17	0.17			
	8-26	1-12	1.45-1.70	2.0-20	0.06-0.12	5.1-6.0	Low----------	0.17	0.17			
	26-31	1-12	1.45-1.70	2.0-20	0.06-0.12	5.1-6.0	Low----------	0.17	0.17			
	31-40	18-35	1.45-1.65	0.2-0.6	0.13-0.20	5.6-8.4	Moderate-----	0.43	0.43			
	40-60	18-35	1.50-1.75	0.2-0.6	0.12-0.18	5.6-8.4	Moderate-----	0.43	0.43			
EnC:												
Ellwood---------	0-8	10-25	1.35-1.55	0.6-2.0	0.19-0.24	3.6-7.3	Low----------	0.43	0.43	5	5	1-3
	8-15	20-32	1.45-1.65	0.2-0.6	0.14-0.22	3.6-7.3	Moderate-----	0.32	0.32			
	15-35	27-35	1.50-1.70	0.2-0.6	0.12-0.18	3.6-7.3	Moderate-----	0.32	0.32			
	35-80	27-35	1.50-1.70	0.2-0.6	0.12-0.18	6.1-8.4	Moderate-----	0.43	0.43			
Iosco----------	0-11	10-15	1.25-1.40	6.0-20	0.10-0.12	5.1-7.3	Low----------	0.10	0.10	5	2	1-4
	11-33	0-15	1.35-1.60	6.0-20	0.06-0.11	5.1-6.5	Low----------	0.17	0.17			
	33-44	18-35	1.50-1.70	0.2-0.6	0.16-0.20	6.1-7.8	Moderate-----	0.37	0.37			
	44-60	15-35	1.50-1.70	0.2-0.6	0.17-0.20	6.6-8.4	Moderate-----	0.37	0.37			
Vilas----------	0-4	2-6	1.35-1.65	6.0-20	0.09-0.12	4.5-7.3	Low----------	0.10	0.10	5	2	1-3
	4-5	1-5	1.35-1.65	6.0-20	0.06-0.12	4.5-6.5	Low----------	0.17	0.17			
	5-8	2-6	1.50-1.65	6.0-20	0.07-0.12	4.5-6.5	Low----------	0.17	0.17			
	8-37	1-5	1.50-1.70	6.0-20	0.05-0.08	4.5-6.5	Low----------	0.15	0.15			
	37-62	0-3	1.50-1.70	6.0-20	0.04-0.07	4.5-6.5	Low----------	0.15	0.15			
EoD:												
Ellwood---------	0-8	10-25	1.35-1.55	0.6-2.0	0.19-0.24	3.6-7.3	Low----------	0.43	0.43	5	5	1-3
	8-15	20-32	1.45-1.65	0.2-0.6	0.14-0.22	3.6-7.3	Moderate-----	0.32	0.32			
	15-35	27-35	1.50-1.70	0.2-0.6	0.12-0.18	3.6-7.3	Moderate-----	0.32	0.32			
	35-80	27-35	1.50-1.70	0.2-0.6	0.12-0.18	6.1-8.4	Moderate-----	0.43	0.43			
Vilas----------	0-4	2-6	1.35-1.65	6.0-20	0.09-0.12	4.5-7.3	Low----------	0.10	0.10	5	2	1-3
	4-5	1-5	1.35-1.65	6.0-20	0.06-0.12	4.5-6.5	Low----------	0.17	0.17			
	5-8	2-6	1.50-1.65	6.0-20	0.07-0.12	4.5-6.5	Low----------	0.17	0.17			
	8-37	1-5	1.50-1.70	6.0-20	0.05-0.08	4.5-6.5	Low----------	0.15	0.15			
	37-62	0-3	1.50-1.70	6.0-20	0.04-0.07	4.5-6.5	Low----------	0.15	0.15			
Padus----------	0-2	3-10	1.35-1.70	0.6-2.0	0.10-0.18	4.5-7.3	Low----------	0.24	0.24	4	3	1-3
	2-3	3-12	1.40-1.70	0.6-2.0	0.09-0.19	4.5-6.5	Low----------	0.24	0.24			
	3-19	6-15	1.40-1.70	0.6-2.0	0.09-0.19	4.5-6.0	Low----------	0.24	0.24			
	19-38	6-18	1.40-1.70	0.6-2.0	0.06-0.19	4.5-6.5	Low----------	0.24	0.24			
	38-60	0-3	1.55-1.80	>6.0	0.01-0.06	5.1-6.5	Low----------	0.10	0.10			
Ep:												
Epiaquents------	0-8	---	0.30-0.50	2.0-6.0	0.35-0.45	5.6-7.8	----------	0.10	0.10	5	2	20-80
	8-11	5-25	1.30-1.70	0.6-6.0	0.07-0.30	5.1-7.3	Low----------	0.28	0.28			
	11-60	3-30	1.35-1.80	0.2-20	0.05-0.15	6.1-8.4	Low----------	0.28	0.28			
Epiaquods-------	0-8	---	0.30-0.50	2.0-6.0	0.35-0.45	3.6-6.5	----------	0.10	0.10	5	2	20-80
	8-12	3-20	1.40-1.70	0.6-20	0.05-0.18	3.6-6.5	Low----------	---	---			
	12-23	3-20	1.40-1.70	0.6-20	0.05-0.18	4.5-6.5	Low----------	---	---			
	23-60	2-15	1.40-1.80	0.6-20	0.02-0.15	5.6-7.3	Low----------	---	---			
FeB---------- Fence	0-2	8-20	1.35-1.55	0.6-2.0	0.20-0.24	3.6-7.3	Low----------	0.37	0.37	5	5	1-2
	2-6	5-15	1.35-1.55	0.6-2.0	0.20-0.22	3.6-6.5	Low----------	0.37	0.37			
	6-14	5-15	1.50-1.65	0.6-2.0	0.16-0.22	3.6-6.0	Low----------	0.37	0.37			
	14-25	5-15	1.50-1.65	0.6-2.0	0.16-0.22	3.6-6.5	Low----------	0.43	0.43			
	25-42	8-18	1.50-1.65	0.6-2.0	0.16-0.22	4.5-7.8	Low----------	0.43	0.43			
	42-60	5-15	1.50-1.65	0.2-0.6	0.14-0.20	---	Low----------	0.43	0.43			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH						Pct
Fm---------- Fordum	0-9	10-23	1.35-1.45	0.6-2.0	0.17-0.24	4.5-8.4	Low----------	0.24	0.24	4	8	4-12
	9-29	8-17	1.40-1.50	0.6-6.0	0.10-0.22	4.5-8.4	Low----------	0.37	0.37			
	29-60	2-5	1.55-1.70	>6.0	0.04-0.10	5.6-8.4	Low----------	0.15	0.15			
GaA---------- Gastrow	0-3	5-15	1.30-1.55	0.6-2.0	0.22-0.24	3.6-7.3	Low----------	0.37	0.37	5	5	2-4
	3-6	2-15	1.30-1.55	0.6-2.0	0.18-0.22	3.6-7.3	Low----------	0.43	0.43			
	6-10	5-15	1.40-1.65	0.6-2.0	0.18-0.22	3.6-6.0	Low----------	0.43	0.43			
	10-31	5-15	1.40-1.65	0.6-2.0	0.18-0.22	3.6-6.0	Low----------	0.43	0.43			
	31-37	8-17	1.40-1.65	0.6-2.0	0.16-0.20	5.1-7.3	Low----------	0.24	0.24			
	37-60	5-15	1.45-1.65	0.6-2.0	0.12-0.16	5.6-7.3	Low----------	0.24	0.24			
GmC, GmD--------- Goodman	0-4	5-12	1.35-1.45	0.6-2.0	0.19-0.24	3.6-6.5	Low----------	0.43	0.43	5	5	2-4
	4-20	8-14	1.45-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.37	0.37			
	20-31	8-14	1.50-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43	0.43			
	31-35	2-12	1.50-1.70	0.6-2.0	0.05-0.18	3.6-6.5	Low----------	0.24	0.24			
	35-62	2-12	1.50-1.75	0.6-6.0	0.05-0.16	5.1-6.5	Low----------	0.28	0.28			
GwB---------- Goodwit	0-5	5-12	1.35-1.45	0.6-2.0	0.19-0.24	4.5-7.3	Low----------	0.43	0.43	5	5	2-4
	5-6	4-10	1.45-1.60	0.6-2.0	0.18-0.22	4.5-7.3	Low----------	0.37	0.37			
	6-17	6-14	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	17-40	8-14	1.50-1.60	0.6-2.0	0.17-0.22	4.5-6.5	Low----------	0.43	0.43			
	40-47	8-17	1.50-1.70	0.6-2.0	0.07-0.18	4.5-6.5	Low----------	0.32	0.32			
	47-62	2-12	1.50-1.75	0.6-2.0	0.05-0.12	5.1-6.5	Low----------	0.10	0.10			
IsA---------- Iosco	0-11	10-15	1.25-1.40	6.0-20	0.10-0.12	5.1-7.3	Low----------	0.10	0.10	5	2	1-4
	11-33	0-15	1.35-1.60	6.0-20	0.06-0.11	5.1-6.5	Low----------	0.17	0.17			
	33-44	18-35	1.50-1.70	0.2-0.6	0.16-0.20	6.1-7.8	Moderate-----	0.37	0.37			
	44-60	15-35	1.50-1.70	0.2-0.6	0.17-0.20	6.6-8.4	Moderate-----	0.37	0.37			
Kr---------- Kinross	0-2	---	0.10-0.35	2.0-20	0.35-0.45	3.6-5.0	----------	0.05	0.05	5	2	20-70
	2-17	0-10	1.40-1.70	6.0-20	0.04-0.09	3.6-6.0	Low----------	0.15	0.15			
	17-60	0-10	1.40-1.70	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15	0.15			
Lo:												
Loxley----------	0-9	---	0.30-0.40	>6.0	0.55-0.65	3.6-4.4	----------	---	---	3	7	70-90
	9-60	---	0.10-0.35	0.2-6.0	0.35-0.45	3.6-4.4	----------	---	---			
Beseman---------	0-12	---	0.10-0.20	>6.0	0.55-0.65	3.6-4.4	----------	---	---	2	7	25-75
	12-36	---	0.10-0.25	0.6-6.0	0.35-0.45	3.6-4.4	----------	---	---			
	36-60	10-27	1.55-1.95	0.2-0.6	0.11-0.18	3.6-7.3	Moderate-----	0.28	0.37			
Dawson----------	0-10	---	0.15-0.30	>6.0	0.55-0.65	3.6-4.4	----------	---	---	2	7	65-85
	10-44	---	0.15-0.40	0.2-6.0	0.35-0.45	3.6-4.4	----------	---	---			
	44-60	0-10	1.55-1.75	6.0-20	0.03-0.10	4.5-6.5	Low----------	0.10	0.10			
Lu:												
Lupton----------	0-6	---	0.10-0.35	0.2-6.0	0.35-0.45	5.6-7.8	----------	---	---	3	2	70-90
	6-60	---	0.10-0.35	0.2-6.0	0.35-0.45	5.6-7.8	----------	---	---			
Cathro----------	0-8	---	0.28-0.45	0.2-6.0	0.35-0.45	4.5-7.8	----------	---	---	2	2	60-85
	8-30	---	0.15-0.30	0.2-6.0	0.35-0.45	4.5-7.8	----------	---	---			
	30-60	10-27	1.50-1.70	0.2-2.0	0.11-0.22	5.6-8.4	Low----------	0.32	---			
Markey----------	0-36	---	0.15-0.45	0.2-6.0	0.35-0.45	5.6-7.8	----------	---	---	2	2	55-85
	36-60	0-10	1.40-1.65	>20	0.03-0.08	5.6-8.4	Low----------	0.10	0.15			
MaA---------- Manitowish	0-4	4-10	1.30-1.70	2.0-6.0	0.11-0.15	4.5-7.3	Low----------	0.20	0.20	3	3	1-3
	4-13	5-15	1.40-1.70	0.6-6.0	0.11-0.18	4.5-6.0	Low----------	0.24	0.24			
	13-29	3-12	1.45-1.65	2.0-60	0.04-0.12	4.5-6.5	Low----------	0.15	0.15			
	29-62	0-3	1.55-1.70	6.0-60	0.02-0.07	5.1-6.5	Low----------	0.10	0.15			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH						Pct
Mn---------- Minocqua	0-5	---	0.15-0.45	2.0-6.0	0.35-0.45	4.5-7.8	Low----------	0.32	0.32	4	2	30-60
	5-21	10-17	1.50-1.60	0.6-2.0	0.11-0.19	4.5-7.8	Low----------	0.43	0.43			
	21-25	3-10	1.65-1.75	2.0-20	0.06-0.13	4.5-7.8	Low----------	0.10	0.15			
	25-60	0-3	1.75-1.85	>6.0	0.02-0.04	4.5-7.8	Low----------	0.10	0.10			
MrB---------- Morganlake	0-7	1-12	1.35-1.60	2.0-20	0.09-0.14	5.1-7.3	Low----------	0.15	0.15	5	2	1-3
	7-8	1-12	1.40-1.65	2.0-20	0.06-0.12	5.1-6.0	Low----------	0.17	0.17			
	8-26	1-12	1.45-1.70	2.0-20	0.06-0.12	5.1-6.0	Low----------	0.17	0.17			
	26-31	1-12	1.45-1.70	2.0-20	0.06-0.12	5.1-6.0	Low----------	0.17	0.17			
	31-40	18-35	1.45-1.65	0.2-0.6	0.13-0.20	5.6-8.4	Moderate-----	0.43	0.43			
	40-60	18-35	1.50-1.75	0.2-0.6	0.12-0.18	5.6-8.4	Moderate-----	0.43	0.43			
MuB---------- Mudlake	0-4	4-15	1.35-1.60	0.6-2.0	0.18-0.24	4.5-7.3	Low----------	0.43	0.43	5	5	2-4
	4-5	4-12	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	5-12	4-15	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	12-34	4-17	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	34-43	5-17	1.40-1.70	0.6-2.0	0.07-0.21	4.5-6.0	Low----------	0.28	0.28			
	43-70	4-12	1.40-1.70	0.6-6.0	0.05-0.14	5.1-6.5	Low----------	0.20	0.20			
PaB, PaC, PaD---- Padus	0-2	3-10	1.35-1.70	0.6-2.0	0.10-0.18	4.5-7.3	Low----------	0.24	0.24	4	3	1-3
	2-3	3-12	1.40-1.70	0.6-2.0	0.09-0.19	4.5-6.5	Low----------	0.24	0.24			
	3-19	6-15	1.40-1.70	0.6-2.0	0.09-0.19	4.5-6.0	Low----------	0.24	0.24			
	19-38	6-18	1.40-1.70	0.6-2.0	0.06-0.19	4.5-6.5	Low----------	0.24	0.24			
	38-60	0-3	1.55-1.80	>6.0	0.01-0.06	5.1-6.5	Low----------	0.10	0.10			
PeB, PeC, PeD:												
Padus----------	0-2	3-10	1.35-1.70	0.6-2.0	0.10-0.18	4.5-7.3	Low----------	0.24	0.24	4	3	1-3
	2-3	3-12	1.40-1.70	0.6-2.0	0.09-0.19	4.5-6.5	Low----------	0.24	0.24			
	3-19	6-15	1.40-1.70	0.6-2.0	0.09-0.19	4.5-6.0	Low----------	0.24	0.24			
	19-38	6-18	1.40-1.70	0.6-2.0	0.06-0.19	4.5-6.5	Low----------	0.24	0.24			
	38-60	0-3	1.55-1.80	>6.0	0.01-0.06	5.1-6.5	Low----------	0.10	0.10			
Pence----------	0-4	3-15	1.20-1.65	2.0-6.0	0.10-0.18	4.5-7.3	Low----------	0.20	0.20	3	3	1-3
	4-15	2-15	1.35-1.45	0.6-6.0	0.10-0.15	4.5-6.0	Low----------	0.17	0.24			
	15-31	2-10	1.65-1.75	2.0-60	0.05-0.08	4.5-6.5	Low----------	0.05	0.10			
	31-60	0-4	1.35-1.80	6.0-60	0.02-0.05	5.1-6.5	Low----------	0.05	0.10			
PnB, PnC, PnD---- Pence	0-4	3-15	1.20-1.65	2.0-6.0	0.10-0.18	4.5-7.3	Low----------	0.20	0.20	3	3	1-3
	4-15	2-15	1.35-1.45	0.6-6.0	0.10-0.15	4.5-6.0	Low----------	0.17	0.24			
	15-31	2-10	1.65-1.75	2.0-60	0.05-0.08	4.5-6.5	Low----------	0.05	0.10			
	31-60	0-4	1.35-1.80	6.0-60	0.02-0.05	5.1-6.5	Low----------	0.05	0.10			
PsB, PsC, PsD:												
Pence----------	0-4	3-15	1.20-1.65	2.0-6.0	0.10-0.18	4.5-7.3	Low----------	0.20	0.20	3	3	1-3
	4-15	2-15	1.35-1.45	0.6-6.0	0.10-0.15	4.5-6.0	Low----------	0.17	0.24			
	15-31	2-10	1.65-1.75	2.0-60	0.05-0.08	4.5-6.5	Low----------	0.05	0.10			
	31-60	0-4	1.35-1.80	6.0-60	0.02-0.05	5.1-6.5	Low----------	0.05	0.10			
Vilas----------	0-4	2-6	1.35-1.65	6.0-20	0.09-0.12	4.5-7.3	Low----------	0.10	0.10	5	2	1-3
	4-5	1-5	1.35-1.65	6.0-20	0.06-0.12	4.5-6.5	Low----------	0.17	0.17			
	5-8	2-6	1.50-1.65	6.0-20	0.07-0.12	4.5-6.5	Low----------	0.17	0.17			
	8-37	1-5	1.50-1.70	6.0-20	0.05-0.08	4.5-6.5	Low----------	0.15	0.15			
	37-62	0-3	1.50-1.70	6.0-20	0.04-0.07	4.5-6.5	Low----------	0.15	0.15			
Pt. Pits, gravel												
Px. Pits, mine												

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH						Pct
Rb---------- Robago	0-7	5-15	1.25-1.55	0.6-2.0	0.08-0.18	3.6-7.3	Low----------	0.28	0.28	5	3	2-4
	7-17	5-15	1.40-1.70	0.6-2.0	0.10-0.14	3.6-6.0	Low----------	0.24	0.24			
	17-27	5-15	1.40-1.70	0.6-2.0	0.10-0.14	5.1-6.5	Low----------	0.24	0.24			
	27-38	8-18	1.40-1.70	0.6-2.0	0.10-0.14	5.6-7.3	Low----------	0.24	0.24			
	38-62	5-15	1.45-1.70	0.6-2.0	0.10-0.15	6.1-7.3	Low----------	0.24	0.24			
RkC, RkD:												
Rock outcrop.												
Ishpeming-------	0-4	2-15	1.30-1.60	6.0-20	0.09-0.12	4.5-6.5	Low----------	0.10	0.10	2	2	1-2
	4-32	2-15	1.30-1.60	6.0-20	0.05-0.11	4.5-6.5	Low----------	0.17	0.17			
	32	---	---	0.01-20	---	---	----------	---	---			
Vilas----------	0-4	2-6	1.35-1.65	6.0-20	0.09-0.12	4.5-7.3	Low----------	0.10	0.10	5	2	1-3
	4-5	1-5	1.35-1.65	6.0-20	0.06-0.12	4.5-6.5	Low----------	0.17	0.17			
	5-8	2-6	1.50-1.65	6.0-20	0.07-0.12	4.5-6.5	Low----------	0.17	0.17			
	8-37	1-5	1.50-1.70	6.0-20	0.05-0.08	4.5-6.5	Low----------	0.15	0.15			
	37-62	0-3	1.50-1.70	6.0-20	0.04-0.07	4.5-6.5	Low----------	0.15	0.15			
RmC, RmD:												
Rock outcrop.												
Metonga---------	0-2	3-10	1.35-1.70	0.6-2.0	0.14-0.18	3.6-6.0	Low----------	0.28	0.28	2	3	1-4
	2-4	3-15	1.35-1.70	0.6-2.0	0.16-0.22	3.6-6.0	Low----------	0.37	0.37			
	4-17	3-15	1.40-1.70	0.6-2.0	0.13-0.24	3.6-6.0	Low----------	0.37	0.37			
	17-39	3-10	1.40-1.75	0.6-2.0	0.05-0.16	5.1-6.5	Low----------	0.24	0.24			
	39	---	---	0.01-20	---	---	----------	---	---			
Sarona----------	0-1	4-15	1.35-1.65	0.6-2.0	0.10-0.18	4.5-7.3	Low----------	0.28	0.28	5	3	1-3
	1-3	4-12	1.45-1.65	0.6-6.0	0.08-0.18	4.5-6.5	Low----------	0.24	0.24			
	3-16	4-12	1.55-1.65	0.6-6.0	0.05-0.17	4.5-6.5	Low----------	0.24	0.24			
	16-41	5-17	1.60-1.70	0.6-6.0	0.07-0.17	4.5-6.5	Low----------	0.24	0.24			
	41-60	4-15	1.60-1.70	0.6-6.0	0.04-0.13	5.1-6.5	Low----------	0.17	0.17			
RsB, RsC--------- Rousseau	0-6	2-12	1.30-1.55	2.0-6.0	0.10-0.12	4.5-6.0	Low----------	0.15	0.15	5	2	1-2
	6-36	0-10	1.30-1.60	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15	0.15			
	36-60	0-10	1.50-1.65	6.0-20	0.05-0.07	5.1-6.5	Low----------	0.15	0.15			
SaB, SaC, SaD---- Sarona	0-3	4-12	1.35-1.65	0.6-2.0	0.10-0.18	4.5-7.3	Low----------	0.28	0.28	5	3	1-3
	3-17	4-12	1.55-1.65	0.6-6.0	0.05-0.17	4.5-6.0	Low----------	0.24	0.24			
	17-48	4-15	1.55-1.70	0.6-6.0	0.05-0.17	4.5-6.0	Low----------	0.24	0.24			
	48-66	5-17	1.60-1.70	0.6-6.0	0.07-0.17	5.1-6.5	Low----------	0.17	0.24			
	66-73	4-15	1.60-1.70	0.6-6.0	0.05-0.15	5.1-6.5	Low----------	0.17	0.17			
SdB, SdC, SdD:												
Sarona----------	0-3	4-12	1.35-1.65	0.6-2.0	0.10-0.18	4.5-7.3	Low----------	0.28	0.28	5	3	1-3
	3-17	4-12	1.55-1.65	0.6-6.0	0.05-0.17	4.5-6.0	Low----------	0.24	0.24			
	17-48	4-15	1.55-1.70	0.6-6.0	0.05-0.17	4.5-6.0	Low----------	0.24	0.24			
	48-66	5-17	1.60-1.70	0.6-6.0	0.07-0.17	5.1-6.5	Low----------	0.17	0.24			
	66-73	4-15	1.60-1.70	0.6-6.0	0.05-0.15	5.1-6.5	Low----------	0.17	0.17			
Padus----------	0-2	3-10	1.35-1.70	0.6-2.0	0.10-0.18	4.5-7.3	Low----------	0.24	0.24	4	3	1-3
	2-3	3-12	1.40-1.70	0.6-2.0	0.09-0.19	4.5-6.5	Low----------	0.24	0.24			
	3-19	6-15	1.40-1.70	0.6-2.0	0.09-0.19	4.5-6.0	Low----------	0.24	0.24			
	19-38	6-18	1.40-1.70	0.6-2.0	0.06-0.19	4.5-6.5	Low----------	0.24	0.24			
	38-60	0-3	1.55-1.80	>6.0	0.01-0.06	5.1-6.5	Low----------	0.10	0.10			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH						Pct
SlB, SlC, SlD:												
Sarona----------	0-3	4-12	1.35-1.65	0.6-2.0	0.10-0.18	4.5-7.3	Low----------	0.28	0.28	5	3	1-3
	3-17	4-12	1.55-1.65	0.6-6.0	0.05-0.17	4.5-6.0	Low----------	0.24	0.24			
	17-48	4-15	1.55-1.70	0.6-6.0	0.05-0.17	4.5-6.0	Low----------	0.24	0.24			
	48-66	5-17	1.60-1.70	0.6-6.0	0.07-0.17	5.1-6.5	Low----------	0.17	0.24			
	66-73	4-15	1.60-1.70	0.6-6.0	0.05-0.15	5.1-6.5	Low----------	0.17	0.17			
Vilas----------	0-4	2-6	1.35-1.65	6.0-20	0.09-0.12	4.5-7.3	Low----------	0.10	0.10	5	2	1-3
	4-5	1-5	1.35-1.65	6.0-20	0.06-0.12	4.5-6.5	Low----------	0.17	0.17			
	5-8	2-6	1.50-1.65	6.0-20	0.07-0.12	4.5-6.5	Low----------	0.17	0.17			
	8-37	1-5	1.50-1.70	6.0-20	0.05-0.08	4.5-6.5	Low----------	0.15	0.15			
	37-62	0-3	1.50-1.70	6.0-20	0.04-0.07	4.5-6.5	Low----------	0.15	0.15			
SnB, SnC, SnD---- Sayner	0-4	1-5	1.25-1.45	2.0-6.0	0.08-0.12	4.5-6.5	Low----------	0.10	0.10	5	2	1-3
	4-17	0-5	1.35-1.65	2.0-20	0.03-0.11	4.5-6.0	Low----------	0.17	0.17			
	17-27	0-4	1.45-1.70	2.0-20	0.03-0.11	4.5-6.5	Low----------	0.10	0.15			
	27-63	0-3	1.55-1.80	>6.0	0.01-0.03	5.1-6.5	Low----------	0.10	0.15			
SoD:												
Soperton--------	0-5	3-10	1.20-1.50	0.6-2.0	0.16-0.23	3.6-7.3	Low----------	0.43	0.43	4	5	2-3
	5-22	4-12	1.30-1.45	0.6-2.0	0.16-0.21	3.6-6.0	Low----------	0.43	0.43			
	22-42	6-16	1.80-1.95	0.06-0.2	0.06-0.12	3.6-6.5	Low----------	0.20	0.28			
	42-61	3-10	1.65-1.80	0.6-6.0	0.04-0.10	4.5-6.5	Low----------	0.10	0.17			
Goodman---------	0-4	5-12	1.35-1.45	0.6-2.0	0.19-0.24	3.6-6.5	Low----------	0.43	0.43	5	5	2-4
	4-20	8-14	1.45-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.37	0.37			
	20-31	8-14	1.50-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43	0.43			
	31-35	2-12	1.50-1.70	0.6-2.0	0.05-0.18	3.6-6.5	Low----------	0.24	0.24			
	35-62	2-12	1.50-1.75	0.6-6.0	0.05-0.16	5.1-6.5	Low----------	0.28	0.28			
StC, StD--------- Stambaugh	0-17	5-15	1.10-1.60	0.6-2.0	0.21-0.24	4.5-6.0	Low----------	0.43	0.43	4	5	1-3
	17-33	8-18	1.25-1.70	0.2-0.6	0.20-0.22	4.5-6.0	Low----------	0.37	0.32			
	33-61	0-8	1.50-1.70	>20	0.02-0.04	5.1-6.5	Low----------	0.10	---			
SuC, SuD:												
Stambaugh-------	0-17	5-15	1.10-1.60	0.6-2.0	0.21-0.24	4.5-6.0	Low----------	0.43	0.43	4	5	1-3
	17-33	8-18	1.25-1.70	0.2-0.6	0.20-0.22	4.5-6.0	Low----------	0.37	0.32			
	33-61	0-8	1.50-1.70	>20	0.02-0.04	5.1-6.5	Low----------	0.10	---			
Goodman---------	0-4	5-12	1.35-1.45	0.6-2.0	0.19-0.24	3.6-6.5	Low----------	0.43	0.43	5	5	2-4
	4-20	8-14	1.45-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.37	0.37			
	20-31	8-14	1.50-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43	0.43			
	31-35	2-12	1.50-1.70	0.6-2.0	0.05-0.18	3.6-6.5	Low----------	0.24	0.24			
	35-62	2-12	1.50-1.75	0.6-6.0	0.05-0.16	5.1-6.5	Low----------	0.28	0.28			
TpA---------- Tipler	0-2	3-10	1.35-1.70	0.6-2.0	0.10-0.15	4.5-7.3	Low----------	0.24	0.24	4	3	2-3
	2-4	3-10	1.40-1.65	0.6-2.0	0.08-0.19	4.5-6.5	Low----------	0.24	0.24			
	4-22	5-15	1.40-1.65	0.6-2.0	0.09-0.19	4.5-6.0	Low----------	0.24	0.24			
	22-31	6-17	1.40-1.65	0.6-2.0	0.06-0.19	5.1-6.5	Low----------	0.24	0.24			
	31-60	0-3	1.55-1.80	>6.0	0.01-0.06	5.1-6.5	Low----------	0.15	0.10			
VaB---------- Vanzile	0-1	5-15	1.35-1.55	0.6-2.0	0.20-0.24	4.5-7.3	Low----------	0.43	0.43	4	5	1-3
	1-4	3-15	1.35-1.55	0.6-2.0	0.20-0.24	4.5-6.0	Low----------	0.37	0.37			
	4-13	5-15	1.35-1.65	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	13-17	3-15	1.35-1.65	0.6-2.0	0.17-0.22	4.5-6.5	Low----------	0.43	0.43			
	17-33	8-18	1.40-1.65	0.2-2.0	0.17-0.22	4.5-6.5	Low----------	0.43	0.43			
	33-60	0-8	1.50-1.80	>6.0	0.01-0.06	4.5-6.5	Low----------	0.10	0.15			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH						Pct
VgB:												
Vanzile---------	0-1	5-15	1.35-1.55	0.6-2.0	0.20-0.24	4.5-7.3	Low----------	0.43	0.43	4	5	1-3
	1-4	3-15	1.35-1.55	0.6-2.0	0.20-0.24	4.5-6.0	Low----------	0.37	0.37			
	4-13	5-15	1.35-1.65	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	13-17	3-15	1.35-1.65	0.6-2.0	0.17-0.22	4.5-6.5	Low----------	0.43	0.43			
	17-33	8-18	1.40-1.65	0.2-2.0	0.17-0.22	4.5-6.5	Low----------	0.43	0.43			
	33-60	0-8	1.50-1.80	>6.0	0.01-0.06	4.5-6.5	Low----------	0.10	0.15			
Goodwit---------	0-5	5-12	1.35-1.45	0.6-2.0	0.19-0.24	4.5-7.3	Low----------	0.43	0.43	5	5	2-4
	5-6	4-10	1.45-1.60	0.6-2.0	0.18-0.22	4.5-7.3	Low----------	0.37	0.37			
	6-17	6-14	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	17-40	8-14	1.50-1.60	0.6-2.0	0.17-0.22	4.5-6.5	Low----------	0.43	0.43			
	40-47	8-17	1.50-1.70	0.6-2.0	0.07-0.18	4.5-6.5	Low----------	0.32	0.32			
	47-62	2-12	1.50-1.75	0.6-2.0	0.05-0.12	5.1-6.5	Low----------	0.10	0.17			
VsB, VsC, VsD---- Vilas	0-4	2-6	1.35-1.65	6.0-20	0.09-0.12	4.5-7.3	Low----------	0.10	0.10	5	2	1-3
	4-5	1-5	1.35-1.65	6.0-20	0.06-0.12	4.5-6.5	Low----------	0.17	0.17			
	5-8	2-6	1.50-1.65	6.0-20	0.07-0.12	4.5-6.5	Low----------	0.17	0.17			
	8-37	1-5	1.50-1.70	6.0-20	0.05-0.08	4.5-6.5	Low----------	0.15	0.15			
	37-62	0-3	1.50-1.70	6.0-20	0.04-0.07	4.5-6.5	Low----------	0.15	0.15			
WaC:												
Wabeno----------	0-5	3-10	1.20-1.50	0.6-2.0	0.14-0.23	3.6-7.3	Low----------	0.43	0.43	4	5	1-3
	5-11	3-10	1.30-1.45	0.6-2.0	0.17-0.24	3.6-6.0	Low----------	0.37	0.37			
	11-15	3-10	1.30-1.45	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.43	0.43			
	15-24	6-16	1.65-1.80	0.6-2.0	0.12-0.22	5.1-6.5	Low----------	0.43	0.43			
	24-55	6-16	1.80-1.95	0.06-0.2	0.01-0.03	5.1-6.5	Low----------	0.17	0.24			
	55-63	3-10	1.65-1.80	0.6-2.0	0.01-0.03	4.5-6.5	Low----------	0.20	0.28			
Goodman---------	0-4	5-12	1.35-1.45	0.6-2.0	0.19-0.24	3.6-6.5	Low----------	0.43	0.43	5	5	2-4
	4-20	8-14	1.45-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.37	0.37			
	20-31	8-14	1.50-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43	0.43			
	31-35	2-12	1.50-1.70	0.6-2.0	0.05-0.18	3.6-6.5	Low----------	0.24	0.24			
	35-62	2-12	1.50-1.75	0.6-6.0	0.05-0.16	5.1-6.5	Low----------	0.28	0.28			
WbB:												
Wabeno----------	0-5	3-10	1.20-1.50	0.6-2.0	0.14-0.23	3.6-7.3	Low----------	0.43	0.43	4	5	1-3
	5-11	3-10	1.30-1.45	0.6-2.0	0.17-0.24	3.6-6.0	Low----------	0.37	0.37			
	11-15	3-10	1.30-1.45	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.43	0.43			
	15-24	6-16	1.65-1.80	0.6-2.0	0.12-0.22	5.1-6.5	Low----------	0.43	0.43			
	24-55	6-16	1.80-1.95	0.06-0.2	0.01-0.03	5.1-6.5	Low----------	0.17	0.24			
	55-63	3-10	1.65-1.80	0.6-2.0	0.01-0.03	4.5-6.5	Low----------	0.20	0.28			
Goodwit---------	0-5	5-12	1.35-1.45	0.6-2.0	0.19-0.24	4.5-7.3	Low----------	0.43	0.43	5	5	2-4
	5-6	4-10	1.45-1.60	0.6-2.0	0.18-0.22	4.5-7.3	Low----------	0.37	0.37			
	6-17	6-14	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	17-40	8-14	1.50-1.60	0.6-2.0	0.17-0.22	4.5-6.5	Low----------	0.43	0.43			
	40-47	8-17	1.50-1.70	0.6-2.0	0.07-0.18	4.5-6.5	Low----------	0.32	0.32			
	47-62	2-12	1.50-1.75	0.6-2.0	0.05-0.12	5.1-6.5	Low----------	0.10	0.17			
WkB, WkC--------- Wakefield	0-5	8-15	1.30-1.55	0.6-2.0	0.18-0.24	4.5-6.5	Low----------	0.49	0.49	3	5	1-3
	5-6	8-15	1.30-1.60	0.6-2.0	0.16-0.20	4.5-6.5	Low----------	0.43	0.43			
	6-16	8-15	1.35-1.65	0.6-2.0	0.12-0.20	4.5-6.5	Low----------	0.43	0.43			
	16-27	10-24	1.80-2.05	<0.06	0.04-0.05	4.5-6.5	Low----------	0.28	0.28			
	27-50	18-30	1.45-1.70	0.6-2.0	0.03-0.05	4.5-6.5	Low----------	0.32	0.32			
	50-60	10-20	1.45-1.80	0.6-2.0	0.03-0.05	4.5-6.5	Low----------	0.37	0.37			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH						Pct
WrA---------- Worcester	0-5	5-15	1.35-1.70	0.6-2.0	0.10-0.18	4.5-7.3	Low----------	0.24	0.24	4	3	1-3
	5-21	5-15	1.40-1.70	0.6-2.0	0.06-0.19	4.5-6.0	Low----------	0.24	0.24			
	21-30	8-17	1.40-1.70	0.6-2.0	0.06-0.19	4.5-6.5	Low----------	0.24	0.24			
	30-34	3-8	1.45-1.70	>6.0	0.02-0.11	4.5-6.5	Low----------	0.10	0.17			
	34-62	0-3	1.50-1.80	>6.0	0.01-0.07	5.1-6.5	Low----------	0.10	0.15			

Table 18.--Soil and Water Features

("Flooding" and "water table" and terms such as "frequent," "brief," "apparent," and "perched" are explained in the text. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hard-ness	Total subsi-dence	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In		In			
AnB, AnC: Annalake	B	None	---	---	2.5-3.5	Perched	Sep-Jun	>60	---	---	Moderate	Moderate	Low.
Au: Au Gres	B	None	---	---	0.5-1.5	Apparent	Oct-May	>60	---	---	Moderate	Low	Moderate.
Ca: Capitola	B/D	None	---	---	+1-1.0	Perched	Sep-Jun	>60	---	---	High	High	High.
CoA: Crossett	C	None	---	---	0.5-2.5	Perched	Sep-Jun	>60	---	---	High	High	Low.
CrA: Croswell	A	None	---	---	2.0-3.5	Apparent	Nov-May	>60	---	---	Low	Low	Moderate.
CuA: Cublake	A	None	---	---	2.0-3.5	Perched	Oct-May	>60	---	---	Low	Low	Moderate.
EdB, EdC: Ellwood	C	None	---	---	1.5-3.5	Perched	Oct-May	>60	---	---	Moderate	Moderate	Low.
ElB:													
Ellwood	C	None	---	---	1.5-3.5	Perched	Oct-May	>60	---	---	Moderate	Moderate	Low.
Crossett	C	None	---	---	0.5-2.5	Perched	Sep-Jun	>60	---	---	High	High	Low.
EmB:													
Ellwood	C	None	---	---	1.5-3.5	Perched	Oct-May	>60	---	---	Moderate	Moderate	Low.
Iosco	B	None	---	---	0.5-1.5	Apparent	Nov-Jun	>60	---	---	Moderate	High	Low.
Morganlake	B	None	---	---	1.5-3.5	Perched	Oct-May	>60	---	---	Low	Low	Moderate.
EnC:													
Ellwood	C	None	---	---	1.5-3.5	Perched	Oct-May	>60	---	---	Moderate	Moderate	Low.
Iosco	B	None	---	---	0.5-1.5	Apparent	Nov-Jun	>60	---	---	Moderate	High	Low.
Vilas	A	None	---	---	>6.0	---	---	>60	---	---	Low	Low	High.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hard-ness	Total subsi-dence	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In		In			
EoD:													
Ellwood	C	None	---	---	1.5-3.5	Perched	Oct-May	>60	---	---	Moderate	Moderate	Low.
Vilas	A	None	---	---	>6.0	---	---	>60	---	---	Low	Low	High.
Padus	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
Ep:													
Epiaquents	D	None	---	---	+1-1.0	Perched	Oct-Jun	>60	---	---	High	High	Moderate.
Epiaquods	D	None	---	---	+1-1.0	Perched	Oct-Jun	>60	---	---	High	High	Moderate.
FeB Fence	B	None	---	---	2.5-3.5	Perched	Sep-Jun	>60	---	---	High	Low	High.
Fm Fordum	D	Frequent	Brief or long.	Mar-Jun	+1-1.0	Apparent	Jan-Dec	>60	---	---	High	High	High.
GaA Gastrow	C	None	---	---	0.5-2.0	Apparent	Sep-Jun	>60	---	---	High	Low	Moderate.
GmC, GmD Goodman	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	High.
GwB Goodwit	B	None	---	---	2.5-3.5	Perched	Sep-Jun	>60	---	---	Moderate	Low	High.
IsA Iosco	B	None	---	---	0.5-1.5	Apparent	Nov-Jun	>60	---	---	Moderate	High	Low.
Kr Kinross	A/D	None	---	---	+1-1.0	Apparent	Oct-May	>60	---	---	Moderate	High	Moderate.
Lo:													
Loxley	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	50-55	High	High	High.
Beseman	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	12-36	High	High	High.
Dawson	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	30-36	High	High	High.
Lu:													
Lupton	A/D	None	---	---	+1-1.0	Apparent	Oct-May	>60	---	50-55	High	High	Low.
Cathro	A/D	None	---	---	+1-1.0	Apparent	Oct-May	>60	---	19-22	High	High	Low.
Markey	A/D	None	---	---	+1-1.0	Apparent	Oct-May	>60	---	25-30	High	High	Low.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hard-ness	Total subsi-dence	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In		In			
MaA---------- Manitowish	B	None--------	---	---	2.5-3.5	Apparent	Sep-Jun	>60	---	---	Low------	Low------	Moderate.
Mn---------- Minocqua	B/D	None--------	---	---	+1-1.0	Apparent	Oct-Jun	>60	---	---	High-----	High-----	High.
MrB---------- Morganlake	B	None--------	---	---	1.5-3.5	Perched	Oct-May	>60	---	---	Low------	Low------	Moderate.
MuB---------- Mudlake	C	None--------	---	---	0.5-2.0	Perched	Sep-Jun	>60	---	---	High-----	Moderate	High.
PaB, PaC, PaD--- Padus	B	None--------	---	---	>6.0	---	---	>60	---	---	Moderate	Low------	Moderate.
PeB, PeC, PeD:													
Padus----------	B	None--------	---	---	>6.0	---	---	>60	---	---	Moderate	Low------	Moderate.
Pence----------	B	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Low------	Moderate.
PnB, PnC, PnD--- Pence	B	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Low------	Moderate.
PsB, PsC, PsD:													
Pence----------	B	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Low------	Moderate.
Vilas----------	A	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Low------	High.
Pt. Pits, gravel													
Px. Pits, mine													
Rb---------- Robago	B	None--------	---	---	0.5-2.0	Apparent	Sep-Jun	>60	---	---	High-----	Moderate	Moderate.
RkC, RkD: Rock outcrop.													
Ishpeming------	A	None--------	---	---	>6.0	---	---	20-40	Hard	---	Low------	Low------	High.
Vilas----------	A	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Low------	High.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hard-ness	Total subsi-dence	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In		In			
RmC, RmD:													
Rock outcrop.													
Metonga	B	None	---	---	>6.0	---	---	20-40	Hard	---	Moderate	Low	High.
Sarona	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
RsB, RsC	A	None	---	---	>6.0	---	---	>60	---	---	Low	Low	Moderate.
Rousseau													
SaB, SaC, SaD	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
Sarona													
SdB, SdC, SdD:													
Sarona	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
Padus	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
SlB, SlC, SlD:													
Sarona	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
Vilas	A	None	---	---	>6.0	---	---	>60	---	---	Low	Low	High.
SnB, SnC, SnD	A	None	---	---	>6.0	---	---	>60	---	---	Low	Low	Moderate.
Sayner													
SoD:													
Soperton	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	High.
Goodman	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	High.
StC, StD	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
Stambaugh													
SuC, SuD:													
Stambaugh	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
Goodman	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	High.
TpA	B	None	---	---	2.5-3.5	Apparent	Sep-Jun	>60	---	---	Moderate	Moderate	High.
Tipler													
VaB	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
Vanzile													

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hard-ness	Total subsi-dence	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In		In			
VgB:													
Vanzile	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
Goodwit	B	None	---	---	2.5-3.5	Perched	Sep-Jun	>60	---	---	Moderate	Low	High.
VsB, VsC, VsD Vilas	A	None	---	---	>6.0	---	---	>60	---	---	Low	Low	High.
WaC:													
Wabeno	B	None	---	---	1.5-3.0	Perched	Oct-Jun	>60	---	---	Moderate	Moderate	High.
Goodman	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	High.
WbB:													
Wabeno	B	None	---	---	1.5-3.0	Perched	Oct-Jun	>60	---	---	Moderate	Moderate	High.
Goodwit	B	None	---	---	2.5-3.5	Perched	Sep-Jun	>60	---	---	Moderate	Low	High.
WkB, WkC Wakefield	B	None	---	---	1.0-1.5	Perched	Oct-May	>60	---	---	Moderate	Moderate	Moderate.
WrA Worcester	C	None	---	---	0.5-2.0	Apparent	Oct-Jun	>60	---	---	High	High	High.

Table 19.--Engineering Index Test Data

(Dashes indicate that data were not available. MAX means maximum dry density; OPT, optimum moisture; LL, liquid limit; PI, plasticity index; NP, nonplastic; and UN, Unified)

Soil name and location	Parent material	Report number	Depth	Moisture density		Percentage passing sieve--*				Percentage smaller than--*				LL	PI	Classification	
				MAX	OPT	No. 4	No. 10	No. 40	No. 200	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO	UN
			In	Lb/ft^3	Pct									Pct			
Au Gres loamy sand:																	
NW1/4SW1/4	Primarily sandy glacial outwash.	S91WI-037-4-1	6-15	---	---	100	100	88	20	15	8	4	2	---	NP	A-2-4(0)	SM
sec. 14, T. 38 N., R. 17 E.		4-2	24-60	---	---	100	100	93	15	9	3	2	2	---	NP	A-2-4(0)	SM
Croswell loamy sand:																	
SW1/4SE1/4	Primarily sandy glacial outwash.	S91WI-037-1-1	3-10	---	---	100	100	88	12	11	8	4	3	---	NP	A-2-4(0)	SM
sec. 13, T. 38 N., R. 18 E.		1-2	25-60	---	---	99	99	89	5	4	2	1	1	---	NP	A-3(0)	SP
Ellwood silt loam:																	
SE1/4SE1/4	Silty deposits underlain by silty, loamy, or clayey glacial till.	S85WI-037-2-1	21-30	---	---	97	97	92	77	76	73	44	28	38.6	16.8	A-6(11)	CL
sec. 3, T. 38 N., R. 18 E.		2-2	42-60	---	---	96	96	91	78	76	73	46	23	35.9	14.5	A-6(10)	CL
Ellwood silt loam:																	
NE1/4SE1/4	Silty deposits underlain by silty, loamy, or clayey glacial till.	S90WI-037-1-4	25-35	---	---	98	97	95	84	84	81	47	29	38.6	18.6	A-6(11)	CL
sec. 3, T. 38 N., R. 18 E.		1-8	63-72	---	---	97	96	92	80	79	75	47	29	40.6	21.8	A-7(13)	CL
Goodwit silt loam:																	
SE1/4NE1/4	Primarily silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment.	S85WI-037-4-1	19-38	---	---	98	98	96	86	76	26	9	4	20.2	NP	A-4(8)	ML
sec. 34, T. 38 N., R. 16 E.		4-2	45-60	---	---	86	80	61	19	17	14	9	6	13.3	NP	A-2-4(0)	SM

See footnote at end of table.

Table 19.--Engineering Index Test Data--Continued

Soil name and location	Parent material	Report number	Depth	Moisture density MAX	Moisture density OPT	Percentage passing sieve--* No. 4	No. 10	No. 40	No. 200	Percentage smaller than--* 0.05 mm	0.02 mm	0.005 mm	0.002 mm	LL	PI	Classification AASHTO	UN
			In	Lb/ft^3	Pct									Pct			
Padus sandy loam: SW1/4SE1/4 sec. 30, T. 38 N., R. 16 E.	Loamy deposits underlain by sandy or sandy and gravelly glacial outwash.	S90WI-037-															
		3-1	3-8	---	---	100	100	94	58	42	23	12	8	21.5	NP	A-4(5)	ML
		3-2	26-38	---	---	96	92	70	34	29	17	8	5	14.0	NP	A-2-4(0)	SM
		3-3	38-60	---	---	89	86	49	3	2	2	1	1	---	NP	A-1(0)	SP
Pence sandy loam: SE1/4NW1/4 sec. 8, T. 39 N., R. 19 E.	Loamy deposits underlain by sandy and gravelly glacial outwash.	S89WI-037-															
		2-3	4-7	---	---	100	100	80	51	42	20	7	4	19.1	NP	A-4(3)	ML
		2-6	31-60	---	---	93	88	53	2	1	1	1	1	---	NP	A-3(0)	SP
Rousseau loamy fine sand: NW1/4NW1/4 sec. 3, T. 38 N., R. 19 E.	Sandy glacial outwash or lacustrine deposits.	S91WI-037-															
		2-1	6-12	---	---	100	100	96	32	21	7	3	2	---	NP	A-2-4(0)	SM
		2-2	36-60	---	---	99	99	93	22	10	2	1	1	---	NP	A-2-4(0)	SM
Vanzile silt loam: NE1/4NW1/4 sec. 34, T. 39 N., R. 15 E.	Silty deposits underlain by sandy or sandy and gravelly glacial outwash.	S85WI-037-															
		1-1	7-22	---	---	100	100	99	95	87	45	18	10	18.9	NP	A-4(8)	ML
		1-2	22-34	---	---	100	100	98	92	83	41	20	14	25.5	3.9	A-4(8)	ML
		1-3	37-60	---	---	88	86	58	2	2	2	2	2	---	NP	A-3(0)	SP
Vanzile silt loam: SE1/4SW1/4 sec. 2, T. 38 N., R. 15 E.	Silty deposits underlain by sandy or sandy and gravelly glacial outwash.	S88WI-037-															
		2-3	4-9	---	---	100	100	97	87	76	36	9	5	30.1	NP	A-4(8)	ML
		2-6	17-33	---	---	100	100	98	88	72	34	17	12	23.6	NP	A-4(8)	ML
		2-7	33-60	---	---	95	93	75	2	2	1	1	1	---	NP	A-3(0)	SP

See footnote at end of table.

Table 19.--Engineering Index Test Data--Continued

Soil name and location	Parent material	Report number	Depth	Moisture density MAX	Moisture density OPT	Percentage passing sieve--* No. 4	No. 10	No. 40	No. 200	Percentage smaller than--* 0.05 mm	0.02 mm	0.005 mm	0.002 mm	LL	PI	Classification AASHTO	UN
			In	Lb/ft^3	Pct									Pct			
Wabeno silt loam: SE1/4SE1/4 sec. 26, T. 40 N., R. 15 E.	Primarily silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment.	S88WI-037-1-3	2-8	---	---	100	100	98	91	76	39	16	12	25.0	NP	A-4(8)	ML
		1-5	12-21	---	---	96	96	95	91	81	32	11	5	25.2	NP	A-4(8)	ML
		1-9	52-60	---	---	87	83	63	21	19	14	7	5	---	NP	A-2-4(0)	SM
Wabeno silt loam: NW1/4NW1/4 sec. 24, T. 40 N., R. 15 E.	Primarily silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment.	S90WI-037-4-1	4-12	---	---	99	98	96	90	81	45	15	9	25.3	NP	A-4(8)	ML
		4-2	19-27	---	---	98	97	93	79	69	39	16	12	20.8	NP	A-4(8)	ML
		4-3	38-60	---	---	85	81	59	17	15	11	7	6	14.4	NP	A-2-4(0)	SM
Wabeno silt loam: SE1/4NW1/4 sec. 5, T. 40 N., R. 15 E.	Primarily silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment.	S87WI-037-5-1	5-14	---	---	100	100	97	88	79	44	15	95	---	NP	A-4(8)	ML
		5-3	20-47	---	---	81	76	58	22	19	15	8	5	---	NP	A-2-4(0)	SM
		5-4	47-66	---	---	81	77	54	18	16	14	8	5	---	NP	A-2-4(0)	SM

See footnote at end of table.

Table 19.--Engineering Index Test Data--Continued

Soil name and location	Parent material	Report number	Depth	Moisture density		Percentage passing sieve--*				Percentage smaller than--*				LL	PI	Classi-fication	
				MAX	OPT	No. 4	No. 10	No. 40	No. 200	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO	UN
			In	Lb/ft^3	Pct									Pct			
Wabeno silt loam: SW1/4NE1/4 sec. 5, T. 40 N., R. 15 E.	Primarily silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment.	S87WI-037-6-2	8-18	---	---	95	94	88	78	70	40	14	8	---	NP	A-4(8)	ML
		6-3	23-41	---	---	84	78	58	18	16	13	7	4	---	NP	A-2-4(0)	SM
		6-4	67-72	---	---	80	74	53	16	14	12	7	4	---	NP	A-2-4(0)	SM

* Mechanical analysis according to the AASHTO Designation T88-57. Results from this procedure can differ somewhat from the results obtained by the soil survey procedure of the Natural Resources Conservation Service (NRCS). In the AASHTO procedure, the fine material is analyzed by hydrometer method and the various grain-size fractions are calculated on the basis of all material up to and including that 3 inches in diameter. In the NRCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from the calculation of grain-size fraction. The mechanical analysis data used in this table are not suitable for use in naming textural classes of soils.

Table 20.--Classification of the Soils

Soil name	Family or higher taxonomic class
Annalake	Coarse-loamy, mixed, frigid Oxyaquic Haplorthods
Au Gres	Sandy, mixed, frigid Typic Endoaquods
Beseman	Loamy, mixed, dysic Terric Borosaprists
Capitola	Coarse-loamy, mixed, frigid Mollic Epiaqualfs
Cathro	Loamy, mixed, euic Terric Borosaprists
Crossett	Fine-loamy, mixed Glossaquic Eutroboralfs
Croswell	Sandy, mixed, frigid Oxyaquic Haplorthods
Cublake	Sandy, mixed, frigid Oxyaquic Haplorthods
Dawson	Sandy or sandy-skeletal, mixed, dysic Terric Borosaprists
Ellwood	Fine-loamy, mixed Oxyaquic Eutroboralfs
Epiaquents	Epiaquents
Epiaquods	Epiaquods
Fence	Coarse-silty, mixed, frigid Oxyaquic Haplorthods
Fordum	Coarse-loamy, mixed, nonacid, frigid Mollic Fluvaquents
Gastrow	Coarse-loamy, mixed, frigid Argic Endoaquods
Goodman	Coarse-loamy, mixed, frigid Alfic Haplorthods
Goodwit	Coarse-loamy, mixed, frigid Oxyaquic Haplorthods
Iosco	Sandy over loamy, mixed, frigid Argic Endoaquods
Ishpeming	Sandy, mixed, frigid Entic Haplorthods
Kinross	Sandy, mixed, frigid Typic Endoaquods
Loxley	Dysic Typic Borosaprists
Lupton	Euic Typic Borosaprists
Manitowish	Sandy, mixed, frigid Oxyaquic Haplorthods
Markey	Sandy or sandy-skeletal, mixed, euic Terric Borosaprists
Metonga	Coarse-loamy, mixed, frigid Entic Haplorthods
Minocqua	Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, frigid Typic Endoaquepts
Morganlake	Sandy over loamy, mixed, frigid Oxyaquic Haplorthods
Mudlake	Coarse-loamy, mixed, frigid Alfic Epiaquods
Padus	Coarse-loamy, mixed, frigid Alfic Haplorthods
Pence	Sandy, mixed, frigid Entic Haplorthods
Robago	Coarse-loamy, mixed, frigid Argic Endoaquods
Rousseau	Sandy, mixed, frigid Entic Haplorthods
Sarona	Coarse-loamy, mixed, frigid Alfic Haplorthods
Sayner	Sandy, mixed, frigid Entic Haplorthods
Soperton	Coarse-loamy, mixed, frigid Alfic Fragiorthods
Stambaugh	Coarse-silty over sandy or sandy-skeletal, mixed, frigid Alfic Haplorthods
Tipler	Coarse-loamy, mixed, frigid Oxyaquic Haplorthods
Vanzile	Coarse-silty over sandy or sandy-skeletal, mixed, frigid Alfic Haplorthods
Vilas	Sandy, mixed, frigid Entic Haplorthods
Wabeno	Coarse-loamy, mixed, frigid Oxyaquic Fragiorthods
Wakefield	Coarse-loamy, mixed, frigid Oxyaquic Fragiorthods
Worcester	Coarse-loamy, mixed, frigid Argic Endoaquods