United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Michigan Department of Agriculture, Michigan Agricultural Experiment Station, Michigan State University Extension, and Michigan Technological University

Soil Survey of Alpena County, Michigan

How To Use This Soil Survey

General Soil Map

The general soil map, which is a color map, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

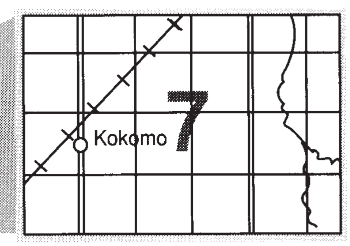
Detailed Soil Maps

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

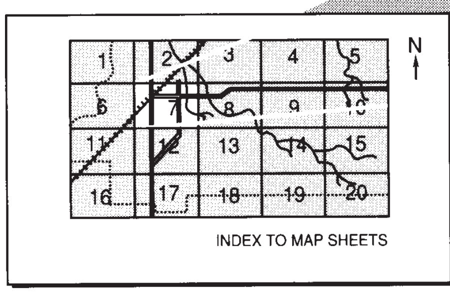
To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

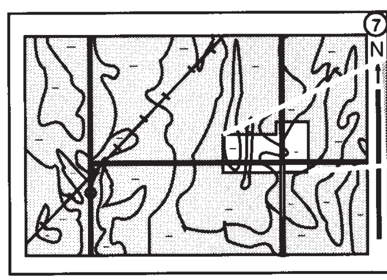
Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

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.



MAP SHEET





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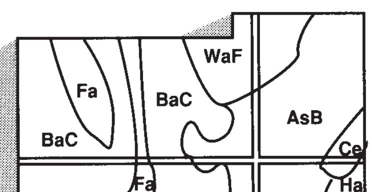

AREA OF INTEREST

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 has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1997. Soil names and descriptions were approved in 1998. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1998. This survey was made cooperatively by the Natural Resources Conservation Service, the Michigan Department of Agriculture, the Michigan Agricultural Experiment Station, Michigan State University Extension, and Michigan Technological University. The survey is part of the technical assistance furnished to the Alpena County Conservation District. Financial assistance was provided by the Alpena County Board of Commissioners.

Cover: Trees growing on the channel bars in the impoundment of the Thunder Bay River in Alpena. Most of the area shown in the picture is in the map unit Histosols and Aquents, ponded. The cleared area in the left foreground, however, is a Rousseau soil on a sand dune.

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.

Contents

Issued 2004

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. Farmers, foresters, 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 that affect 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. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Ronald C. Williams
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Alpena County, Michigan

By Thomas E. Williams, Michigan Department of Agriculture

Fieldwork by Thomas E. Williams, Michigan Department of Agriculture, and
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United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with
Michigan Department of Agriculture, Michigan Agricultural Experiment Station,
Michigan State University Extension, and Michigan Technological University

ALPENA COUNTY is in the northeastern part of the Lower Peninsula of Michigan (fig. 1). The county is bordered on the north by Presque Isle County, on the west by Montmorency County, on the south by Alcona County, and on the east by Lake Huron. It has a total area of 385,025 acres, or about 600 square miles. About 61 percent of the acreage is forested, and 24 percent is in farms. About 6 percent is water, and about 9 percent is used for other purposes, including urban land, transportation routes, and quarries. In 1990, the population of the county was 30,605. The city of Alpena is the county seat. Farming and timber production are the major enterprises in the rural part of the county, and cement manufacturing and small industry are important in the city.

This soil survey updates the survey of Alpena County, Michigan, published in 1924 (Wildermuth et al., 1924). It provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section gives general information about the survey area. It describes history and development, climate, physiography, karst geology, and lakes and streams.

Figure 1.—Location of Alpena County in Michigan.

History and Development

The first inhabitants of the area now known as Alpena County were the Chippewa Indians. They were primarily fishermen and trappers, and their villages were concentrated on Thunder Bay and the Thunder Bay River. Indian artifacts, such as projectile points, pots, and pieces of copper, have been found at several archeological sites in the county.

In 1787, the Northwest Ordinance was enacted. The survey area became part of Wayne County, Indiana, Territory in 1796. In 1818, after establishment of the Michigan Territory in 1805, it became part of Michilimackinac County. In 1819, the Chippewa Nation of Indians, through the Treaty of Saginaw, ceded the land south of the Thunder Bay River to the United States. This part of the county became part of Oakland County in 1822. The land north of the Thunder Bay River was ceded by the Treaty of Washington in 1836. The county was named Anomickee in 1840. In 1843, the name changed to Alpena, which is an Indian word meaning “a good partridge country.” A land survey was conducted in the county in 1873.

European settlement of the county began in the mid-1800s, when several people moved into the survey area and began logging the great stands of timber. Daniel Carter is considered to be the first permanent European settler in Alpena County (Law and Law, 1975).

Alpena County was officially organized in 1857. At that time, the population was 290, and the county seat was Fremont. The name “Fremont” was later changed to “Alpena.”

Logging was the dominant industry at the time of settlement and remained so for many years. It still occurs in the county. As the countryside was cleared, agriculture made it’s way into the county. It remains a very important industry in the county. Heavy industry in Alpena plays a very important role in the economy of the county.

Climate

Prepared by the Water and Climate Center, Natural Resources Conservation Service, Portland, Oregon. Climate tables were created from data collected at Phelps Collins Airport.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Alpena in the period 1961 to 1990. 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 19.9 degrees F and the average daily minimum temperature is 11.2 degrees. The lowest temperature on record, which occurred on February 17, 1979, is -37 degrees. In summer, the average temperature is 64.3 degrees and the average daily maximum temperature is 77.0 degrees. The highest recorded temperature, which occurred on June 19, 1995, is 103 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 (40 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 28.97 inches. Of this, about 9.36 inches, or about 32 percent, usually falls in June through August. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 3.02 inches on September 10, 1968. Thunderstorms occur on about 32 days each year, and most occur in July.

The average seasonal snowfall is about 87.0 inches. The greatest snow depth at any one time during the period of record was 37 inches, recorded on February 19, 1985. On the average, 111 days of the year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 17.3 inches, recorded on March 4, 1985.

The average relative humidity in midafternoon is about 61 percent. Humidity is higher at night, and the average at dawn is about 83 percent. The sun shines 63 percent of the time possible in summer and 37 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 9.2 miles per hour, in April.

Physiography

Alpena County is in the northeast upland division of the State. This division is covered dominantly by thick deposits of glacial drift. The major topographic divisions are level and undulating plains and rolling to hilly morainic areas. Four distinct kinds of surface features occur in Alpena County. These features are moraines, lake plains, karst plains, and flood plains.

The morainic areas are divided into dissected moraines and ground moraines. The dissected moraines were deposited by the action of glaciers and subsequently were partly eroded or dissected by meltwater and precipitation. These moraines are at the higher elevations and characteristically have steep sides and numerous valleys. The largest dissected moraine in the county is in most of the western part of Ossineke Township. The ground moraines are composed of glacial till that was deposited and shaped at the base of the glaciers. These moraines are characterized by elongated hills and ridges oriented in the direction of the movement of the glacial ice. The largest ground moraines in the county are in the eastern part of Ossineke Township and in Long Rapids Township.

The lake plains are associated with the former Great Lakes Warren, Algonquin, and Nipissing. These plains are characterized by nearly level to undulating areas separated in places by steep scarps that reflect changes in lake elevation. The largest lake plains are in the northern part of Wilson Township and the western part of Wellington Township.

The karst plains are areas that are shallow to limestone bedrock. These areas have thin layers of lacustrine deposits, glacial till, or wind-deposited material or exposed rock. The rock is partially dissolved, resulting in widened fractures and zones that are subject to collapse. The largest karst plains are in Alpena Township, north of Alpena, and in Maple Ridge Township.

The flood plains are associated with the larger rivers—Thunder Bay River and Wolf Creek. These plains are characterized by nearly level and level areas of waterborne sediment usually deposited during annual spring flooding. The largest flood plain follows the main branch of the Thunder Bay River from the center of the west side of the county to the river's outlet in Alpena.

The highest elevation in the county, 1,105 feet above mean sea level, is about a mile east of Turtle Lake. The lowest elevation, 577 feet above mean sea level, is at the shoreline of Lake Huron, which forms the eastern boundary of the county

Karst Geology

By Tyrone J. Black, Michigan Department of Natural Resources, Geological Survey Division.

The Alpena County area is well known for its karst features. The term "karst" is used for the many expressions of ground-water action upon limestone bedrock. Sinkholes, swallows, and caves are the karst features that can have a substantial impact on farming and construction. Sinkholes are of two general types—solution and collapse. Pits dissolved into bedrock by naturally occurring acids in ground water are called solution sinkholes. The solution sinkholes in Alpena County are evidenced by the swallowing of soil or water into bedrock cavities. These features are a few inches to a few feet in size and act as feeders to a deeper system or as a separate shallow karst system.

In northern Michigan, the sinkholes larger than a few feet are collapse sinks. Collapse sinks are caused by the collapse of bedrock into large cavities or caverns. Collapse may be accelerated by solution enlargement of the cavity or fractures in the roof of the collapsing cavern.

The fault trend of Presque Isle and Alpena Counties is an area of natural fissures and faults. It can be traced on the surface from Trap Lake, Mindack Lake, and Fitzgerald Lake to southern Long Lake and Devils Lake. These fractures have provided a path for ground water to enter the formation and dissolve the evaporites of the Detroit River Group. This group is a bedrock formation made up of a sequence of limestones, shales, and evaporite minerals. Evaporites include halite (salt), gypsum, and anhydrite. Once the evaporites are removed, the formation settles. Some of the settling occurs unevenly and results in local collapses. Sinkholes occur where the collapse reaches the surface.

Sinkholes allow greater potential loss of overburden, by soil piping, into the cavities. The soils settle in the cavities and caverns while water deep in the system flows underground to Lake Huron.

Collapse of the sinkholes generally occurred 1,000 to 10,000 years ago, after the last glacier retreated from the survey area. The sinkholes are a few feet to more than 2,000 feet across, commonly 50 to 400 feet across, and are 2 to 120 feet deep. They have distinct top edges, are normally circular, and have steep to vertical walls. Their vertical rock walls are revealed in areas of thin glacial drift. Only the sinkholes that have been "active" since the retreat of the glacier about 10,000 years ago have become visible at the surface. All of the major rock-quarrying operations in northern Michigan, except for those at Alpena and Rockport, have encountered drift-covered "stagnant" collapse sinkholes, indicating that the range of the sinkholes covers much of the northern tip of the Lower Peninsula.

Thick drift and rubble have created plugs over most swallows and some sinkholes. This condition prevents the active flow or erosion of rock or soil material into any voids. If there is no movement of soil or rock into the lower voids, then there is no slumping or collapse of overburden.

Karst-related subsidence features have recently caused damage in the county. Most features of this type are on soils that are moderately deep to very shallow over bedrock. The smaller features are nuisances; the larger features have caused loss of livestock or equipment damage. Farmers have used many as locations for stone piles. They have attempted to bridge some with logs and stone. The logs eventually rot out. Stone bridges delay the loss of soil.

Sinks act as funnels, focusing a greater volume of water and surface materials into the underlying rock formation. If the sinkhole has swallowed enough overburden or occurred in the right location, it may capture all or part of a stream. The water may then find its way to the bedrock without being acid-buffered by the glacial drift. Then, active chemical erosion of the limestone bedrock occurs.

Tracing or capturing contaminated water lost to the karst systems in Alpena County can be extremely difficult. A fracture or cavern system immediately confines any waterflow entering the system. These channels may zigzag along fracture patterns or filter in and out of the surrounding host rock. These paths also may join others to become larger passages. Ground water may flow in a direction completely unexpected when only surface topography is considered. The dip of an aquitard (confining layer) and points of aquifer drainage dramatically affect the flow direction. A karst system adds to this complexity.

The shallow karst system in the area from the Alpena golf course to Alpena Community College discharges its water to the Thunder Bay River near the college campus. Discharge points of the deep karst system include El Cajon Bay, off the northeast side of Middle Island, and undiscovered locations in Lake Huron, offshore of northeastern Alpena County.

Ground water emerges where surface topography cuts below the surface of the ground-water level. The water also may be drawn off into areas of lower ground water. These areas can be layers of coarse materials, or they can be open fissures and voids in the bedrock that discharge the water efficiently elsewhere.

Lakes and Streams

Alpena County has about 17 lakes and 3 major rivers. These water areas differ in size, shape, and shoreline characteristics. Bodies of water more than 40 acres in size make up about 21,824 acres of the survey area.

Among the larger lakes are Fletcher Pond and Long Lake. Small ponds and lakes are in some limestone sinkholes. Jacobs Lake, Denton Lake, and Coombs Lake occupy three sinkholes in Alpena County.

The rivers and streams in Alpena County eventually drain into Lake Huron. The largest river, the Thunder Bay River, has three large tributaries. The North Branch Thunder Bay River flows through a large lake plain and drains part of Montmorency County to the west and part of Presque Isle County to the north. Its watershed is comprised of sandy material in the higher areas and loamy and silty materials on the lake plain. A portion of this tributary flows through a karst plain. Some water is captured by fractures in the limestone. Sunken Lake, in Presque Isle, is an area where dams have been built to prevent diversion of the flow underground. The Upper South Branch Thunder Bay River runs for about 4 miles and connects Fletcher Pond to the main branch. The Lower South Branch Thunder Bay River connects Hubbard Lake in Alcona County to Lake Winyah. It drains a large ground moraine that is dominantly farmland.

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 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 and names of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

In some areas of Alpena County, the soil scientists were denied access. No information is about the soils in these areas is currently available. These areas are in map unit 380.

Survey Procedures

The general procedures followed in making this survey are described in the “National Soil Survey Handbook” and the *Soil Survey Manual* of the Natural Resources Conservation Service (USDA, 2002; Soil Survey Division Staff, 1993).

Before traversing the landscape, the soil scientists compared each map sheet to the USGS topographic map for the area and stereoscopically plotted preliminary boundaries of slopes and landforms on aerial photographs. Traverses were made on foot. Most were made at intervals of about one-eighth mile. Traverses or random observations were made at closer intervals in areas of high variability.

Soil examinations along traverses were made each one-eighth mile, or wherever obvious soil boundaries were crossed. Observations of such items as landforms, blown-down trees, vegetation, and roadbanks were made continuously without regard to spacing. Soil boundaries were determined on the basis of soil examination, observations, and photo interpretation. The soil material was examined with the aid of a hand auger or a spade to a depth of about 6 feet. The pedons described as typical were observed and studied in pits.

Samples for chemical and physical analysis were taken from the site of the typical pedon for some of the major soils in the survey area. The analyses were made by the National Soil Survey Laboratory in Lincoln, Nebraska (USDA, 1996). The results of the analyses are stored in a computerized data file at the laboratory. The results and the laboratory procedures can be obtained by request from the laboratory.

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each association on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Very Deep, Level to Undulating Soils That Are Very Poorly Drained, Somewhat Poorly Drained, and Moderately Well Drained

1. Deford-Au Gres-Croswell Association

Very deep, level to undulating, very poorly drained, somewhat poorly drained, and moderately well drained, mucky and sandy soils in areas of depressions, beaches, and bars on lake terraces

Setting

Landform: Lake terraces
Slope range: 0 to 6 percent

Composition

Extent of the association:
6 percent of the survey area
Extent of the soils in the association:
Deford soils—43 percent
Au Gres soils—22 percent
Croswell soils—20 percent
Minor soils—15 percent

Soil Properties and Qualities

Deford

Depth class: Very deep
Drainage class: Very poorly drained
Position on the landform: Depressions
Parent material: Organic and sandy lacustrine sediments
Texture of the surface layer: Muck
Slope: Level and nearly level

Au Gres

Depth class: Very deep
Drainage class: Somewhat poorly drained
Position on the landform: The slightly higher areas on beaches and bars
Parent material: Sandy lacustrine sediments
Texture of the surface layer: Sand
Slope: Level and nearly level

Croswell

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: The slightly higher areas on beaches and bars
Parent material: Sandy lacustrine sediments
Texture of the surface layer: Sand
Slope: Nearly level to undulating

Minor Soils

- Tawas and Lupton soils in level areas
- Finch soils on low beach ridges

Use and Management

Major uses: Woodland, building site development
Management concerns: Wetness, ponding, equipment limitations
Management measures on woodland: Harvesting in the driest season or in winter, when the ground is frozen, and using harvest methods that help to prevent windthrow by leaving the remaining trees properly spaced

Management measures in areas used for building site development: Drainage systems around building sites and mounding of septic tank absorption fields

2. Tacoda-Tawas Association

Very deep, level to gently undulating, somewhat poorly drained and very poorly drained, sandy and mucky soils that formed in sandy or organic material underlain by sandy or sandy and clayey material; on lake terraces

Setting

Landform: Lake terraces
Slope range: 0 to 4 percent

Composition

Extent of the association:
14 percent of the survey area
Extent of the soils in the association:
Tacoda soils—46 percent
Tawas soils—35 percent
Minor soils—19 percent

Soil Properties and Qualities

Tacoda

Depth class: Very Deep
Drainage class: Somewhat poorly drained
Position on the landform: The sides and summits of beaches and bars
Parent material: Sandy and sandy over clayey lacustrine sediments
Texture of the surface layer: Sand
Slope: Nearly level and gently undulating

Tawas

Depth class: Very Deep
Drainage class: Very poorly drained
Position on the landform: Swales
Parent material: Organic and sandy lacustrine sediments
Texture of the surface layer: Muck
Slope: Level

Minor Soils

- Udipsamments and Grayling soils on ridges
- Springport soils in depressions
- Ausable soils on flood plains
- Battlefield soils on low beach ridges

Use and Management

Major uses: Woodland, building site development
Management concerns: Wetness, ponding, equipment limitations
Management measures on woodland: Harvesting in the driest season or in winter, when the ground is frozen, and using harvest methods that help to prevent windthrow by leaving the remaining trees properly spaced
Management measures in areas used for building site development: Drainage systems around building sites and mounding of septic tank absorption fields

3. Lupton-Tawas-Cathro Association

Very deep, level and nearly level, very poorly drained, mucky soils that formed in organic material or in organic material over sandy or loamy material; on lake plains and ground moraines

Setting

Landform: Lake plains and ground moraines
Slope range: 0 to 2 percent

Composition

Extent of the association:
14 percent of the survey area
Extent of the soils in the association:
Lupton soils—40 percent
Tawas soils—35 percent
Cathro soils—17 percent
Minor soils—8 percent

Soil Properties and Qualities

Lupton

Depth class: Very deep
Drainage class: Very poorly drained
Position on the landform: Depressions
Parent material: Organic material
Texture of the surface layer: Muck
Slope: Level and nearly level

Tawas

Depth class: Very Deep
Drainage class: Very poorly drained
Position on the landform: Depressions
Parent material: Organic and sandy lacustrine sediments
Texture of the surface layer: Muck
Slope: Level and nearly level

Cathro

Depth class: Very deep
Drainage class: Very poorly drained

Position on the landform: Depressions
Parent material: Organic material and loamy glacial till or lacustrine sediments
Texture of the surface layer: Muck
Slope: Level and nearly level

Minor Soils

- Deford soils in level areas

Use and Management

Major uses: Wildlife habitat, woodland
Management concerns: Wetness, ponding
Management measures: Using harvest methods that help to prevent windthrow by leaving the remaining trees properly spaced and harvesting in winter, when the ground is frozen, which helps to prevent the damage caused by low strength

Very Deep and Deep, Level to Rolling Soils That Are Well Drained to Poorly Drained

4. Algonquin-Negwegon-Springport Association

Very deep, level to gently rolling, moderately well drained to poorly drained, silty and clayey soils on lake plains

Setting

Landform: Lake plains
Slope range: 0 to 12 percent

Composition

Extent of the association:
5 percent of the survey area
Extent of the soils in the association:
Algonquin soils—30 percent
Negwegon soils—29 percent
Springport soils—28 percent
Minor soils—13 percent

Soil Properties and Qualities

Algonquin

Depth class: Very deep
Drainage class: Somewhat poorly drained
Position on the landform: Low ridges and flats
Parent material: Clayey lacustrine sediments
Texture of the surface layer: Silt loam
Slope: Level to gently undulating

Negwegon

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: Low ridges
Parent material: Clayey lacustrine sediments
Texture of the surface layer: Silt loam
Slope: Undulating and gently rolling

Springport

Depth class: Very deep
Drainage class: Poorly drained
Position on the landform: Flats and swales
Parent material: Clayey lacustrine sediments
Texture of the surface layer: Clay loam
Slope: Level and nearly level

Minor Soils

- Hoist soils on low drumlins
- Tonkey soils in swales and depressions

Use and Management

Major uses: Cropland, pasture
Management concerns: Wetness, erosion, soil compaction
Management measures: Drainage systems, cover crops, crop residue management, and rotational grazing

5. Negwegon, Till Substratum-Ossineke-Algonquin, Till Substratum, Association

Very deep, level to gently rolling, moderately well drained and somewhat poorly drained, loamy and clayey soils on till-floored lake plains and on drumlins and ground moraines

Setting

Landform: On till-floored lake plains and on drumlins and ground moraines
Slope range: 0 to 12 percent

Composition

Extent of the association:
6 percent of the survey area
Extent of the soils in the association:
Negwegon, till substratum—35 percent
Ossineke soils—30 percent
Algonquin, till substratum—20 percent
Minor soils—15 percent

Soil Properties and Qualities

Negwegon, till substratum

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: The summits and side slopes of ridges
Parent material: Clayey lacustrine sediments over loamy glacial till
Texture of the surface layer: Silt loam
Slope: Undulating

Ossineke

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: The summits and side slopes of drumlins and ground moraines
Parent material: Loamy glacial till
Texture of the surface layer: Fine sandy loam
Slope: Level to gently rolling

Algonquin, till substratum

Depth class: Very deep
Drainage class: Somewhat poorly drained
Position on the landform: Flats between low ridges and drumlins
Parent material: Clayey lacustrine sediments over loamy glacial till
Texture of the surface layer: Silt loam
Slope: Level and nearly level

Minor Soils

- Klacking soils on narrow ridges
- Hoist and Killmaster soils in the same landscape position as the major soils

Use and Management

Major uses: Cropland, pasture
Management concerns: Wetness, erosion, soil compaction
Management measures: Drainage systems, cover crops, crop residue management, and rotational grazing

6. McGinn-Hoist-Klacking Association

Very deep and deep, level to rolling, well drained and moderately well drained, sandy and loamy soils on drumlins and ground moraines

Setting

Landform: Drumlins and ground moraines
Slope range: 0 to 18 percent

Composition

Extent of the association:
1 percent of the survey area
Extent of the soils in the association:
McGinn soils—30 percent
Hoist soils—14 percent
Klacking soils—11 percent
Minor soils—45 percent

Soil Properties and Qualities

McGinn

Depth class: Very deep
Drainage class: Well drained
Position on the landform: Knolls and ridges
Parent material: Loamy glacial till
Texture of the surface layer: Loamy sand
Slope: Level to rolling

Hoist

Depth class: Deep
Drainage class: Moderately well drained
Position on the landform: The summits and side slopes of ridges
Parent material: Dense loamy glacial till
Texture of the surface layer: Sandy loam
Slope: Level to gently rolling

Klacking

Depth class: Very deep
Drainage class: Well drained
Position on the landform: The side slopes of ridges
Parent material: Sandy glacial outwash
Texture of the surface layer: Loamy sand
Slope: Level to rolling

Minor Soils

- East Lake soils in the same landscape position as the major soils
- Killmaster soils on the level tops of ridges and on the lower side slopes
- Ensley soils in depressions

Use and Management

Major uses: Cropland, pasture, woodland
Management concerns: Erosion, equipment limitations, slope
Management measures on cropland and pasture: Cover crops, crop residue management, and rotational grazing

7. Ossineke-Slade Association

Very deep, level to gently rolling, moderately well drained and somewhat poorly drained soils on drumlins and ground moraines

Setting

Landform: Drumlins and ground moraines
Slope range: 0 to 12 percent

Composition

Extent of the association:
24 percent of the survey area
Extent of the soils in the association:
Ossineke soils—40 percent
Slade soils—35 percent
Minor soils—25 percent

Soil Properties and Qualities

Ossineke

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: The summits and side slopes of drumlins and ground moraines
Parent material: Loamy glacial till
Texture of the surface layer: Fine sandy loam
Slope: Level to gently rolling

Slade

Depth class: Very deep
Drainage class: Somewhat poorly drained
Position on the landform: Flats between drumlins and on the sides of drainageways
Parent material: Loamy glacial till
Texture of the surface layer: Loam
Slope: Level and nearly level

Minor Soils

- Morganlake soils in the same landscape position as the Ossineke soils
- Angelica and Cathro soils in swales and depressions

Use and Management

Major uses: Cropland, pasture, woodland
Management concerns: Erosion, wetness, soil compaction
Management measures on cropland and pasture:
Cover crops, crop residue management, and rotational grazing

8. Morganlake-Hoist-Iosco Association

Very deep and deep, level to gently rolling, moderately well drained and somewhat poorly drained, sandy and loamy soils that formed in loamy glacial till on ground moraines and drumlins

Setting

Landform: Ground moraines and drumlins
Slope range: 0 to 12 percent

Composition

Extent of the association:
9 percent of the survey area
Extent of the soils in the association:
Morganlake soils—44 percent
Hoist soils—20 percent
Iosco soils—16 percent
Minor soils—20 percent

Soil Properties and Qualities

Morganlake

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: The side slopes and summits of knolls and ridges
Parent material: Sandy material over loamy glacial till
Texture of the surface layer: Loamy sand
Slope: Level to gently rolling

Hoist

Depth class: Deep
Drainage class: Moderately well drained
Position on the landform: The side slopes of drumlins
Parent material: Dense loamy glacial till
Texture of the surface layer: Sandy loam
Slope: Level to gently rolling

Iosco

Depth class: Very deep
Drainage class: Somewhat poorly drained
Position on the landform: Toe slopes and the flat summits of ridges
Parent material: Sandy material over loamy glacial till
Texture of the surface layer: Loamy sand
Slope: Level and nearly level

Minor Soils

- Killmaster soils on the lower side slopes of drumlins
- Ossineke soils on side slopes

• Slade soils in the lower areas

Use and Management

Major uses: Cropland, pasture, woodland
Management concerns: Erosion, wetness, soil compaction, equipment limitations
Management measures on cropland and pasture: Cover crops, crop residue management, and rotational grazing
Management measures on woodland: Harvesting in the driest season or in winter, when the ground is frozen, and using harvest methods that help to prevent windthrow by leaving the remaining trees properly spaced

Very Deep, Level to Very Steep Soils That Are Excessively Drained, Well Drained, Moderately Well Drained, and Very Poorly Drained

9. McGinn-Klacking Association

Very deep, moderately sloping to very steep, well drained, sandy soils that formed in sandy and loamy material on dissected moraines

Setting

Landform: Dissected moraines
Slope range: 8 to 50 percent

Composition

Extent of the association:
3 percent of the survey area
Extent of the soils in the association:
McGinn soils—60 percent
Klacking soils—29 percent
Minor soils—11 percent

Soil Properties and Qualities

McGinn

Depth class: Very deep
Drainage class: Well drained
Position on the landform: Summits and shoulder slopes
Parent material: Loamy glacial till
Texture of the surface layer: Loamy sand
Slope: Moderately sloping to very steep

Klacking

Depth class: Very deep
Drainage class: Well drained
Position on the landform: Side slopes
Parent material: Sandy glaciofluvial material
Texture of the surface layer: Loamy sand
Slope: Moderately sloping to very steep

Minor Soils

• Coppler soils in the same landscape position as the major soils
• Chinwhisker and Hoist soils in the slightly lower areas

Use and Management

Major uses: Woodland
Management concerns: Erosion, equipment limitations
Management measures: Keeping the grade of logging roads low and using the less hilly soils as sites for roads and landing areas

10. Proper-Deford-Rousseau Association

Very deep, level to very steep, moderately well drained, very poorly drained, and well drained, sandy and mucky soils on dunes and lake terraces

Setting

Landform: Dunes and lake terraces
Slope range: 0 to 40 percent

Composition

Extent of the association:
3 percent of the survey area
Extent of the soils in the association:
Proper soils—27 percent
Deford soils—27 percent
Rousseau soils—27 percent
Minor soils—19 percent

Soil Properties and Qualities

Proper

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: Toeslopes of dunes and slight rises on lake terraces
Parent material: Sandy lacustrine sediments
Texture of the surface layer: Sand
Slope: Level to undulating

Deford

Depth class: Very deep
Drainage class: Very poorly drained
Position on the landform: Depressions
Parent material: Organic and sandy lacustrine sediments

Texture of the surface layer: Muck
Slope: Level and nearly level

Rousseau

Depth class: Very deep
Drainage class: Well drained
Position on the landform: The summits and steep side slopes of dunes
Parent material: Sandy eolian deposits
Texture of the surface layer: Fine sand
Slope: Hilly to very steep

Minor Soils

- Crowell soils in the same landscape position as the Proper soils
- Tawas soils in mucky depressions
- Finch soils on sand bars around depressions

Use and Management

Major uses: Woodland
Management concerns: Erosion, equipment limitations, wetness
Management measures: Keeping the grade of logging roads low, using the less hilly soils as sites for roads and landing areas, harvesting in the driest season or in winter, when the ground is frozen, and using harvest methods that help to prevent windthrow by leaving the remaining trees properly spaced on the wetter soils

11. Zimmerman-Annalake Association

Very deep, undulating to steep, excessively drained and moderately well drained, sandy soils that formed in stratified sandy and loamy material on moraines and lake plains

Setting

Landform: Moraines and lake plains
Slope range: 6 to 35 percent

Composition

Extent of the association:
1 percent of the survey area
Extent of the soils in the association:
Zimmerman soils—57 percent
Annalake soils—31 percent
Minor soils—12 percent

Soil Properties and Qualities

Zimmerman

Depth class: Very deep
Drainage class: Excessively drained
Position on the landform: The steep side slopes of ridges
Parent material: Sandy glaciofluvial material
Texture of the surface layer: Loamy fine sand
Slope: Undulating to steep

Annalake

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: The lower toe slopes of steep ridges
Parent material: Loamy glaciofluvial material
Texture of the surface layer: Loamy very fine sand
Slope: Undulating to rolling

Minor Soils

- Hoist soils on the tops of ridges
- Morganlake soils in level areas on uplands

Use and Management

Major uses: Woodland
Management concerns: Erosion, equipment limitations
Management measures: Keeping the grade of logging roads low and using the less hilly soils as sites for roads and landing areas

Very Shallow, Moderately Deep, and Very Deep, Level to Undulating Soils That Are Well Drained, Very Poorly Drained, and Excessively Drained

12. Namur-Chippeny-Alpena Association

Very shallow, moderately deep, and very deep, level to undulating, well drained, very poorly drained, and excessively drained soils that are silty or mucky in areas of limestone bedrock and are gravelly on glacial lake beach ridges

Setting

Landform: Wave-worked karst plains
Slope range: 0 to 6 percent

Composition

Extent of the association:
14 percent of the survey area
Extent of the soils in the association:
Namur and similar soils—35 percent
Chippeny and similar soils—27 percent
Alpena soils—15 percent

Minor soils—23 percent

Soil Properties and Qualities

Namur

Depth class: Very shallow
Drainage class: Well drained
Position on the landform: The slightly higher bedrock ridges
Parent material: Material weathered from limestone bedrock
Texture of the surface layer: Silt loam
Slope: Level to undulating

Chippeny

Depth class: Moderately deep
Drainage class: Very poorly drained
Position on the landform: Depressions
Parent material: Organic material overlying limestone bedrock
Texture of the surface layer: Muck
Slope: Level and nearly level

Alpena

Depth class: Very deep
Drainage class: Excessively drained
Position on the landform: Beach ridges
Parent material: Gravelly and sandy beach deposits
Texture of the surface layer: Gravelly sandy loam
Slope: Level to undulating

Minor Soils

- Lachine, Elcajon, and Potagannissing soils in the lower areas

Use and Management

Major uses: Woodland
Management concerns: Very shallow depth to bedrock, wetness
Management measures: Using harvest methods that help to prevent windthrow by leaving the remaining trees properly spaced and harvesting in winter, when the ground is frozen, in areas of the wetter soils

Detailed Soil Map Units

The map units delineated on the detailed 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. More information about each map unit is given under the heading "Use and Management of the Soils."

A map unit delineation on a 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 or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas 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 "included" areas that belong to other taxonomic classes.

Most included 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 the map unit description. Other included soils and miscellaneous areas, 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 included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas 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 included areas 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, but if intensive use of small areas is planned, 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, 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, Thunderbay very fine sandy loam, frequently flooded, is a phase of the Thunderbay 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. Proper-Deford-Rousseau complex, 0 to 40 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. Histosols and Aquents, ponded, 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, quarry, 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.

11B—Eastport sand, 0 to 6 percent slopes

Setting

Landform: Beach ridges
Shape of areas: Elongated
Size of areas: 50 to 100 acres

Typical Profile

Surface layer:
0 to 1 inch—black sand

Subsurface layer:
1 to 8 inches—grayish brown sand

Subsoil:
8 to 14 inches—strong brown sand
14 to 23 inches—yellowish brown sand
23 to 29 inches—very pale brown sand

Substratum:
29 to 80 inches—very pale brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils
- The moderately well drained Croswell soils

Similar inclusions:
- Sandy soils that are somewhat excessively drained

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Equipment limitations, seedling mortality
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.

Buildings

Major management concern: Caving of cutbanks
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concern: Poor filtering capacity
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 5S
Michigan soil management group: 5.3a

12B—Tawas-Au Gres complex, 0 to 4 percent slopes

Setting

Landform: Tawas—swales; Au Gres—ridges; both on lake plains
Shape of areas: Elongated
Size of areas: 10 to 1,000 acres

Typical Profile

Tawas

Surface layer:
0 to 3 inches—black muck

Subsoil:
3 to 26 inches—black muck
26 to 28 inches—very dark gray muck

Substratum:
28 to 80 inches—grayish brown sand

Au Gres

Organic mat:
0 to 1 inch—partially decomposed leaf litter

Surface layer:
1 to 2 inches—black sand

Subsurface layer:
2 to 10 inches—reddish gray sand

Subsoil:
10 to 14 inches—brown, mottled sand
14 to 28 inches—strong brown, mottled sand
28 to 32 inches—yellowish brown, mottled sand

Substratum:
32 to 80 inches—pale brown, mottled sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Tawas—moderately slow to moderately rapid in the mucky part, rapid in the sandy part; Au Gres—rapid
Available water capacity: Tawas—high; Au Gres—low
Drainage class: Tawas—very poorly drained; Au Gres—somewhat poorly drained
Seasonal high water table: Tawas—apparent, 1.0 foot above to 1.0 foot below the surface at some time from January to December; Au Gres—apparent, 0.5 foot to 1.5 feet below the surface at some time from October to June
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Tawas—moderate; Au Gres—severe
Shrink-swell potential: Low
Potential for frost action: Tawas—high; Au Gres—moderate

Composition

Tawas soil and similar soils: 60 to 70 percent
Au Gres soil and similar soils: 25 to 40 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Lupton soils in deep depressions between ridges

Similar inclusions:
- Soils that have organic layers less than 15 inches thick
- Sandy soils that have fine sand in the surface layer

Use and Management

Land use: Woodland

Woodland

Major management concerns: Tawas—excessive wetness, equipment limitations, windthrow hazard, plant competition, seedling mortality; Au Gres—equipment limitations, windthrow hazard, plant competition
Management considerations:
- Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
- After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.
- If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
- Trees that can withstand seasonal wetness should be selected for planting.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Tawas soil.

Buildings

Major management concerns: Au Gres—seasonal wetness, caving of cutbanks; Tawas—ponding
Management considerations:
- Because of ponding, the Tawas soil is generally unsuited to building site development.

• A surface or subsurface drainage system lowers the water table.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Au Gres—poor filtering capacity, seasonal wetness; Tawas—ponding
Management considerations:
• Because of ponding, the Tawas soil is generally unsuited to septic tank absorption fields.
• The poor filtering capacity of the Au Gres soil can result in the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: Tawas—VIw; Au Gres—IVw
Woodland ordination symbol: Tawas—5W; Au Gres—6W
Michigan soil management group: Tawas—M/4c; Au Gres—5b

13—Tawas-Lupton mucks

Setting

Landform: Low flats, depressions, and drainageways on moraines, outwash plains, and lake plains
Slope: 0 to 2 percent
Shape of areas: Irregular, linear, or oval
Size of areas: 3 to 10 acres

Typical Profile

Tawas

Surface layer:
0 to 3 inches—black muck

Subsoil:
3 to 26 inches—black muck
26 to 28 inches—very dark gray muck

Substratum:
28 to 80 inches—grayish brown sand

Lupton

Surface layer:
0 to 4 inches—black muck

Substratum:
4 to 24 inches—black muck
24 to 80 inches—very dark grayish brown muck

Soil Properties and Qualities

Depth class: Very deep
Permeability: Tawas—moderately slow to moderately rapid in the mucky part, rapid in the sandy part; Lupton—moderately slow to moderately rapid
Available water capacity: Tawas—high; Lupton—very high
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the substratum
Potential for frost action: High

Composition

Tawas soil and similar soils: 10 to 95 percent
Lupton soil and similar soils: 10 to 85 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Deford soils, which have less than 8 inches of muck on the surface; near edges of the map unit
• The somewhat poorly drained Au Gres soils on low ridges

Similar inclusions:
• Soils that have organic layers in the lower part of the substratum that are less decomposed

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can

be used only during periods in winter when skid roads and access roads are frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.

Buildings

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, these soils are generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, these soils are generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: Tawas—5W; Lupton—2W
Michigan soil management group: Tawas—M/4c; Lupton—Mc

14—Dawson-Loxley peats

Setting

Landform: Low flats and closed depressions on outwash plains and lake plains
Slope: 0 to 2 percent
Shape of areas: Irregular or oval
Size of areas: 3 to 10 acres

Typical Profile

Dawson

Surface layer:
0 to 6 inches—dark reddish brown peat

Subsoil:
6 to 16 inches—black muck
16 to 31 inches—dark reddish brown muck
31 to 34 inches—dark brown fine sand

Substratum:
34 to 80 inches—olive brown fine sand

Loxley

Surface layer:
0 to 4 inches—dark yellowish brown peat

Substratum:
4 to 76 inches—dark reddish brown muck
76 to 80 inches—black muck

Soil Properties and Qualities

Depth class: Very deep
Permeability: Dawson—moderately slow to moderately rapid in the organic material, rapid in the sandy material; Loxley—moderately slow to moderately rapid
Available water capacity: Tawas—high, Loxley—very high
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: High

Composition

Dawson soil and similar soils: 10 to 95 percent
Loxley soil and similar soils: 10 to 95 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils on low ridges
• Small areas of open water

Similar inclusions:
• Soils that have less than 16 inches of organic material

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
• These soils are generally unsuited to woodland because of extreme acidity, the low strength of the organic material, and the wetness. The tree cover is sparse, with some spruce and tamarack around the

edges of the map unit. Shrubs and mosses are the most common vegetation.

Buildings

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, these soils are generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, these soils are generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: 2W
Michigan soil management group: Mc-a

16B—Graycalm sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 1 inch—black sand

Subsurface layer:
1 to 5 inches—grayish brown sand

Subsoil:
5 to 24 inches—yellowish brown sand
24 to 80 inches—light yellowish brown sand with bands of brown loamy sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Graycalm soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Coppler soils, which have very gravelly sand in the substratum; in landscape positions similar to those of the Graycalm soil

Similar inclusions:
• Sandy soils that do not have bands of loamy sand in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—building site development, pasture

Pasture

Major management concerns: Droughtiness, soil blowing
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, seedling mortality
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.

Buildings

Major management concern: Caving of cutbanks
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concern: Poor filtering capacity
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery

planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 6S
Michigan soil management group: 5a

16C—Graycalm sand, 6 to 12 percent slopes

Setting

Landform: Outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 1 inch—black sand

Subsurface layer:
1 to 5 inches—grayish brown sand

Subsoil:
5 to 24 inches—yellowish brown sand
24 to 80 inches—light yellowish brown sand with bands of brown loamy sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Graycalm soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Coppler soils, which have very gravelly sand in the substratum; in landscape positions similar to those of the Graycalm soil

Similar inclusions:
- Sandy soils that do not have bands of loamy sand in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—building site development, pasture

Pasture

Major management concerns: Droughtiness, soil blowing
Management considerations:
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, seedling mortality
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.

Buildings

Major management concern: Caving of cutbanks
Management considerations:
- Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, slope
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.
- Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 6S
Michigan soil management group: 5a

16D—Graycalm sand, 12 to 18 percent slopes

Setting

Landform: Knolls and ridges on outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 1 inch—black sand

Subsurface layer:
1 to 5 inches—grayish brown sand

Subsoil:
5 to 24 inches—yellowish brown sand
24 to 80 inches—light yellowish brown sand with bands of brown loamy sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Graycalm soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Coppler soils, which have very gravelly sand in the substratum; in landscape positions similar to those of the Graycalm soil

Similar inclusions:
• Sandy soils that do not have bands of loamy sand in the substratum

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Equipment limitations, seedling mortality
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.

Buildings

Major management concern: Caving of cutbanks, slope
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, slope
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 6S
Michigan soil management group: 5a

16E—Graycalm sand, 18 to 35 percent slopes

Setting

Landform: Escarpments on stream terraces
Shape of areas: Elongated
Size of areas: 3 to 30 acres

Typical Profile

Surface layer:
0 to 1 inch—black sand

Subsurface layer:
1 to 5 inches—grayish brown sand

Subsoil:
5 to 24 inches—yellowish brown sand
24 to 80 inches—light yellowish brown sand with bands of brown loamy sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Graycalm soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Coppler soils, which have very gravelly sand in the substratum; in landscape positions similar to those of the Graycalm soil

Similar inclusions:
• Sandy soils that do not have bands of loamy sand in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, erosion hazard, seedling mortality
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Seeding skid roads, logging roads, and landings after the trees are logged helps to control erosion. Some areas may require mulch.
• Planting special nursery stock or containerized seedlings and planting when the soil is moist can reduce the seedling mortality rate.

Buildings

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 6S
Michigan soil management group: 5a

17A—Croswell sand, 0 to 3 percent slopes

Setting

Landform: Stream terraces and lake terraces
Shape of areas: Elongated or irregular
Size of areas: 3 to 300 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsurface layer:
2 to 3 inches—brown sand

Subsoil:
3 to 6 inches—dark brown sand
6 to 11 inches—strong brown sand
11 to 24 inches—yellowish brown sand

Substratum:
24 to 80 inches—pale brown, mottled sand

Soil Properties and Qualities

Depth class: Very deep

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Apparent, 2 to 3 feet below the surface at some time in October, November, or December or in March, April, or May
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres and Finch soils
- The very poorly drained Deford soils in depressions

Similar inclusions:
- Soils that have a surface layer of fine sand

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: A limited available water capacity, a low content of organic matter, soil blowing, seasonal droughtiness, nutrient loss
Management considerations:
- Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
- Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.
- Increasing the content of organic matter in the root zone may improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.
- Because of the need for protection of ground water, nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
- A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture and in reducing the hazard of soil blowing.
- Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.

Pasture

Major management concerns: Droughtiness, soil blowing
Management considerations:
- Proper stocking rates and short-duration grazing during the summer help to control soil blowing, maintain plant density and hardiness, and keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
- Species preference can be managed by selective cutting.
- Competing vegetation generally can be controlled by mechanical means.
- Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Caving of cutbanks, wetness
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, wetness
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.

• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 5S
Michigan soil management group: 5a

17B—Croswell sand, 0 to 6 percent slopes

Setting

Landform: Stream terraces and lake terraces
Shape of areas: Elongated or irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsurface layer:
2 to 3 inches—brown sand

Subsoil:
3 to 6 inches—dark brown sand
6 to 11 inches—strong brown sand
11 to 24 inches—yellowish brown sand

Substratum:
24 to 80 inches—pale brown, mottled sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Apparent, 2 to 3 feet below the surface at some time in October, November, or December or in March, April, or May
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres and Finch soils
• The very poorly drained Deford soils in depressions

Similar inclusions:
• Soils that have a surface layer of fine sand

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: A limited available water capacity, a low content of organic matter, soil blowing, seasonal droughtiness, nutrient loss
Management considerations:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.
• Increasing the content of organic matter in the root zone may improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.
• Because of the need for protection of ground water, nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture and in reducing the hazard of soil blowing.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.

Pasture

Major management concerns: Droughtiness, soil blowing
Management considerations:
• Proper stocking rates and short-duration grazing during the summer help to control soil blowing, maintain plant density and hardiness, and keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.

• Planting when the soil is moist can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate
• Species preference can be managed by selective cutting.
• Competing vegetation generally can be controlled by mechanical means.
• Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Caving of cutbanks, wetness
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, wetness
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 5S
Michigan soil management group: 5a

18A—Au Gres sand, 0 to 3 percent slopes

Setting

Landform: Stream terraces, lake terraces, and outwash plains
Shape of areas: Elongated or irregular
Size of areas: 3 to 200 acres

Typical Profile

Organic mat:
0 to 1 inch—partially decomposed leaf litter

Surface layer:
1 to 2 inches—black sand

Subsurface layer:
2 to 10 inches—reddish gray sand

Subsoil:
10 to 14 inches—brown, mottled sand
14 to 28 inches—strong brown, mottled sand
28 to 32 inches—yellowish brown, mottled sand

Substratum:
32 to 80 inches—pale brown, mottled sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 1.5 feet below the surface at some time from October to June
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Au Gres soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Deford soils in depressions

Similar inclusions:
• Sandy soils that are moderately well drained
• Soils that have a dark reddish brown, cemented subsoil

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: A limited available water capacity, seasonal wetness, soil blowing, nutrient loss
Management considerations:
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture and in reducing the hazard of soil blowing.
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.

• Increasing the content of organic matter in the root zone may improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.
• Subsurface drains can reduce the wetness if a suitable outlet is available.

Pasture

Major management concerns: Droughtiness, soil blowing, seasonal wetness
Management considerations:
• Proper stocking rates and short-duration grazing during the summer help to control soil blowing, maintain plant density and hardiness, and keep the pasture in good condition.
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition
Management considerations:
• Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.
• Special harvest methods may be needed to control undesirable plants.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Buildings

Major management concerns: Caving of cutbanks, seasonal wetness
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• A surface or subsurface drainage system lowers the water table.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, seasonal wetness
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 6W
Michigan soil management group: 5b

19—Leafriver muck

Setting

Landform: Depressions on lake plains and outwash plains
Slope: 0 to 1 percent
Shape of areas: Elongated or irregular
Size of areas: 5 to 10 acres

Typical Profile

Surface layer:
0 to 9 inches—black muck

Subsoil:
9 to 21 inches—brown, mottled sand

Substratum:
21 to 27 inches—grayish brown sand
27 to 80 inches—dark grayish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Moderate
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

Leafriver soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils

Similar inclusions:
- Soils that have a thicker organic surface layer
- Sandy soils that are poorly drained

Use and Management

Land use: Dominant use—woodland; other use—abandoned cropland

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, excessive wetness
Management considerations:
- Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Landing sites generally can be used only during the driest part of the year.
- Special harvest methods may be needed to control undesirable plants.
- Because of wetness, severe seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concern: Ponding
- Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 2W
Michigan soil management group: 5c

27A—Tacoda sand, 0 to 3 percent slopes

Setting

Landform: Lake terraces
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 14 inches—grayish brown sand

Subsoil:
14 to 18 inches—brown, mottled sand
18 to 27 inches—strong brown, mottled sand
27 to 36 inches—light yellowish brown, mottled sand

Substratum:
36 to 44 inches—pale brown, mottled sand
44 to 80 inches—reddish brown, mottled silty clay

Soil Properties and Qualities

Permeability: Rapid in the sandy part of the soil, very slow in the silty clay part of the substratum
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, 0.5 foot to 1.5 feet below the surface at some time from September to June
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low in the upper part of the soil, high in the silty clay part of the substratum
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
- The very poorly drained Wakeley soils in depressions

Similar inclusions:
- Soils that are moderately well drained
- Soils that have less clay in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Pasture

Major management concerns: Droughtiness, soil blowing, seasonal wetness

Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, plant competition
Management considerations:
- Skidders should not be used during wet periods, when ruts form easily.
- Landing sites generally can be used only during the driest part of the year.
- After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.

Buildings

Major management concerns: Caving of cutbanks, seasonal wetness, frost action
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, very slow permeability, seasonal wetness
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.
- Filling or mounding with suitable material helps to raise the absorption field above the water table.
- A subsurface drainage system lowers the water table.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 4W
Michigan soil management group: 4/1b

28B—East Lake sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains and lake terraces
Shape of areas: Irregular
Size of areas: 3 to 300 acres

Typical Profile

Surface layer:
0 to 1 inch—black sand

Subsurface layer:
1 to 2 inches—brown sand

Subsoil:
2 to 4 inches—dark brown sand
4 to 11 inches—brown sand
11 to 34 inches—strong brown sand

Substratum:
34 to 80 inches—brown, stratified gravelly sand and very gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid in the upper part of the soil, very rapid in the substratum
Available water capacity: Low
Drainage class: Somewhat excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

East Lake soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Battlefield soils

Similar inclusions:
- Soils that have less gravel in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Pasture

Major management concerns: Droughtiness, soil blowing
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, seedling mortality
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.

Buildings

Major management concern: Caving of cutbanks
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concern: Poor filtering capacity
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 2S
Michigan soil management group: 5a

28C—East Lake sand, 6 to 12 percent slopes

Setting

Landform: Ridges and knolls on outwash plains and lake terraces
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 1 inch—black sand

Subsurface layer:
1 to 2 inches—brown sand

Subsoil:
2 to 4 inches—dark brown sand
4 to 11 inches—brown sand
11 to 34 inches—strong brown sand

Substratum:
34 to 80 inches—brown, stratified gravelly sand and very gravelly sand

Soil Properties and Qualities

Permeability: Rapid in the upper part of the soil, very rapid in the substratum
Available water capacity: Low
Drainage class: Somewhat excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

East Lake soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Battlefield soils

Similar inclusions:
• Soils that have less gravel in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Pasture

Major management concerns: Droughtiness, soil blowing
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, seedling mortality
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist and planting special

nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.

Buildings

Major management concerns: Caving of cutbanks, slope
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concern: Poor filtering capacity
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 2S
Michigan soil management group: 5a

29A—Battlefield sand, 0 to 3 percent slopes

Setting

Landform: Lake terraces and outwash plains
Shape of areas: Elongated
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 5 inches—dark brown sand

Subsurface layer:
5 to 7 inches—brown, mottled sand

Subsoil:
7 to 11 inches—dark brown, mottled gravelly sand
11 to 15 inches—strong brown, mottled gravelly sand
15 to 23 inches—yellowish brown gravelly sand

Substratum:
23 to 80 inches—pale brown, stratified gravelly sand, gravelly coarse sand, and sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid in the sandy upper part of the soil, very rapid in the substratum
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 1.5 feet below the surface at some time from October to June
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Battlefield soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils on low knolls or ridges
• The very poorly drained Deford soils in depressions and swales

Similar inclusions:
• Soils that have a loamy layer in the subsoil

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Pasture

Major management concerns: Droughtiness, seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition
Management considerations:
• Landing sites generally can be used only during the driest part of the year.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

• Special harvest methods may be needed to control undesirable plants.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Buildings

Major management concerns: Caving of cutbanks, seasonal wetness, frost action
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, seasonal wetness
Management considerations:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 5W
Michigan soil management group: 5b

30—Wheatley muck

Setting

Landform: Depressions on lake terraces and in glacial drainageways
Slope: 0 to 1 percent
Shape of areas: Elongated or irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 5 inches—black muck

Substratum:
5 to 9 inches—gray, mottled sand
9 to 34 inches—brown, mottled sand
34 to 80 inches—greenish gray gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid in the sandy upper part of the substratum, very rapid in the gravelly sand
Available water capacity: Low
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Wheatley soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Leafriver soils, which are sandy throughout; in landscape positions similar to those of the Wheatley soil
• The somewhat poorly drained Battlefield soils on low ridges

Similar inclusions:
• Soils that have a loamy layer in the subsoil

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition
Management considerations:
• Access is easiest during periods in winter when access roads are frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Special harvest methods may be needed to control undesirable plants.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concern: Ponding

Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 2W
Michigan soil management group: 5c

31B—Klacking loamy sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 3 to 300 acres

Typical Profile

Surface layer:
0 to 4 inches—very dark gray loamy sand

Subsurface layer:
4 to 12 inches—pinkish gray loamy sand

Subsoil:
12 to 25 inches—brown loamy sand
25 to 33 inches—pale brown sand with bands of reddish brown loamy sand
33 to 64 inches—reddish brown sandy loam and light brown sand

Substratum:
64 to 80 inches—pale brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid
Available water capacity: Low
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Klacking soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained McGinn soils, which have more clay in the subsoil than the Klacking soil; on knolls
• The somewhat excessively drained Coppler soils, which have very gravelly sand in the substratum; in landscape positions similar to those of the Klacking soil

Similar inclusions:
• Soils that have thinner bands of sandy loam in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Seasonal droughtiness, soil blowing, a low content of organic matter
Management considerations:
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.

Pasture

Major management concerns: Seasonal droughtiness, soil blowing, overgrazing
Management considerations:
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concern: Seedling mortality
Management considerations:
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.

Buildings

Major management concern: Caving of cutbanks
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: None

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 6S
Michigan soil management group: 4a

31C—Klacking loamy sand, 6 to 12 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 4 inches—very dark gray loamy sand

Subsurface layer:
4 to 12 inches—pinkish gray loamy sand

Subsoil:
12 to 25 inches—brown loamy sand
25 to 33 inches—pale brown sand with bands of reddish brown loamy sand
33 to 64 inches—reddish brown sandy loam and light brown sand

Substratum:
64 to 80 inches—pale brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid
Available water capacity: Low
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Klacking soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained McGinn soils, which have more clay in the subsoil than the Klacking soil; on knolls
• The somewhat excessively drained Coppler soils, which have very gravelly sand in the substratum; in landscape positions similar to those of the Klacking soil

Similar inclusions:
• Soils that have thinner bands of sandy loam in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Seasonal droughtiness, soil blowing, a low content of organic matter
Management considerations:
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.

Pasture

Major management concerns: Seasonal droughtiness, soil blowing, overgrazing
Management considerations:
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concern: Seedling mortality
Management considerations:
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.

Buildings

Major management concern: Caving of cutbanks
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concern: Slope
Management considerations:
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 6S
Michigan soil management group: 4a

31D—Klacking loamy sand, 12 to 18 percent slopes

Setting

Landform: Outwash plains, kames, and moraines
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 4 inches—very dark gray loamy sand

Subsurface layer:
4 to 12 inches—pinkish gray loamy sand

Subsoil:
12 to 25 inches—brown loamy sand
25 to 33 inches—pale brown sand with bands of reddish brown loamy sand
33 to 64 inches—reddish brown sandy loam and light brown sand

Substratum:
64 to 80 inches—pale brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid
Available water capacity: Low
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Klacking soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained McGinn soils, which have more clay in the subsoil than the Klacking soil; on knolls
• The somewhat excessively drained Coppler soils, which have very gravelly sand in the substratum; in landscape positions similar to those of the Klacking soil

Similar inclusions:
• Soils that have thinner bands of sandy loam in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Cropland

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to cultivation.

Pasture

Major management concerns: Seasonal droughtiness, soil blowing, overgrazing
Management considerations:
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Seedling mortality, equipment limitations, erosion
Management considerations:
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.

Buildings

Major management concerns: Slope, caving of cutbanks
Management considerations:
• Because of the slope, this soil is poorly suited to building site development without extensive land shaping.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concern: Slope
Management considerations:
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 6S
Michigan soil management group: 4a

31E—Klacking loamy sand, 18 to 35 percent slopes

Setting

Landform: Kames and moraines
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 4 inches—very dark gray loamy sand

Subsurface layer:
4 to 12 inches—pinkish gray loamy sand

Subsoil:
12 to 25 inches—brown loamy sand
25 to 33 inches—pale brown sand with bands of reddish brown loamy sand
33 to 64 inches—reddish brown sandy loam and light brown sand

Substratum:
64 to 80 inches—pale brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid
Available water capacity: Low
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Klacking soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained McGinn soils, which have more clay in the subsoil than the Klacking soil; on knolls
• The somewhat excessively drained Coppler soils, which have very gravelly sand in the substratum; in landscape positions similar to those of the Klacking soil

Similar inclusions:
• Soils that have thinner bands of sandy loam in the substratum

Use and Management

Land use: Dominant use—woodland; other use—pasture

Cropland

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to cultivation.

Pasture

Major management concerns: Seasonal droughtiness, soil blowing, overgrazing
Management considerations:
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Slope, equipment limitations, erosion hazard, droughtiness
Management considerations:
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography. The grade should be kept as low as possible.
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.

Buildings

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 6S
Michigan soil management group: 4a

35—Kinross muck

Setting

Landform: Depressions on lake plains and outwash plains
Slope: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 5 inches—dark reddish brown and black muck

Subsurface layer:
5 to 9 inches—dark gray and gray, mottled fine sand

Subsoil:
9 to 13 inches—dark reddish brown, mottled fine sand
13 to 19 inches—brown, mottled fine sand
19 to 27 inches—brownish yellow, mottled fine sand

Substratum:
27 to 51 inches—pale brown, mottled fine sand
51 to 80 inches—grayish brown fine sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Kinross soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils on ridges
• The very poorly drained Loxley soils, which have thick organic layers

Similar inclusions:
• Soils with medium sand in the subsoil and substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Landing sites generally can be used only during the driest part of the year.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of wetness, severe seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 2W
Michigan soil management group: 5c-a

36B—Annalake loamy very fine sand, 0 to 6 percent slopes

Setting

Landform: Lake plains and deltas
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 4 inches—very dark grayish brown loamy very fine sand

Subsurface layer:
4 to 6 inches—brown loamy very fine sand

Subsoil:
6 to 12 inches—brown loamy very fine sand
12 to 16 inches—brown loamy fine sand
16 to 33 inches—brown loamy fine sand and reddish brown loam
33 to 42 inches—reddish brown, mottled loam and brown, mottled loamy sand

Substratum:
42 to 80 inches—light brown, stratified fine sandy loam and very fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 6.0 feet below the surface at some time in September, October, or November or in March, April, or May
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
- The excessively drained Zimmerman soils in landscape positions similar to those of the Annalake soil
- The poorly drained Tonkey soils in depressions

Similar inclusions:
- Soils that have more silt in the substratum

Use and Management

Land use: Dominant uses—woodland, pasture; other uses—cropland, building site development

Cropland

Major management concerns: Water erosion, soil blowing, seasonal wetness
Management considerations:
- Crop residue management and a cropping sequence that includes close-growing crops help to control water erosion.
- Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
- Most climatically adapted crops can be grown if an adequate drainage system is installed.
- Subsurface drainage systems should be designed so that the rate of flowing water helps to keep fine sand and silt from plugging the tile lines. Also, suitable filtering material may be needed to keep the silt and fine sand from flowing into the tile lines.

Pasture

Major management concerns: Overgrazing, seasonal wetness, seasonal droughtiness
Management considerations:
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
- Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, plant competition
Management considerations:
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Skidders should not be used during wet periods, when ruts form easily.
- Competing vegetation generally can be controlled by mechanical means.
- Special harvest methods may be needed to control undesirable plants.

Buildings

Major management concerns: Caving of cutbanks, seasonal wetness, frost action
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concern: Seasonal wetness
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3
Michigan soil management group: 3a-s

36C—Annalake loamy very fine sand, 6 to 12 percent slopes

Setting

Landform: Lake terraces and deltas
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 4 inches—very dark grayish brown loamy very fine sand

Subsurface layer:
4 to 6 inches—brown loamy very fine sand

Subsoil:
6 to 12 inches—brown loamy very fine sand
12 to 16 inches—brown loamy fine sand
16 to 33 inches—brown loamy fine sand and reddish brown loam
33 to 42 inches—reddish brown, mottled loam and brown, mottled loamy sand

Substratum:
42 to 80 inches—light brown, stratified fine sandy loam and very fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 6.0 feet below the surface at some time in September, October, or November or in March, April, or May
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The excessively drained Zimmerman soils in landscape positions similar to those of the Annalake soil
• The moderately well drained Negwegon soils in landscape positions similar to those of the Annalake soil

Similar inclusions:
• Soils that have more silt in the substratum

Use and Management

Land use: Dominant uses—woodland, pasture; other uses—cropland, building site development

Cropland

Major management concerns: Water erosion, soil blowing, seasonal wetness
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control runoff and water erosion.
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Most climatically adapted crops can be grown if an adequate drainage system is installed.
• Subsurface drainage systems should be designed so that the rate of flowing water helps to keep fine sand and silt from plugging the tile lines. Also, suitable filtering material may be needed to keep the silt and fine sand from flowing into the tile lines.

Pasture

Major management concerns: Overgrazing, seasonal wetness, seasonal droughtiness

Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, plant competition
Management considerations:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Skidders should not be used during wet periods, when ruts form easily.
• Competing vegetation generally can be controlled by mechanical means.
• Special harvest methods may be needed to control undesirable plants.

Buildings

Major management concerns: Slope, caving of cutbanks, seasonal wetness, frost action
Management considerations:
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Seasonal wetness, slope
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3
Michigan soil management group: 3a-s

37A—Richter loamy fine sand, 0 to 3 percent slopes

Setting

Landform: Lake plains and glacial drainageways
Shape of areas: Irregular
Size of areas: 3 to 30 acres

Typical Profile

Surface layer:
0 to 8 inches—black loamy fine sand

Subsurface layer:
8 to 12 inches—light gray loamy sand

Subsoil:
12 to 18 inches—brown, mottled loamy sand
18 to 26 inches—brown, mottled sandy loam and pale brown, mottled loamy sand
26 to 37 inches—stratified, mottled, brown fine sandy loam and reddish brown clay loam

Substratum:
37 to 80 inches—stratified, mottled, pinkish gray loamy sand and reddish brown silt loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 1.5 feet below the surface at some time from October to June
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

Richter soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The excessively drained Zimmerman soils in the higher areas
• The moderately well drained Hoist soils in the higher areas

Similar inclusions:
• Soils that are moderately well drained

- Soils that have more sand throughout
- Soils that have more clay throughout

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Seasonal wetness, soil blowing
Management considerations:
- Most climatically adapted crops can be grown if an adequate drainage system is installed.
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Subsurface drainage systems should be designed so that the rate of flowing water helps to keep fine sand and silt from plugging the tile lines. Also, suitable filtering material may be needed to keep the silt and fine sand from flowing into the tile lines.
- Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing.

Pasture

Major management concerns: Seasonal wetness, overgrazing
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
- Landing sites generally can be used only during the driest part of the year.
- Special site preparation, such as bedding before planting, can reduce the seedling mortality rate.
- Trees that can withstand seasonal wetness should be selected for planting.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
- Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Seasonal wetness, caving of cutbanks, frost action
Management considerations:
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concern: Seasonal wetness
Management considerations:
- Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W
Michigan soil management group: 3b-s

37B—Richter loamy fine sand, 0 to 6 percent slopes

Setting

Landform: Lake plains and glacial drainageways
Shape of areas: Irregular
Size of areas: 3 to 10 acres

Typical Profile

Surface layer:
0 to 8 inches—black loamy fine sand

Subsurface layer:
8 to 12 inches—light gray loamy sand

Subsoil:
12 to 18 inches—brown, mottled loamy sand
18 to 26 inches—brown, mottled sandy loam and pale brown, mottled loamy sand
26 to 37 inches—stratified, mottled, brown fine sandy loam and reddish brown clay loam

Substratum:
37 to 80 inches—stratified, mottled, pinkish gray loamy sand and reddish brown silt loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 1.5 feet below the surface at some time from October to June
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

Richter soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The excessively drained Zimmerman soils in the higher areas
- The moderately well drained Hoist soils in the higher areas

Similar inclusions:
- Soils that are moderately well drained
- Soils that have more sand throughout
- Soils that have more clay throughout

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Seasonal wetness, soil blowing
Management considerations:
- Most climatically adapted crops can be grown if an adequate drainage system is installed.
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Subsurface drainage systems should be designed so that the rate of flowing water helps to keep fine sand and silt from plugging the tile lines. Also, suitable filtering material may be needed to keep the silt and fine sand from flowing into the tile lines.
- Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing.

Pasture

Major management concerns: Seasonal wetness, overgrazing
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
- Landing sites generally can be used only during the driest part of the year.
- Special site preparation, such as bedding before planting, can reduce the seedling mortality rate.
- Trees that can withstand seasonal wetness should be selected for planting.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
- Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Seasonal wetness, caving of cutbanks, frost action
Management considerations:
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concern: Seasonal wetness
Management considerations:
- Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3W
Michigan soil management group: 3b-s

38—Tonkey silt loam

Setting

Landform: Depressions on lake plains outwash plains and in glacial drainageways
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 7 inches—black silt loam

Subsoil:
7 to 15 inches—greenish gray, mottled, stratified sandy loam and sand
15 to 22 inches—greenish gray, mottled, stratified silt loam and sandy loam

Substratum:
22 to 80 inches—brown, mottled, stratified silt loam, sandy loam, and sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from September to June
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: High

Composition

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

Inclusions

Contrasting inclusions:
- The very poorly drained Cathro soils, which have a thick organic surface layer
- The moderately well drained Annalake soils in the higher areas

Similar inclusions:
- Soils that are somewhat poorly drained
- Soils that have more clay throughout

Use and Management

Land use: Dominant use—woodland; other use—pasture

Pasture

Major management concerns: Seasonal wetness, overgrazing
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
- The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
- Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Access is easiest during periods in winter when access roads are frozen.
- Skidders should not be used during wet periods, when ruts form easily.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concern: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 5W
Michigan soil management group: 3c-s

41B—McGinn loamy sand, 0 to 6 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 3 inches—grayish brown loamy sand

Subsoil:
3 to 12 inches—yellowish brown loamy sand
12 to 18 inches—grayish brown loamy sand
18 to 22 inches—reddish brown loam and grayish brown loamy sand
22 to 26 inches—reddish brown loam

Substratum:
26 to 80 inches—reddish brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the sandy part of the profile, moderate in the loamy part
Available water capacity: Moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

McGinn soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Klacking soils, which contain less clay in the subsoil than the McGinn soil; in landscape positions similar to those of the McGinn soil

Similar inclusions:
• Soils that are moderately well drained
• Soils that have a surface layer of sandy loam

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Soil blowing, a low content of organic matter, nutrient loss
Management considerations:
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.
• Increasing the content of organic matter in the root zone may improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.
• Integrated pest management, such as scouting and bio-control methods, can help to prevent the leaching of pesticides.

Pasture

Major management concern: Overgrazing
Management considerations:
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: None

Buildings

Major management concerns: Caving of cutbanks, frost action
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: None

Interpretive Groups

Land capability classification: IIIs

Woodland ordination symbol: 4S
Michigan soil management group: 3a

41C—McGinn loamy sand, 6 to 12 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 3 inches—grayish brown loamy sand

Subsoil:
3 to 12 inches—yellowish brown loamy sand
12 to 18 inches—grayish brown loamy sand
18 to 22 inches—reddish brown loam and grayish brown loamy sand
22 to 26 inches—reddish brown loam

Substratum:
26 to 80 inches—reddish brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the sandy part of the profile, moderate in the loamy part
Available water capacity: Moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

McGinn soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Klacking soils, which contain less clay in the subsoil than the McGinn soil; in landscape positions similar to those of the McGinn soil

Similar inclusions:
• Soils that are moderately well drained
• Soils that have a surface layer of sandy loam

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Soil blowing, a low content of organic matter, nutrient loss
Management considerations:
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the content of organic matter.
• Conservation tillage systems, contour farming, cover crops, and sod-based rotations minimize the detachment and loss of nutrients associated with sediment, thus reducing the losses of solid-phase nitrogen and phosphorus.
• Integrated pest management, such as scouting and bio-control methods, can help to prevent the leaching of pesticides.

Pasture

Major management concern: Overgrazing
Management considerations:
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concern: Equipment limitations
Management considerations:
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Buildings

Major management concerns: Caving of cutbanks, frost action
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concern: Slope

Management considerations:
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 4S
Michigan soil management group: 3a

41D—McGinn loamy sand, 12 to 18 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 3 inches—grayish brown loamy sand

Subsoil:
3 to 12 inches—yellowish brown loamy sand
12 to 18 inches—grayish brown loamy sand
18 to 22 inches—reddish brown loam and grayish brown loamy sand
22 to 26 inches—reddish brown loam

Substratum:
26 to 80 inches—reddish brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the sandy part of the profile, moderate in the loamy part
Available water capacity: Moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

McGinn soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Klacking soils, which contain less clay in the subsoil than the McGinn soil; in landscape positions similar to those of the McGinn soil

Similar inclusions:
• Soils that are moderately well drained
• Soils that have a surface layer of sandy loam

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Soil blowing, a low content of organic matter, nutrient loss
Management considerations:
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the content of organic matter.
• Conservation tillage systems, contour farming, cover crops, and sod-based rotations minimize the detachment and loss of nutrients associated with sediment, thus reducing the losses of solid-phase nitrogen and phosphorus.
• Integrated pest management, such as scouting and bio-control methods, can help to prevent the leaching of pesticides.

Pasture

Major management concern: Overgrazing
Management considerations:
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concern: Equipment limitations
Management considerations:
• The grade of logging roads should be kept as low as possible.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Buildings

Major management concerns: Slope, caving of cutbanks, frost action
Management considerations:
• Buildings should be designed so that they conform

to the natural slope of the land. Land shaping is necessary in some areas.
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concern: Slope
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 4S
Michigan soil management group: 3a

41E—McGinn loamy sand, 18 to 35 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 3 inches—grayish brown loamy sand

Subsoil:
3 to 12 inches—yellowish brown loamy sand
12 to 18 inches—grayish brown loamy sand
18 to 22 inches—reddish brown loam and grayish brown loamy sand
22 to 26 inches—reddish brown loam

Substratum:
26 to 80 inches—reddish brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the sandy part of the profile, moderate in the loamy part
Available water capacity: Moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: High
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

McGinn soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Klacking soils which contain less clay in the subsoil than the McGinn soil; in landscape positions similar to those of the McGinn soil

Similar inclusions:
• Soils that are moderately well drained
• Soils that have a surface layer of sandy loam

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Cropland

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to cultivation.

Pasture

Major management concern: Overgrazing
Management considerations:
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concern: Equipment limitations
Management considerations:
• The grade of logging roads should be kept as low as possible.
• Skid roads and skid trails should be located in the less sloping areas between ravines.
• Ordinary crawler tractors and rubber-tired skidders cannot be operated safely on the very steep side slopes of the ravines.

Buildings

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Slope

Management considerations:
• Because of the slope, this soil is generally unsuited to building site development.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 4S
Michigan soil management group: 3a

42A—Killmaster sandy loam, 0 to 3 percent slopes

Setting

Landform: Ground moraines and drumlins
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 11 inches—very dark grayish brown sandy loam

Subsurface layer:
11 to 12 inches—grayish brown, mottled sandy loam

Subsoil:
12 to 17 inches—grayish brown and brown, mottled sandy loam
17 to 22 inches—brown, mottled sandy loam

Substratum:
22 to 80 inches—brown, dense sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part of the profile, very slow in the substratum
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, 1 to 3 feet below the surface at some time from October to May
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Hoist soils in the higher areas
• The very poorly drained Lupton soils in the lower areas

Similar inclusions:
• Soils that have a surface layer of loamy sand

Use and Management

Land use: Dominant use—pasture; other uses—woodland, cropland, building site development

Cropland

Major management concerns: Seasonal wetness, very slow permeability, a low content of organic matter, soil blowing
Management considerations:
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Because of the very slow permeability, subsurface drains should be narrowly spaced.
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.

Pasture

Major management concerns: Seasonal wetness, overgrazing
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, seasonal wetness, windthrow hazard
Management considerations:
• Skidders should not be used during wet periods, when ruts form easily.
• Landing sites generally can be used only during the driest part of the year.
• Special site preparation, such as bedding before planting, can reduce the seedling mortality rate.
• Trees that can withstand seasonal wetness should be selected for planting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

Major management concerns: Wetness, caving of cutbanks, frost action
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Wetness, very slow permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4W
Michigan soil management group: 3b

43—Wakeley mucky sand

Setting

Landform: Lake terraces
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 3 inches—black mucky sand

Substratum:
3 to 6 inches—gray sand
6 to 16 inches—brown, mottled sand
16 to 21 inches—grayish brown, mottled loamy sand
21 to 80 inches—reddish brown, mottled silty clay

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid in the sandy part of the profile, very slow in the clayey part
Available water capacity: Low
Drainage class: Very poorly drained
Seasonal high water table: Perched, 1 foot above to 1 foot below the surface at some time from September to June
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low in the upper part of the profile, high in the lower part
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Tacoda soils in the higher areas

Similar inclusions:
• Soils that have a surface layer of muck

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Pasture

Major management concerns: Seasonal wetness, overgrazing
Management considerations:
• The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
• Skidders should not be used during wet periods, when ruts form easily.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Landing sites generally can be used only during the driest part of the year.
• Because of wetness, severe seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concern: Ponding

Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 3W
Michigan soil management group: 4/1c

44B—Ossineke fine sandy loam, 0 to 6 percent slopes

Setting

Landform: Ground moraines and drumlins
Shape of areas: Irregular
Size of areas: 3 to 300 acres

Typical Profile

Surface layer:
0 to 10 inches—dark brown fine sandy loam

Subsoil:
10 to 15 inches—yellowish brown fine sandy loam
15 to 22 inches—light brown, mottled fine sandy loam and reddish brown clay loam
22 to 35 inches—reddish brown, mottled clay loam
35 to 41 inches—reddish brown, mottled loam

Substratum:
41 to 80 inches—brown fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the part of the soil that is fine sandy loam, moderately slow or slow in the underlying layers
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched, 1.5 to 3.5 feet below the surface at some time in October or November or in March, April, or May
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the part of the soil that is fine sandy loam, moderate in the part that is clay loam
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Slade soils in drainageways and in the lower areas

Similar inclusions:
• Soils that have a surface layer of sandy loam
• Soils that have thin layers of loamy sand in the substratum

Use and Management

Land use: Dominant uses—cropland, woodland; other uses—pasture, building site development

Cropland

Major management concerns: Water erosion, seasonal wetness, soil blowing, soil compaction
Management considerations:
• Crop rotations that include grasses or legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, seasonal wetness, plant competition, windthrow hazard
Management considerations:
• Because of low strength, suitable surfacing material is needed on year-round logging roads and landings.

• Culverts are needed to maintain the natural drainage system.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Species preference can be managed by selective cutting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

Major management concerns: Seasonal wetness, a moderate shrink-swell potential, a moderate potential for frost action
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.

Septic tank absorption fields

Major management concerns: Restricted permeability, seasonal wetness
Management considerations:
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 4
Michigan soil management group: 3a

44C—Ossineke fine sandy loam, 6 to 12 percent slopes

Setting

Landform: Ground moraines and drumlins
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 10 inches—dark brown fine sandy loam

Subsoil:
10 to 15 inches—yellowish brown fine sandy loam
15 to 22 inches—light brown, mottled fine sandy loam and reddish brown clay loam
22 to 35 inches—reddish brown, mottled clay loam
35 to 41 inches—reddish brown, mottled loam

Substratum:
41 to 80 inches—brown fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the part of the soil that is fine sandy loam, moderately slow or slow in the underlying layers
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched, 1.5 to 3.5 feet below the surface at some time in October or November or in March, April, or May
Surface runoff rate: High
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the part of the soil that is fine sandy loam, moderate in the part that is clay loam
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Slade soils in drainageways and in the lower areas

Similar inclusions:
• Soils that have a surface layer of sandy loam
• Soils that have thin layers of loamy sand in the substratum

Use and Management

Land use: Dominant uses—cropland, woodland; other uses—pasture, building site development

Cropland

Major management concerns: Water erosion, seasonal wetness, soil blowing, soil compaction
Management considerations:
• Crop rotations that include grasses or legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Conservation tillage, crop residue management,

windbreaks, and cover crops help to control soil blowing.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, seasonal wetness, plant competition, windthrow hazard
Management considerations:
• Because of low strength, suitable surfacing material is needed on year-round logging roads and landings.
• Culverts are needed to maintain the natural drainage system.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Species preference can be managed by selective cutting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

Major management concerns: Seasonal wetness, slope, a moderate shrink-swell potential, a moderate potential for frost action
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.

Septic tank absorption fields

Major management concerns: Slope, restricted permeability, seasonal wetness
Management considerations:
• Land shaping and installing the distribution lines on the contour help to overcome the slope.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 4
Michigan soil management group: 3a

45B—Hoist sandy loam, 0 to 6 percent slopes

Setting

Landform: Ground moraines and drumlins
Shape of areas: Irregular
Size of areas: 3 to 300 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown sandy loam

Subsurface layer:
9 to 10 inches—gray sandy loam

Subsoil:
10 to 15 inches—brown sandy loam
15 to 21 inches—grayish brown and brown sandy loam
21 to 28 inches—brown, mottled loam
28 to 47 inches—light brown sandy loam

Substratum:
47 to 80 inches—light brown, dense sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part of the subsoil, moderately slow in the lower part of the subsoil, very slow in the substratum
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.5 feet below the surface at some time in October or November or in March, April, or May
Surface runoff rate: Medium
Flooding: None

Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Killmaster soils in the lower areas
- The very poorly drained Lupton soils in depressions

Similar inclusions:
- Soils that have a surface layer of loam

Use and Management

Land use: Dominant uses—woodland, cropland; other uses—pasture, building site development

Cropland

Major management concerns: Water erosion, soil blowing, seasonal wetness
Management considerations:
- A system of conservation tillage that leaves crop residue on the surface helps to control water erosion, helps to prevent crusting during periods of heavy rainfall, and increases the rate of water infiltration.
- Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
- Subsurface drains can reduce the wetness if a suitable outlet is available.

Pasture

Major management concerns: Overgrazing, seasonal wetness
Management considerations:
- Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, plant competition
Management considerations:
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Skidders should not be used during wet periods, when ruts form easily.
- After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.
- Special harvest methods may be needed to control undesirable plants.

Buildings

Major management concerns: Caving of cutbanks, seasonal wetness, frost action
Management considerations:
- Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
- Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Seasonal wetness, very slow permeability
Management considerations:
- Filling or mounding with suitable material helps to raise the absorption field above the water table.
- Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3
Michigan soil management group: 3a-d

45C—Hoist sandy loam, 6 to 12 percent slopes

Setting

Landform: Ground moraines and drumlins
Shape of areas: Irregular
Size of areas: 3 to 150 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown sandy loam

Subsurface layer:
9 to 10 inches—gray sandy loam

Subsoil:
10 to 15 inches—brown sandy loam
15 to 21 inches—grayish brown and brown sandy loam

21 to 28 inches—brown, mottled loam
28 to 47 inches—light brown sandy loam

Substratum:
47 to 80 inches—light brown, dense sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part of the subsoil, moderately slow in the lower part of the subsoil, very slow in the substratum
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.5 feet below the surface at some time in October or November or in March, April, or May
Surface runoff rate: High
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Killmaster soils in the lower areas
• The poorly drained Ensley soils in the lower areas

Similar inclusions:
• Soils that have a surface layer of loam

Use and Management

Land use: Dominant uses—woodland, cropland; other uses—pasture, building site development

Cropland

Major management concerns: Water erosion, soil blowing, seasonal wetness
Management considerations:
• A system of conservation tillage that leaves crop residue on the surface helps to control water erosion, helps to prevent crusting during periods of heavy rainfall, and increases the rate of water infiltration.
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Subsurface drains can reduce the wetness if a suitable outlet is available.

Pasture

Major management concerns: Overgrazing, seasonal wetness
Management considerations:
• Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, plant competition
Management considerations:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Skidders should not be used during wet periods, when ruts form easily.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.
• Special harvest methods may be needed to control undesirable plants.

Buildings

Major management concerns: Caving of cutbanks, seasonal wetness, frost action
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Seasonal wetness, very slow permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3
Michigan soil management group: 3a-d

46—Ensley mucky sandy loam

Setting

Landform: Depressions on ground moraines
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 80 acres

Typical Profile

Surface layer:
0 to 8 inches—black mucky sandy loam

Subsoil:
8 to 15 inches—grayish brown, mottled sandy loam
15 to 29 inches—light reddish brown, mottled sandy loam

Substratum:
29 to 42 inches—pinkish gray, mottled sandy loam
42 to 80 inches—gray sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from September to June
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

Ensley soil and similar soils: 95 to 98 percent
Contrasting inclusions: 2 to 5 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Leafriver soils, which have a sandy profile; in landscape positions similar to those of the Ensley soil

Similar inclusions:
- Soils that have a surface layer of muck

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Landing sites generally can be used only during the driest part of the year.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Special harvest methods may be needed to control undesirable plants.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concern: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 3W
Michigan soil management group: 3c

47D—Graycalm sand, 6 to 18 percent slopes

Setting

Landform: Knolls and ridges on outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 3 to 10 acres

Typical Profile

Surface layer:
0 to 1 inch—black sand

Subsurface layer:
1 to 5 inches—grayish brown sand

Subsoil:
5 to 24 inches—yellowish brown sand
24 to 80 inches—light yellowish brown sand with bands of brown loamy sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Graycalm soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Coppler soils, which have very gravelly sand in the substratum; in landscape positions similar to those of the Graycalm soil

Similar inclusions:
• Sandy soils that do not have bands of loamy sand in the substratum

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Equipment limitations, seedling mortality
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.

Buildings

Major management concerns: Caving of cutbanks, slope
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, slope
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 6S
Michigan soil management group: 5a

53B—Negwegon silt loam, 2 to 6 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 3 to 150 acres

Typical Profile

Surface layer:
0 to 9 inches—brown silt loam

Subsurface layer:
9 to 12 inches—brown silt loam

Subsoil:
12 to 14 inches—reddish brown silty clay and brown silt loam
14 to 21 inches—reddish brown, mottled silty clay
21 to 51 inches—reddish brown silty clay

Substratum:
51 to 80 inches—reddish brown silty clay loam stratified with brown silt loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Very slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.5 feet below the surface at some time in October or November or in March, April, or May
Surface runoff rate: Very high

Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Springport soils in depressions and drainageways

Similar inclusions:
• Soils that are somewhat poorly drained

Use and Management

Land use: Dominant uses—cropland, pasture; other uses—woodland, building site development

Cropland

Major management concerns: Erosion hazard, seasonal wetness, tilth of the surface layer, soil compaction, nutrient loss
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations that include grasses and legumes, grade-stabilization structures, or a combination of these.
• Growing grasses and legumes for pasture or hay is effective in controlling erosion.
• Most climatically adapted crops can be grown if an adequate drainage system is installed.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.
• Including grasses and legumes in the crop rotation can reduce nutrient losses, improve soil structure, and provide nitrogen for use by succeeding crops.

Pasture

Major management concerns: Erosion hazard, seasonal wetness, compaction
Management considerations:
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition
Management considerations:
• Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Special harvest methods may be needed to control undesirable plants.
• Exposing the soil just prior to the production of a seed crop, or prior to artificial seeding, can help desirable tree seedlings to become established quickly and to compete better with undesirable vegetation.
• Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Shrink-swell potential, seasonal wetness, frost action
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling and by frost action.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Very slow permeability, seasonal wetness
Management considerations:
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIIe

Woodland ordination symbol: 3C
Michigan soil management group: 1.5a

53C—Negwegon silt loam, 6 to 12 percent slopes

Setting

Landform: Ridges and knolls on lake plains
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 9 inches—brown silt loam

Subsurface layer:
9 to 12 inches—brown silt loam

Subsoil:
12 to 14 inches—reddish brown silty clay and brown silt loam
14 to 21 inches—reddish brown, mottled silty clay
21 to 51 inches—reddish brown silty clay

Substratum:
51 to 80 inches—reddish brown silty clay loam stratified with brown silt loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Very slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.5 feet below the surface at some time in October or November or in March, April, or May
Surface runoff rate: Very high
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Springport soils in depressions and drainageways

Similar inclusions:
• Soils that are somewhat poorly drained

Use and Management

Land use: Dominant uses—cropland, pasture; other uses—woodland, building site development

Cropland

Major management concerns: Erosion hazard, seasonal wetness, tilth of the surface layer, soil compaction, nutrient loss
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations that include grasses and legumes, grade-stabilization structures, or a combination of these.
• Growing grasses and legumes for pasture or hay is effective in controlling erosion.
• Most climatically adapted crops can be grown if an adequate drainage system is installed.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.
• Including grasses and legumes in the crop rotation can reduce nutrient losses, improve soil structure, and provide nitrogen for use by succeeding crops.

Pasture

Major management concerns: Erosion hazard, seasonal wetness, compaction
Management considerations:
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition
Management considerations:
• Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced

and by such harvest methods as selective cutting and strip cutting.
• Special harvest methods may be needed to control undesirable plants.
• Exposing the soil just prior to the production of a seed crop, or prior to artificial seeding, can help desirable tree seedlings to become established quickly and to compete better with undesirable vegetation.
• Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Shrink-swell potential, seasonal wetness, frost action, slope
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Very slow permeability, seasonal wetness, slope
Management considerations:
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3C
Michigan soil management group: 1.5a

54A—Algonquin silt loam, 0 to 3 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark gray silt loam

Subsurface layer:
5 to 7 inches—brown silt loam

Subsoil:
7 to 13 inches—reddish brown, mottled clay
13 to 19 inches—reddish brown, mottled silty clay loam
19 to 55 inches—light reddish brown, mottled, stratified silty clay loam and loam

Substratum:
55 to 80 inches—light reddish brown, mottled, stratified silty clay loam and loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Very slow
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, 0.5 foot to 1.5 feet below the surface at some time from October to May
Surface runoff rate: High
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Negwegon soils in the higher areas
• The moderately well drained Annalake soils in the higher areas

Similar inclusions:
• Soils that have a thin surface layer of sandy loam

Use and Management

Land use: Dominant uses—cropland, pasture; other uses—woodland, building site development

Cropland

Major management concerns: Seasonal wetness, very slow permeability, soil compaction, tilth of the surface layer

Management considerations:
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Because of the very slow permeability, subsurface drains should be narrowly spaced.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.

Pasture

Major management concerns: Compaction, seasonal wetness
Management considerations:
- Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seedling mortality
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
- Skidders should not be used during wet periods, when ruts form easily.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Trees that can withstand seasonal wetness should be selected for planting.
- If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
- Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Shrink-swell potential, seasonal wetness, frost action
Management considerations:
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- A surface or subsurface drainage system lowers the water table.

Septic tank absorption fields

Major management concerns: Seasonal wetness, very slow permeability
Management considerations:
- Filling or mounding with suitable material helps to raise the absorption field above the water table.
- A subsurface drainage system lowers the water table.
- Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
- Increasing the size of the absorption area helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 6W
Michigan soil management group: 1.5b

55—Springport clay loam, drained

Setting

Landform: Depressions on lake plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 150 acres

Typical Profile

Surface layer:
0 to 9 inches—black, mottled clay loam

Subsoil:
9 to 16 inches—greenish gray, mottled silty clay loam
16 to 23 inches—reddish brown, mottled silty clay

Substratum:
23 to 80 inches—reddish brown, mottled silty clay

Soil Properties and Qualities

Depth class: Very deep

Permeability: Very slow
Available water capacity: High
Drainage class: Poorly drained
Seasonal high water table: Perched, 1.0 foot above to 1.5 feet below the surface at some time from September to May
Surface runoff rate: High
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Negwegon soils in the higher areas
• The somewhat poorly drained Algonquin soils in the slightly higher areas

Similar inclusions:
• Soils that have a mucky surface layer

Use and Management

Land use: Dominant uses—woodland, pasture; other uses—cropland, building site development

Cropland

Major management concerns: Seasonal wetness, tilth of the surface layer, soil compaction, very slow permeability, ponding
Management considerations:
• Excess water can be removed by open ditches, subsurface drains, pumps, or a combination of these.
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Shallow surface ditches help to remove surface water after heavy rains.
• Because of the very slow permeability, subsurface drains should be narrowly spaced.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
• Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 6W
Michigan soil management group: 1.5c

57B—Kawkawlin loam, 1 to 4 percent slopes

Setting

Landform: Till plains
Shape of areas: Irregular

Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark grayish brown loam

Subsoil:
10 to 13 inches—brown, mottled clay loam and brown, mottled loam
13 to 16 inches—strong brown, mottled clay loam
16 to 30 inches—strong brown, mottled loam

Substratum:
30 to 80 inches—reddish brown, mottled clay loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Slow
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, 1.0 to 1.5 feet below the surface at some time from October to May
Surface runoff rate: High
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Composition

Kawkawlin soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
- The poorly drained Tonkey soils in depressions

Similar inclusions:
- Soils that have a surface layer of loamy sand

Use and Management

Land use: Dominant use—cropland; other uses—woodland, pasture, building site development

Cropland

Major management concerns: Erosion hazard, seasonal wetness, tilth of the surface layer, nutrient loss
Management considerations:
- Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control runoff and water erosion.
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Shallow surface ditches help to remove surface water after heavy rains.
- Conservation tillage systems, contour farming, cover crops, and sod-based rotations minimize the detachment and loss of nutrients associated with sediment, thus reducing the losses of solid-phase nitrogen and phosphorus.

Pasture

Major management concerns: Seasonal wetness, overgrazing, compaction
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition
Management considerations:
- Landing sites generally can be used only during the driest part of the year.
- Skidders should not be used during wet periods, when ruts form easily.
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Competing vegetation generally can be controlled by mechanical means.
- Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Seasonal wetness, frost action
Management considerations:
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Seasonal wetness, slow permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3W
Michigan soil management group: 1.5b

59B—Algonquin-Springport complex, 0 to 6 percent slopes

Setting

Landform: Algonquin—low knolls; Springport—depressions; both on lake plains
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Typical Profile

Algonquin

Surface layer:
0 to 5 inches—very dark gray silt loam

Subsurface layer:
5 to 7 inches—brown silt loam

Subsoil:
7 to 13 inches—reddish brown, mottled clay
13 to 19 inches—reddish brown, mottled silty clay loam
19 to 55 inches—light reddish brown, mottled, stratified silty clay loam and loam

Substratum:
55 to 80 inches—light reddish brown, mottled, stratified silty clay loam and loam

Springport

Surface layer:
0 to 9 inches—black, mottled silty clay loam

Subsoil:
9 to 16 inches—greenish gray, mottled silty clay loam
16 to 23 inches—reddish brown, mottled silty clay

Substratum:
23 to 80 inches—reddish brown, mottled silty clay

Soil Properties and Qualities

Depth class: Very deep
Permeability: Very slow
Available water capacity: High
Drainage class: Algonquin—somewhat poorly drained; Springport—poorly drained
Depth to a seasonal high water table: Algonquin—perched, 0.5 foot to 1.5 feet below the surface at some time from October to May; Springport—perched, 1.0 foot above to 1.5 feet below the surface at some time from September to May
Surface runoff rate: High
Flooding: None
Hazard of water erosion: Algonquin—moderate; Springport—slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Algonquin soil and similar soils: 60 to 70 percent
Springport soil and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Tacoda soils, which have a sandy surface soil and subsoil; in landscape positions similar to those of the Algonquin soil
• The very poorly drained Wakeley soils, which are sandy in the surface layer and in the upper part of the substratum; in landscape positions similar to those of the Springport soil

Similar inclusions:
• Soils that have a mucky surface layer; in depressions

Use and Management

Land use: Dominant uses—woodland, pasture; other uses—cropland, building site development

Cropland

Major management concerns: Both soils—seasonal wetness, tilth of the surface layer; Algonquin—erosion hazard; Springport—ponding
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control runoff and water erosion.
• Both surface and subsurface drainage systems are needed to reduce the wetness.

• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Shallow surface ditches help to remove surface water after heavy rains.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.
• The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.

Buildings

Major management concerns: Algonquin—shrink-swell potential, seasonal wetness, frost action; Springport—ponding
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.
• Because of ponding, the Springport soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Algonquin—seasonal wetness, very slow permeability; Springport—ponding
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Because of ponding, the Springport soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Algonquin—IIIe; Springport—Vw
Woodland ordination symbol: 6W
Michigan soil management group: Algonquin—1.5b; Springport—1.5c

62A—Allendale loamy sand, 0 to 3 percent slopes

Setting

Landform: Lake terraces
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 11 inches—very dark grayish brown loamy sand

Subsurface layer:
11 to 13 inches—pale brown, mottled sand

Subsoil:
13 to 20 inches—brown, mottled sand
20 to 22 inches—yellowish brown, mottled sand
22 to 25 inches—reddish brown, mottled sandy loam
25 to 44 inches—reddish brown, mottled silty clay

Substratum:
44 to 80 inches—reddish brown, mottled silty clay

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid in the sandy part of the profile, very slow in the clayey part

Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, 0.5 foot to 2.5 feet below the surface at some time from September to May
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the sandy part of the profile, high in the clayey part
Potential for frost action: Moderate

Composition

Allendale soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Algonquin soils, which contain more clay in the surface layer and subsoil than the Allendale soil; in landscape positions similar to those of the Allendale soil
• The very poorly drained Wakeley soils in drainageways

Similar inclusions:
• Soils that have a silty or loamy substratum

Use and Management

Land use: Dominant uses—woodland, cropland; other uses—pasture, building site development

Cropland

Major management concerns: Seasonal wetness, soil blowing, nutrient loss, a low content of organic matter
Management considerations:
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Because of the need for protection of ground water, nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
• Inclusion of green manure crops in the cropping sequence, no-till planting, and crop residue management increase the content of organic matter.

Pasture

Major management concerns: Overgrazing, seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition
Management considerations:
• Landing sites generally can be used only during the driest part of the year.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Special harvest methods may be needed to control undesirable plants.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Trees that can withstand seasonal wetness should be selected for planting.

Buildings

Major management concerns: Seasonal wetness, shrink-swell potential, caving of cutbanks, frost action
Management considerations:
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Seasonal wetness, very slow permeability, poor filtering capacity
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 4W
Michigan soil management group: 4/1b

63D—Bamfield fine sandy loam, 12 to 18 percent slopes

Setting

Landform: Ridges and knolls on ground moraines and disintegration moraines
Shape of areas: Irregular
Size of areas: 3 to 75 acres

Typical Profile

Surface layer:
0 to 6 inches—black fine sandy loam

Subsurface layer:
6 to 8 inches—gray fine sandy loam

Subsoil:
8 to 11 inches—dark yellowish brown fine sandy loam
11 to 14 inches—brown loamy fine sand and reddish brown clay loam
14 to 42 inches—reddish brown clay loam

Substratum:
42 to 80 inches—reddish brown loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part of the profile, moderately slow to very slow in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: High
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Ossineke soils in the less sloping areas
• The very poorly drained Lupton soils in closed depressions

Similar inclusions:
• Soils that have a surface layer of loam

Use and Management

Land use: Dominant use—woodland; other uses—pasture, cropland

Cropland

Major management concerns: Water erosion, soil compaction, soil blowing
Management considerations:
• Grassed waterways, water- and sediment-control basins, diversions, and grade-stabilization structures help to prevent gully erosion.
• Growing grasses and legumes for pasture or hay is effective in controlling erosion.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.

Pasture

Major management concern: Compaction
Management considerations:
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, plant competition
Management considerations:
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.
• Special harvest methods may be needed to control undesirable plants.

Buildings

Major management concerns: Slope, shrink-swell potential, frost action

Management considerations:
• Land shaping may be necessary to develop a suitable building site.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Slope, very slow permeability
Management considerations:
• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.
• Increasing the size of the absorption area and backfilling the trenches with porous material help to compensate for the very slow permeability.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3R
Michigan soil management group: 3/2a

63E—Bamfield fine sandy loam, 18 to 35 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 6 inches—black fine sandy loam

Subsurface layer:
6 to 8 inches—gray fine sandy loam

Subsoil:
8 to 11 inches—dark yellowish brown fine sandy loam
11 to 14 inches—brown loamy fine sand and reddish brown clay loam
14 to 42 inches—reddish brown clay loam

Substratum:
42 to 80 inches—reddish brown loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part of the profile, moderately slow to very slow in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Very high
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Ossineke soils in the less sloping areas

Similar inclusions:
• Soils that have a surface layer of loam

Use and Management

Land use: Dominant use—woodland; other use—pasture

Cropland

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to cultivation.

Pasture

Major management concern: Compaction
Management considerations:
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, plant competition
Management considerations:
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography. The grade should be kept as low as possible.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because of the erosion hazard, water should be

removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Areas that are sensitive to erosion and droughty conditions may require mulch, such as straw, bark, or wood chips.
• Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is poorly suited to building site development without extensive land shaping.

Septic tank absorption fields

Major management concerns: Slope, very slow permeability
Management considerations:
• Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 3/2a

68—Rondeau muck

Setting

Landform: Depressions on lake plains
Slope: 0 to 2 percent slopes
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 10 inches—black muck

Subsoil:
10 to 27 inches—black muck

Substratum:
27 to 80 inches—light gray marl

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately slow to moderately rapid in the muck, slow in the marl
Available water capacity: Very high
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Potential for frost action: High

Composition

Rondeau soil and similar soils: 100 percent

Similar Inclusions

• Soils that have a mucky surface layer less than 16 inches thick

Use and Management

Land use: Wetland wildlife habitat

Buildings

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: None assigned
Michigan soil management group: M/mc

69—Loxley peat

Setting

Landform: Closed depressions on lake plains and outwash plains
Slope: 0 to 2 percent slopes
Shape of areas: Oval
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 4 inches—dark yellowish brown peat

Substratum:
4 to 76 inches—dark reddish brown muck
76 to 80 inches—black muck

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately slow to moderately rapid
Available water capacity: Very high
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Potential for frost action: High

Composition

Loxley soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Kinross soils, which have a thin organic surface layer

Similar inclusions:
• Soils that have a sandy substratum

Use and Management

Land use: Dominant uses—woodland, wetland wildlife habitat

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.

Buildings

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: 2W
Michigan soil management group: Mc-a

70—Lupton muck

Setting

Landform: Depressions on lake plains, outwash plains, and moraines
Slope: 0 to 2 percent
Shape of areas: Irregular or oval
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 4 inches—black muck

Substratum:
4 to 24 inches—black muck
24 to 80 inches—very dark grayish brown muck

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately slow to moderately rapid
Available water capacity: Very high
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Potential for frost action: High

Composition

Lupton soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Deford soils, which have less than 8 inches of muck on the surface; near the edges of the map unit

Similar inclusions:
• Soils that have organic layers in the lower part of the substratum that are less decomposed

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.

Buildings

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 2W
Michigan soil management group: Mc

71—Tawas muck

Setting

Landform: Depressions on lake plains
Slope: 0 to 2 percent
Shape of areas: Irregular or elongated
Size of areas: 3 to 300 acres

Typical Profile

Surface layer:
0 to 3 inches—black muck

Subsoil:
3 to 26 inches—black muck
26 to 28 inches—very dark gray muck

Substratum:
28 to 80 inches—grayish brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately slow to moderately rapid in the muck, rapid in the underlying sand
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the substratum
Potential for frost action: High

Composition

Tawas soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Deford soils, which have less than 8 inches of muck on the surface; near the edges of the map unit
• The somewhat poorly drained Au Gres soils on low ridges

Similar inclusions:
• Soils that have thin layers of sand in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• After the trees are cut, competition from brush can

delay or prevent natural regeneration of desired species.
• Because of wetness, severe seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 5W
Michigan soil management group: M/4c

72—Dorval muck

Setting

Landform: Depressions on lake plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Surface layer:
0 to 6 inches—black muck

Subsoil:
6 to 27 inches—black muck

Substratum:
27 to 60 inches—brown, mottled silty clay

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately slow to moderately rapid in the muck, very slow in the underlying silty clay
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Perched, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: High in the substratum
Potential for frost action: High

Composition

Dorval soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Algonquin soils in the higher areas
• The very poorly drained Lupton soils, which have more than 51 inches of muck

Similar inclusions:
• Soils that have a thin layer of sand above the clayey substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition
Management considerations:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw

Woodland ordination symbol: 2W
Michigan soil management group: M/1c

74C2—Negwegon silty clay loam, 6 to 12 percent slopes, eroded

Setting

Landform: Ridges and knolls on lake plains
Distinctive landscape feature: Eroded surface
Shape of areas: Irregular
Size of areas: 3 to 15 acres

Typical Profile

Surface layer:
0 to 9 inches—brown silty clay loam

Subsoil:
9 to 15 inches—reddish brown silty clay
15 to 21 inches—reddish brown, mottled silty clay
21 to 51 inches—reddish brown silty clay

Substratum:
51 to 80 inches—reddish brown silty clay loam stratified with brown silt loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Very slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.5 feet below the surface at some time in October or November or in March, April, or May
Surface runoff rate: Very high
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Algonquin soils in the lower areas

Similar inclusions:
- Soils that are well drained
- Soils that have a darker surface layer

Use and Management

Land use: Dominant uses—cropland, pasture; other uses—woodland, building site development

Cropland

Major management concerns: Erosion hazard, seasonal wetness, tilth of the surface layer, soil compaction, nutrient loss
Management considerations:
- Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
- Growing grasses and legumes for pasture or hay is effective in controlling erosion.
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Because of the very slow permeability, subsurface drains should be narrowly spaced.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.
- Conservation tillage systems, contour farming, cover crops, and sod-based rotations minimize the detachment and loss of nutrients associated with sediment, thus reducing the losses of solid-phase nitrogen and phosphorus.

Pasture

Major management concerns: Erosion hazard, seasonal wetness, compaction
Management considerations:
- Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
- Proper stocking rates and short-duration grazing during the summer help to control soil blowing and water erosion, maintain plant density and hardiness, and keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition
Management considerations:
- Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

• Species preference can be managed by selective cutting.
• Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Shrink-swell potential, seasonal wetness
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Very slow permeability, seasonal wetness
Management considerations:
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3
Michigan soil management group: 1.5a

75B—Rubicon sand, 0 to 6 percent slopes

Setting

Landform: Flats or low knolls on outwash plains and lake terraces
Shape of areas: Irregular
Size of areas: 3 to 500 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsurface layer:
2 to 4 inches—grayish brown sand

Subsoil:
4 to 11 inches—brown sand
11 to 15 inches—strong brown sand
15 to 43 inches—yellowish brown sand

Substratum:
43 to 80 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils in landscape positions similar to or slightly lower than those of the Rubicon soil

Similar inclusions:
• Soils that have a lighter colored substratum
• Soils thst have a darker subsoil
• Soils that have thin bands of loamy sand in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Woodland

Major management concerns: Equipment limitations, seedling mortality
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.

Pasture

Major management concerns: Seasonal droughtiness, overgrazing
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results

of soil tests helps to ensure the maximum growth of plants, especially legumes.

Buildings

Major management concern: Caving of cutbanks
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concern: Poor filtering capacity
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low uniform application rates minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.3a

75D—Rubicon sand, 6 to 18 percent slopes

Setting

Landform: Knolls and low ridges on lake terraces and outwash planes
Shape of areas: Irregular or linear
Size of areas: 3 to 25 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsurface layer:
2 to 4 inches—grayish brown sand

Subsoil:
4 to 11 inches—brown sand
11 to 15 inches—strong brown sand
15 to 43 inches—yellowish brown sand

Substratum:
43 to 80 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils in shallow depressions

Similar inclusions:
• Soils that have a lighter colored substratum
• Soils that have a darker subsoil
• Soils that have thin bands of loamy sand in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Woodland

Major management concerns: Equipment limitations, seedling mortality
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.

Pasture

Major management concerns: Seasonal droughtiness, overgrazing
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Buildings

Major management concerns: Caving of cutbanks, slope
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings should be designed so that they conform

to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, slope
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low uniform application rates minimize the risk of ground-water pollution.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.3a

75E—Rubicon sand, 18 to 35 percent slopes

Setting

Landform: Ridges on lake terraces and outwash plains
Shape of areas: Irregular or linear
Size of areas: 3 to 25 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsurface layer:
2 to 4 inches—grayish brown sand

Subsoil:
4 to 11 inches—brown sand
11 to 15 inches—strong brown sand
15 to 43 inches—yellowish brown sand

Substratum:
43 to 80 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils in shallow depressions

Similar inclusions:
• Soils that have a lighter colored substratum
• Soils that have a darker subsoil
• Soils that have thin bands of loamy sand in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Woodland

Major management concerns: Erosion hazard, equipment limitations, seedling mortality
Management considerations:
• The risk of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes and logging roads should be stabilized.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.

Buildings

Major management concerns: Caving of cutbanks, slope
Management considerations:
• Because of the slope, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R

Michigan soil management group: 5.3a

77—Rollaway muck, frequently flooded

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 60 to 200 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark gray muck

Substratum:
10 to 20 inches—gray, mottled fine sandy loam stratified with very dark gray silt loam
20 to 33 inches—gray, mottled silt loam
33 to 42 inches—light brownish gray loamy fine sand
42 to 80 inches—grayish brown, mottled silty clay

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: Frequent
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the upper part of the profile, high in the lower part
Potential for frost action: High

Composition

Rollway soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
- The poorly drained Thunderbay soils

Similar inclusions:
- Soils that have a thinner surface layer of muck

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
- Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Carefully managed reforestation helps to control undesirable understory plants.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concern: Seasonal flooding
Management considerations:
- Because of flooding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Seasonal flooding
Management considerations:
- Because of flooding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 3W
Michigan soil management group: 3/1c

78—Pits, borrow

Setting

Shape of areas: Irregular
Size of areas: 3 to 150 acres

Composition

Pits: 100 percent

Use and Management

Land use: Source of gravel, sand, or fill material
Management considerations:
- Some areas have been excavated below the seasonal high water table and are ponded.
- A few pits have small deposits of rubbish.
- Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned

Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

82B—Udorthents, loamy, nearly level and undulating

Setting

Landform: Ridges and knolls
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 15 acres

Typical Profile

Surface layer:
0 to 3 inches—reddish brown loam

Substratum:
3 to 80 inches—reddish brown loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low to high
Flooding: None
Hazard of water erosion: Slight to severe
Hazard of soil blowing: Variable
Shrink-swell potential: Variable
Potential for frost action: Variable

Composition

Udorthents and similar soils: About 100 percent

Similar Inclusions

- Soils that have more clay in the substratum

Use and Management

Land use: Former use—source of borrow material; current use—none
Management considerations:
- Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

82C—Udorthents, nearly level to gently rolling

Setting

Landform: Ridges and knolls
Slope: 0 to 12 percent
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 3 inches—reddish brown loam

Substratum:
3 to 80 inches—reddish brown loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low to high
Flooding: None
Hazard of water erosion: Slight to severe
Hazard of soil blowing: Variable
Shrink-swell potential: Variable
Potential for frost action: Variable

Composition

Udorthents and similar soils: About 100 percent

Similar Inclusions

- Soils that have more clay in the substratum

Use and Management

Land use: Former use—source of borrow material; current use—none
Management considerations:
- Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

83B—Udipsamments, nearly level and undulating

Setting

Landform: Ridges and knolls

Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 6 inches—yellowish brown fine sand

Substratum:
6 to 60 inches—light yellowish brown fine sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff: Negligible to medium
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Udipsamments and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Aquents in depressions

Similar inclusions:
- Soils that have loamy bands in the substratum

Use and Management

Land use: Former use—source of borrow material; current use—idle land
Management considerations:
- Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

83F—Udipsamments, nearly level to very steep

Setting

Landform: Ridges and knolls
Slope: 0 to 40 percent
Shape of areas: Irregular
Size of areas: 3 to 25 acres

Typical Profile

Surface layer:
0 to 6 inches—yellowish brown fine sand

Substratum:
6 to 80 inches—light yellowish brown fine sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff: Negligible to medium
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Udipsamments and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Aquents in depressions

Similar inclusions:
- Soils that have loamy bands in the substratum

Use and Management

Land use: Former use—source of borrow material; current use—idle land
Management considerations:
- Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

84B—Zimmerman loamy fine sand, 0 to 6 percent slopes

Setting

Landform: Lake terraces
Shape of areas: Irregular
Size of areas: 10 to 200 acres

Typical Profile

Surface layer:
0 to 1 inch—black loamy fine sand

Subsurface layer:
1 to 3 inches—dark grayish brown fine sand

Subsoil:
3 to 6 inches—dark yellowish brown fine sand
6 to 24 inches—yellowish brown fine sand
24 to 46 inches—pale brown fine sand
46 to 80 inches—pale brown fine sand with bands of brown loamy fine sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
- The moderately well drained Annalake soils, which contain more clay than the Zimmerman soil

Similar inclusions:
- Soils that have coarser sand

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Nutrient and pesticide loss, seasonal droughtiness, soil blowing
Management considerations:
- Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
- Increasing the content of organic matter in the root zone may improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.
- Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.
- Because of the need for protection of ground water, nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
- Including grasses and legumes in the crop rotation can reduce nutrient losses, improve soil structure, and provide nitrogen for use by succeeding crops.
- Irrigation water management is effective in reducing the amount of nitrogen leached from irrigated fields.
- Integrated pest management, such as scouting and bio-control methods, can help to prevent the leaching of pesticides.
- Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
- Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.

Pasture

Major management concern: Seasonal droughtiness
Management considerations:
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, seasonal droughtiness
Management considerations:
- Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.

Buildings

Major management concern: Caving of cutbanks
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concern: Poor filtering capacity
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery

planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 8S
Michigan soil management group: 4a

84C—Zimmerman loamy fine sand, 6 to 12 percent slopes

Setting

Landform: Lake terraces
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 1 inch—black loamy fine sand

Subsurface layer:
1 to 3 inches—dark grayish brown fine sand

Subsoil:
3 to 6 inches—dark yellowish brown fine sand
6 to 24 inches—yellowish brown fine sand
24 to 46 inches—pale brown fine sand
46 to 80 inches—pale brown fine sand with bands of brown loamy fine sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Annalake soils, which contain more clay than the Zimmerman soil

Similar inclusions:
• Soils that have coarser sand

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Nutrient and pesticide loss, seasonal droughtiness, soil blowing
Management considerations:
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the content of organic matter in the root zone may improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.
• Because of the need for protection of ground water, nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
• Including grasses and legumes in the crop rotation can reduce nutrient losses, improve soil structure, and provide nitrogen for use by succeeding crops.
• Irrigation water management is effective in reducing the amount of nitrogen leached from irrigated fields.
• Integrated pest management, such as scouting and bio-control methods, can help to prevent the leaching of pesticides.
• Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.

Pasture

Major management concern: Seasonal droughtiness
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, seasonal droughtiness
Management considerations:
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.

Buildings

Major management concern: Caving of cutbanks
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, slope
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 8S
Michigan soil management group: 4a

84E—Zimmerman loamy fine sand, 18 to 35 percent slopes

Setting

Landform: Dissected lake plains
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 1 inch—black loamy fine sand

Subsurface layer:
1 to 3 inches—dark grayish brown fine sand

Subsoil:
3 to 6 inches—dark yellowish brown fine sand
6 to 24 inches—yellowish brown fine sand
24 to 46 inches—pale brown fine sand
46 to 80 inches—pale brown fine sand with bands of brown loamy fine sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Annalake soils, which contain more clay than the Zimmerman soil; in the less sloping areas

Similar inclusions:
• Soils that have coarser sand

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, erosion hazard, seedling mortality
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss. Some areas may require mulch.
• Planting special nursery stock or containerized seedlings and planting when the soil is moist can reduce the seedling mortality rate.

Buildings

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Slope

Management considerations:
- Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 8S
Michigan soil management group: 4a

85D—Zimmerman-Annalake complex, 6 to 18 percent slopes

Setting

Landform: Ridges on dissected lake plains
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Typical Profile

Zimmerman

Surface layer:
0 to 1 inch—black loamy fine sand

Subsurface layer:
1 to 3 inches—dark grayish brown fine sand

Subsoil:
3 to 6 inches—dark yellowish brown fine sand
6 to 24 inches—yellowish brown fine sand
24 to 46 inches—pale brown fine sand
46 to 80 inches—pale brown fine sand with bands of brown loamy fine sand

Annalake

Surface layer:
0 to 4 inches—very dark grayish brown loamy very fine sand

Subsurface layer:
4 to 6 inches—brown loamy very fine sand

Subsoil:
6 to 16 inches—brown loamy very fine sand
16 to 33 inches—brown loamy fine sand and reddish brown loam
33 to 42 inches—reddish brown, mottled loam and brown, mottled loamy sand

Substratum:
42 to 80 inches—light brown, stratified fine sandy loam and very fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Zimmerman—rapid; Annalake—moderate
Available water capacity: Zimmerman—low; Annalake—moderate
Drainage class: Zimmerman—excessively drained; Annalake—moderately well drained
Depth to a seasonal high water table: Zimmerman—more than 6.0 feet; Annalake—perched, 2.5 to 6.0 feet below the surface at some time in September, October, or November or in March, April, or May
Surface runoff rate: Zimmerman—very low; Annalake—medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Zimmerman—low; Annalake—moderate

Composition

Zimmerman soil and similar soils: 50 to 60 percent
Annalake soil and similar soils: 40 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Hoist soils in landscape positions similar to those of the Zimmerman and Annalake soils

Similar inclusions:
- Soils that are medium sand

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Both soils—equipment limitations; Zimmerman—seedling mortality; Annalake—plant competition, erosion hazard
Management considerations:
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
- Planting special nursery stock or containerized

seedlings can reduce the seedling mortality rate on the Zimmerman soil.
• Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas of the Zimmerman soil.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed on the Annalake soil.

Buildings

Major management concerns: Both soils—caving of cutbanks, slope; Annalake—seasonal wetness, frost action
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concern: Both soils—slope; Zimmerman—poor filtering capacity; Annalake—seasonal wetness
Management considerations:
• The poor filtering capacity of the Zimmerman soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.
• Filling or mounding with suitable material helps to raise the absorption field above the water table in the Annalake soil.
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly on both soils.

Interpretive Groups

Land capability classification: Zimmerman—VIs; Annalake—IVe
Woodland ordination symbol: Zimmerman—8S; Annalake—3
Michigan soil management group: Zimmerman—4a; Annalake—3a-s

86—Histosols and Aquents, ponded

Setting

Landform: Depressions on lake terraces, outwash plains, and flood plains
Slope: 0 percent
Shape of areas: Oval, elongated, or irregular
Size of areas: 3 to 100 acres

Soil Properties and Qualities

Depth class: Very deep
Texture: Aquents—sandy or loamy; Histosols—muck
Permeability: Rapid to slow
Available water capacity: Low to high
Drainage class: Very poorly drained
Seasonal high water table: Apparent, at the surface to 1 foot above the surface throughout the year
Surface runoff: Negligible
Flooding: None to frequent
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Potential for frost action: High

Composition

Aquents: 0 to 100 percent
Histosols: 0 to 100 percent
Contrasting inclusions: 0 to 5 percent

Contrasting Inclusions

• Small areas of poorly drained or somewhat poorly drained soils on islands

Use and Management

Land use: Wetland wildlife habitat
Management considerations:
• Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

87—Ausable muck, frequently flooded

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 11 inches—black muck

Substratum:
11 to 24 inches—brown, mottled sand
24 to 80 inches—gray, mottled sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate or moderately rapid in the surface layer, rapid in the substratum
Available water capacity: Moderate
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: Frequent
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Ausable soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
- Aquents, which are ponded all year

Similar inclusions:
- Soils that have thicker layers of muck

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, plant competition, windthrow, excessive wetness
Management considerations:
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
- Carefully managed reforestation helps to control undesirable understory plants.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

Major management concern: Seasonal flooding
Management considerations:
- Because of flooding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Seasonal flooding
Management considerations:
- Because of flooding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: 2W
Michigan soil management group: L-4c

90B—Chinwhisker sand, 0 to 4 percent slopes

Setting

Landform: Stream terraces, outwash plains, and lake terraces
Shape of areas: Irregular or elongated
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 4 inches—brown sand

Subsoil:
4 to 11 inches—brown sand
11 to 18 inches—strong brown sand
18 to 34 inches—light yellowish brown sand
34 to 48 inches—light yellowish brown, mottled sand
48 to 80 inches—light yellowish brown, mottled sand with thin bands of brown loamy sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Apparent, 2.0 to 4.5 feet below the surface at some time from October to June

Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Chinwhisker soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils in the lower areas
- The very poorly drained Deford soils in depressions

Similar inclusions:
- Soils that have a calcareous substratum
- Soils that have thin layers of gravelly sand in the substratum
- Soils that are lighter colored in the upper part of the subsoil

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development, cropland

Cropland

Major management concerns: A low content of organic matter, nutrient and pesticide loss, seasonal droughtiness, soil blowing
Management considerations:
- Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.
- Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
- Because of the need for protection of ground water, nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
- Integrated pest management, such as scouting and bio-control methods, can help to prevent the leaching of pesticides.
- Adjusting the rate of water application to the available water capacity, the rate of water intake, and the needs of the crop helps to prevent excessive irrigation of the soil and excessive leaching of plant nutrients and pesticides.
- Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
- Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing. A permanent plant cover also helps to control soil blowing.

Pasture

Major management concerns: Seasonal droughtiness, soil blowing
Management considerations:
- Proper stocking rates and short-duration grazing during the summer help to control soil blowing, maintain plant density and hardiness, and keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, seedling mortality, plant competition
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.

Buildings

Major management concerns: Caving of cutbanks, seasonal wetness
Management considerations:
- Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Seasonal wetness, poor filtering capacity
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.
- Mounding or adding suitable fill material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IVs

Woodland ordination symbol: 6S
Michigan soil management group: 5a

92B—Klacking-McGinn loamy sands, 0 to 6 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Klacking

Surface layer:
0 to 4 inches—very dark gray loamy sand

Subsurface layer:
4 to 12 inches—pinkish gray loamy sand

Subsoil:
12 to 25 inches—brown loamy sand
25 to 33 inches—pale brown sand with bands of reddish brown loamy sand
33 to 64 inches—reddish brown sandy loam and light brown sand

Substratum:
64 to 80 inches—pale brown sand

McGinn

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 3 inches—grayish brown loamy sand

Subsoil:
3 to 12 inches—yellowish brown loamy sand
12 to 18 inches—grayish brown loamy sand
18 to 22 inches—reddish brown loam and grayish brown loamy sand
22 to 26 inches—reddish brown loam

Substratum:
26 to 80 inches—reddish brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Klacking—moderately rapid; McGinn—moderately rapid in the sandy part, moderate in the loamy part
Available water capacity: Klacking—low; McGinn—moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff: Klacking—negligible; McGinn—low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Klacking—low; McGinn—moderate

Composition

Klacking soil and similar soils: 60 to 70 percent
McGinn soil and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Coppler soils in landscape positions similar to those of the Klacking and McGinn soils
• The very poorly drained Lupton soils in depressions

Similar inclusions:
• Soils that are moderately well drained
• Soils that have a surface layer of sandy loam

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concern: Seedling mortality
Management considerations:
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.

Buildings

Major management concern: Caving of cutbanks
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: None

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Klacking—6S; McGinn—4S
Michigan soil management group: Klacking—4a; McGinn—3a

92C—Klacking-McGinn loamy sands, 6 to 12 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Klacking

Surface layer:
0 to 4 inches—very dark gray loamy sand

Subsurface layer:
4 to 12 inches—pinkish gray loamy sand

Subsoil:
12 to 25 inches—brown loamy sand
25 to 33 inches—pale brown sand with bands of reddish brown loamy sand
33 to 64 inches—reddish brown sandy loam and light brown sand

Substratum:
64 to 80 inches—pale brown sand

McGinn

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 3 inches—grayish brown loamy sand

Subsoil:
3 to 12 inches—yellowish brown loamy sand
12 to 18 inches—grayish brown loamy sand
18 to 22 inches—reddish brown loam and grayish brown loamy sand
22 to 26 inches—reddish brown loam

Substratum:
26 to 80 inches—reddish brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Klacking—moderately rapid; McGinn—moderately rapid in the sandy part, moderate in the loamy part
Available water capacity: Klacking—low; McGinn—moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Klacking—very low; McGinn—medium
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Klacking—low; McGinn—moderate

Composition

Klacking soil and similar soils: 60 to 70 percent
McGinn soil and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Coppler soils in landscape positions similar to those of the Klacking and McGinn soils
- The very poorly drained Lupton soils in depressions

Similar inclusions:
- Soils that are moderately well drained
- Soils that have a surface layer of sandy loam

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concern: Seedling mortality, equipment limitations
Management considerations:
- Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Buildings

Major management concern: Caving of cutbanks, frost action
Management considerations:
- Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concern: Slope
Management considerations:
- Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe

Woodland ordination symbol: Klacking—6S; McGinn—4S
Michigan soil management group: Klacking—4a; McGinn—3a

93B—Tacoda-Wakeley complex, 0 to 4 percent slopes

Setting

Landform: Lake plains and lake terraces
Position on the landform: Tacoda—ridges; Wakeley—swales
Shape of areas: irregular
Size of areas: 5 to 200 acres

Typical Profile

Tacoda

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 14 inches—grayish brown sand

Subsoil:
14 to 18 inches—brown, mottled sand
18 to 27 inches—strong brown, mottled sand
27 to 36 inches—light yellowish brown, mottled sand

Substratum:
36 to 44 inches—pale brown, mottled sand
44 to 80 inches—reddish brown, mottled silty clay

Wakeley

Surface layer:
0 to 3 inches—black mucky sand

Substratum:
3 to 6 inches—gray sand
6 to 16 inches—brown, mottled sand
16 to 21 inches—grayish brown, mottled loamy sand
21 to 80 inches—reddish brown, mottled silty clay

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid in the sandy part of both soils, very slow in the clayey part
Available water capacity: Low
Drainage class: Wakeley—very poorly drained; Tacoda—somewhat poorly drained
Depth to a seasonal high water table: Wakeley—perched, 1.0 foot above to 1.0 foot below the surface at some time from January to December; Tacoda—perched, 0.5 foot to 1.5 feet below the surface at some time from September to June
Surface runoff: Tacoda—very low; Wakeley—negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low in the sandy part, high in the clayey part
Potential for frost action: Moderate

Composition

Tacoda soil and similar soils: 45 to 55 percent
Wakeley soil and similar soils: 45 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Dorval soils in depressions

Similar inclusions:
- Soils that have a surface layer of loamy sand
- Soils that have a surface layer of fine sand
- Soils that are somewhat poorly drained and have a clayey substratum between depths of 20 and 40 inches

Use and Management

Land use: Woodland

Woodland

Major management concerns: Seasonal wetness, windthrow hazard, plant competition
Management considerations:
- Skidders should not be used during wet periods, when ruts form easily.
- Landing sites generally can be used only during the driest part of the year.
- Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Both soils—caving of cutbanks; Wakeley—ponding

Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Because of ponding, the Wakeley soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Wakeley—ponding
Management considerations:
• Because of ponding, the Wakeley soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Tacoda—IVw; Wakeley—Vw
Woodland ordination symbol: Tacoda—4W; Wakeley—3W
Michigan soil management group: Tacoda—4/1b; Wakeley—4/1c

94F—Klacking-McGinn loamy sands, 8 to 50 percent slopes, dissected

Setting

Landform: Ground moraines
Position on the landform: McGinn—the summit between deeply dissected valleys; Klacking—the lower backslopes and toeslopes of the dissected valleys
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Klacking

Surface layer:
0 to 4 inches—very dark gray loamy sand

Subsurface layer:
4 to 12 inches—pinkish gray loamy sand

Subsoil:
12 to 25 inches—brown loamy sand
25 to 33 inches—pale brown sand with bands of reddish brown loamy sand
33 to 64 inches—reddish brown sandy loam and light brown sand

Substratum:
64 to 80 inches—pale brown sand

McGinn

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 3 inches—grayish brown loamy sand

Subsoil:
3 to 12 inches—yellowish brown loamy sand
12 to 18 inches—grayish brown loamy sand
18 to 22 inches—reddish brown loam and grayish brown loamy sand
22 to 26 inches—reddish brown loam

Substratum:
26 to 80 inches—reddish brown sandy loam

Soil Properties and Qualities

Depth class: very deep
Permeability: Klacking—moderately rapid; McGinn—moderately rapid in the sandy part, moderate in the loamy part
Available water capacity: Klacking—low; McGinn—moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Klacking—very low; McGinn—high
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Klacking—low; McGinn—moderate

Composition

Klacking soil and similar soils: 50 to 60 percent
McGinn soil and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Coppler soils on backslopes and toeslopes in dissected areas

Similar inclusions:
• Soils that have a surface layer of loamy fine sand
• Soils that have a surface layer of fine sandy loam

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, erosion hazard, slope
Management considerations:
• Ordinary crawler tractors and rubber-tired skidders cannot be operated safely on the very steep side slopes of the ravines.
• Skid roads and skid trails should be located in the less sloping areas between ravines.

• Nearly level areas should be selected as sites for landings.
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Cable yarding systems are generally safer than other logging methods and result in less surface disturbance.
• Areas that are sensitive to erosion and droughty conditions may require mulch, such as straw, bark, or wood chips.

Buildings

Major management concern: Slope
Management considerations:
• Because of the slope, these soils are generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Slope
Management considerations:
• Because of the slope, these soils are generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Klacking—6S; McGinn—4S
Michigan soil management group: Klacking—4a; McGinn—3a

97—Colonville very fine sandy loam, occasionally flooded

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 10 to 20 acres

Typical Profile

Surface layer:
0 to 19 inches—dark brown, mottled very fine sandy loam

Subsoil:
19 to 35 inches—light brown, mottled fine sandy loam and very fine sandy loam

Substratum:
35 to 65 inches—light brown, mottled fine sandy loam
65 to 80 inches—light brownish gray, mottled very fine sandy loam

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: High
Drainage class: Somewhat poorly drained
Depth to a seasonal high water table: 1 to 2 feet below the surface from September to May
Surface runoff rate: Very low
Flooding: Occasional
Content of organic matter: High
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

Colonville soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Rollaway soils

Similar inclusions:
• Soils that have a surface layer of mucky very fine sandy loam

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, windthrow hazard
Management considerations:
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.
• Carefully managed reforestation helps to control undesirable understory plants.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

Major management concern: Seasonal flooding

Management considerations:
• Because of flooding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Seasonal flooding
Management considerations:
• Because of flooding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 3W
Michigan soil management group: L-2c-c

113—Angelica loam

Setting

Landform: Ground moraines
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray, mottled loam

Subsoil:
8 to 17 inches—gray, mottled loam
17 to 29 inches—pale brown, mottled loam

Substratum:
29 to 80 inches—reddish gray, mottled loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately slow
Available water capacity: High
Drainage class: Poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from September to June
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Slade soils in the higher areas

Similar inclusions:
• Soils that have a surface layer of fine sandy loam

Use and Management

Land use: Dominant uses—woodland, cropland, pasture

Cropland

Major management concerns: Seasonal wetness, tilth of surface layer
Management considerations:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.

Woodland

Major management concerns: Seasonal wetness, equipment limitations, windthrow hazard
Management considerations:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Access is easiest during periods in winter when access roads are frozen.
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 7W
Michigan soil management group: 2.5c

116C—Mancelona sand, 6 to 12 percent slopes

Setting

Landform: Stream terraces and glacial drainageways
Shape of areas: Irregular
Size of areas: 3 to 10 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—pinkish gray sand

Subsoil:
6 to 16 inches—brown sand
16 to 20 inches—yellowish brown sand
20 to 29 inches—light yellowish brown sand
29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown very gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the surface layer and subsoil, very rapid in the substratum
Available water capacity: Low
Drainage class: Somewhat excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Graycalm and well drained Klacking soils, which do not have a substratum of very gravelly sand; in landscape positions similar to those of the Mancelona soil
• The well drained McGinn soils, which have a loamy substratum; in landscape positions similar to those of the Mancelona soil

Similar inclusions:
• Soils that are moderately well drained
• Soils that do not have a loamy layer in the subsoil

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Seasonal droughtiness, soil blowing, a low content of organic matter, a limited available water capacity, nutrient loss
Management considerations:
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.
• Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
• Increasing the content of organic matter in the root zone may improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.

Pasture

Major management concerns: Seasonal droughtiness, soil blowing, overgrazing
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: None

Buildings

Major management concern: Caving of cutbanks
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concern: Poor filtering capacity
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3S
Michigan soil management group: 4a

127—Cathro muck

Setting

Landform: Depressions on lake plains and moraines
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 150 acres

Typical Profile

Surface layer:
0 to 6 inches—black muck

Subsoil:
6 to 14 inches—black muck
14 to 28 inches—dark reddish brown muck
28 to 30 inches—black silt loam

Substratum:
30 to 33 inches—greenish gray silty clay loam
33 to 80 inches—greenish gray silt loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately slow to moderately rapid in the mucky part, moderately slow in the part that is silty clay loam
Available water capacity: Very high
Drainage class: Very poorly drained
Seasonal high water table: Perched, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the substratum
Potential for frost action: High

Composition

Cathro soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Slade soils in the higher areas
• The very poorly drained Lupton soils, which have more than 51 inches of muck

Similar inclusions:
• Soils that have a thin layer of sand above the clayey substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition
Management considerations:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 5W
Michigan soil management group: M/3c

128—Dawson peat

Setting

Landform: Depressions on lake plains
Slope: 0 to 2 percent
Shape of areas: Irregular or elongated
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 6 inches—dark reddish brown peat

Subsoil:
6 to 16 inches—black muck
16 to 31 inches—dark reddish brown muck
31 to 34 inches—dark brown fine sand

Substratum:
34 to 80 inches—olive brown fine sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately slow to moderately rapid in the mucky part, rapid in the sandy part
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low in the substratum
Potential for frost action: High

Composition

Dawson soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Kinross soils, which have less than 8 inches of muck on the surface; near the edges of the map unit
• The somewhat poorly drained Au Gres soils on low ridges

Similar inclusions:
• Soils that have thin layers of sand in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.
• Because of wetness, severe seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding, low strength
Management considerations:
• Because of ponding and low strength, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: 2W
Michigan soil management group: Mc-a

145C—Rousseau fine sand, 6 to 12 percent slopes

Setting

Landform: Dunes
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Organic mat:
0 to 1 inch—dark reddish brown, undecomposed leaf litter

Surface layer:
1 to 3 inches—very dark gray fine sand

Subsurface layer:
3 to 6 inches—grayish brown fine sand

Subsoil:
6 to 10 inches—brown fine sand
10 to 23 inches—strong brown fine sand
23 to 37 inches—yellowish brown fine sand

Substratum:
37 to 80 inches—yellowish brown fine sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Rousseau soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils on low knolls

Similar inclusions:
• Soils that are medium sand

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Equipment limitations, seedling mortality, droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.

Buildings

Major management concerns: Caving of cutbanks, slope
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, slope
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 5S
Michigan soil management group: 4a

145E—Rousseau fine sand, 18 to 35 percent slopes

Setting

Landform: Dunes
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Organic mat:

0 to 1 inch—dark reddish brown, undecomposed leaf litter

Surface layer:
1 to 3 inches—very dark gray fine sand

Subsurface layer:
3 to 6 inches—grayish brown fine sand

Subsoil:
6 to 10 inches—brown fine sand
10 to 23 inches—strong brown fine sand
23 to 37 inches—yellowish brown fine sand

Substratum:
37 to 80 inches—yellowish brown fine sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Rousseau soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils on low knolls

Similar inclusions:
• Soils that are medium sand

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Slope, equipment limitations, seedling mortality, erosion hazard
Management considerations:
• The grade of logging roads should be kept as low as possible.
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• The risk of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.

Buildings

Major management concerns: Caving of cutbanks, slope
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Because of the slope, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 5S
Michigan soil management group: 4a

159A—Finch sand, 0 to 3 percent slopes

Setting

Landform: Nearly level lake plains
Shape of areas: Irregular
Size of areas: 3 to 300 acres

Typical Profile

Organic mat:
0 to 1 inch—black, well decomposed organic matter

Surface layer:
1 to 11 inches—light brownish gray sand

Subsoil:
11 to 16 inches—dark reddish brown, mottled sand
16 to 23 inches—strong brown and dark reddish brown, mottled, cemented sand

Substratum:
23 to 80 inches—pale brown, mottled sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid in most of the sandy layers, but moderately rapid in the cemented part of the subsoil
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 1.5 feet below the surface at some time from October to June
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Finch soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Deford soils

Similar inclusions:
- Soils that have fine sand in the substratum
- Soils that have less than 50 percent orstein in the control section

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Pasture

Major management concern: Seasonal wetness
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Skidders should not be used during wet periods, when ruts form easily.
- Special site preparation, such as bedding before planting, can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings also reduces the seedling mortality rate.
- Carefully managed reforestation helps to control undesirable understory plants.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

Major management concerns: Seasonal wetness, caving of cutbanks, frost action
Management considerations:
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, seasonal wetness
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- Mounding or adding suitable fill material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 4W
Michigan soil management group: 5b-h

166A—Slade loam, 0 to 3 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 3 to 1,000 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark gray loam

Subsurface layer:
5 to 7 inches—pinkish gray, mottled fine sandy loam

Subsoil:
7 to 9 inches—reddish brown, mottled clay loam and pinkish gray, mottled fine sandy loam
9 to 23 inches—reddish brown, mottled clay loam
23 to 26 inches—brown, mottled loam

Substratum:
26 to 60 inches—reddish brown, mottled loam
60 to 80 inches—brown loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part of the profile, moderately slow in the lower part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, 0.5 foot to 1.5 feet below the surface at some time from September to May
Surface runoff rate: Medium
Flooding: None

Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Ossineke soils in the higher areas
• The poorly drained Angelica soils in the lower areas

Similar inclusions:
• Soils that have a surface layer of sandy loam

Use and Management

Land use: Dominant use—cropland; other uses—woodland, pasture, building site development

Cropland

Major management concerns: Seasonal wetness, tilth of surface layer
Management considerations:
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.

Pasture

Major management concerns: Compaction, seasonal wetness
Management considerations:
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, seasonal wetness, plant competition, windthrow hazard
Management considerations:
• Skidders should not be used during wet periods, when ruts form easily.
• Landing sites generally can be used only during the driest part of the year.
• If trees are planted, site preparation by mechanical means is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

Major management concerns: Seasonal wetness, frost action, shrink-swell potential
Management considerations:
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.

Septic tank absorption fields

Major management concerns: Moderately slow permeability, seasonal wetness
Management considerations:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W
Michigan soil management group: 2.5b

182—Pits, quarry

Setting

Landform: Limestone or shale bedrock plains
Shape of areas: Irregular or rectangular
Size of areas: 10 to 640 acres

Composition

Pits: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Contrasting Inclusions

• Udorthents, loamy, in waste piles

Use and Management

Land use: Source of limestone or shale
Management considerations:
• Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned

Michigan soil management group: None assigned

300A—Hagensville fine sandy loam, 0 to 2 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 7 inches—black fine sandy loam

Subsoil:
7 to 16 inches—yellowish brown, mottled fine sandy loam
16 to 18 inches—dark yellowish brown, mottled fine sandy loam

Substratum:
18 to 80 inches—brown, mottled gravelly fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, 0.5 foot to 2.0 feet below the surface at some time from October to May
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

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

Inclusions

Contrasting inclusions:
- The moderately well drained Ossineke soils in the higher areas

Similar inclusions:
- Soils that have a surface layer of very fine sandy loam

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Seasonal wetness, soil blowing
Management considerations:
- Most climatically adapted crops can be grown if an adequate drainage system is installed.
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Subsurface drainage systems should be designed so that the rate of flowing water helps to keep fine sand and silt from plugging the tile lines. Also, suitable filtering material may be needed to keep the silt and fine sand from flowing into the tile lines.
- Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing.

Pasture

Major management concerns: Seasonal wetness, overgrazing
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
- Landing sites generally can be used only during the driest part of the year.
- Special site preparation, such as bedding before planting, can reduce the seedling mortality rate.
- Trees that can withstand seasonal wetness should be selected for planting.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
- Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Seasonal wetness, caving of cutbanks, frost action
Management considerations:
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by a drainage system around structures with basements and crawl spaces.

• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concern: Seasonal wetness
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W
Michigan soil management group: 3b

304A—Iosco loamy sand, 0 to 3 percent slopes

Setting

Landform: Lake terraces, moraines, and till-floored lake plains
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 10 inches—brown loamy sand

Subsoil:
10 to 19 inches—reddish brown, mottled loamy sand
19 to 24 inches—brown, mottled loamy sand
24 to 27 inches—brown, mottled sandy loam
27 to 37 inches—reddish brown, mottled clay loam
37 to 52 inches—brown, mottled loam

Substratum:
52 to 80 inches—brown, mottled sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid in the sandy part of the profile, moderate in the loamy part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 1.5 feet below the surface at some time from September to June
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the upper part of the profile, moderate in the lower part
Potential for frost action: Moderate

Composition

Iosco soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Algonquin soils, which contain more clay in the surface layer and subsoil than the Iosco soil
• The very poorly drained Wakeley soils in drainageways
• The somewhat poorly drained Finch on low ridges

Similar inclusions:
• Soils that have a darker surface layer
• Soils that have sand in the upper part of the subsoil
• Soils that have a silty substratum

Use and Management

Land use: Dominant uses—woodland, cropland; other uses—pasture, building site development

Cropland

Major management concerns: Nutrient loss, a low content of organic matter, seasonal wetness, soil blowing
Management considerations:
• Because of the need for protection of ground water, nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
• Crop residue management, green manure crops, applications of manure, cover crops, and conservation tillage help to maintain or improve tilth and increase the available water capacity and the content of organic matter.
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.

Pasture

Major management concerns: Overgrazing, seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.

• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Seasonal wetness, seasonal droughtiness, equipment limitations, windthrow hazard, plant competition
Management considerations:
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.
• Trees that can withstand seasonal wetness should be selected for planting.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Landing sites generally can be used only during the driest part of the year.
• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Exposing the soil just prior to the production of a seed crop, or prior to artificial seeding, can help desirable tree seedlings to become established quickly and to compete better with undesirable vegetation.
• Carefully managed reforestation helps to control undesirable understory plants.
• Selective cutting or cutting in strips and leaving seed trees along the edge of the openings, where they can naturally regenerate the area, are desirable measures.

Buildings

Major management concerns: Seasonal wetness, shrink-swell potential, caving of cutbanks, frost action
Management considerations:
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Seasonal wetness, poor filtering capacity
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• A subsurface drainage system lowers the water table.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 4W
Michigan soil management group: 4/2b

305B—Johnswood very flaggy loam, 1 to 6 percent slopes, stony

Setting

Landform: Low knolls on ground moraines
Shape of areas: Irregular
Size of areas: 3 to 60 acres

Typical Profile

Surface layer:
0 to 5 inches—black very flaggy loam

Subsoil:
5 to 12 inches—yellowish brown, mottled very gravelly clay loam

Substratum:
12 to 80 inches—pale brown, mottled very gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones; percentage of surface covered—0.05
Permeability: Slow
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Perched, 1 to 3 feet below the surface at some time in September, October, or November or in March, April, or May
Surface runoff rate: High
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
- The well drained Alpena soils in the higher areas
- The somewhat poorly drained Elcajon soils in the lower areas

Similar inclusions:
- Areas that are very stony
- Soils that have a lighter colored surface layer

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Cropland

Major management concern: Stoniness
Management considerations:
- Because of the content of rock fragments, this soil is generally unsuited to cropland.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition
Management considerations:
- Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
- Because of the content of cobbles, machine planting is not practical on this soil.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Trees that can withstand seasonal wetness should be selected for planting.

Buildings

Major management concerns: Wetness, large stones, slow permeability
Management considerations:
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Because of the content of flagstones and stones, excavation is difficult and cutbanks are unstable. Trench walls should be reinforced.

Septic tank absorption fields

Major management concern: Seasonal wetness
Management considerations:
- Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3F
Michigan soil management group: Ga

308B—Krakow flaggy fine sandy loam, 1 to 6 percent slopes

Setting

Landform: Gently undulating ground moraines and glacial lake benches
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 3 inches—dark grayish brown flaggy fine sandy loam

Subsurface layer:
3 to 8 inches—brown flaggy fine sandy loam

Subsoil:
8 to 15 inches—dark brown very flaggy clay loam

Substratum:
15 to 80 inches—light yellowish brown very flaggy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—flagstones; percentage of surface covered—20
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Krakow soil and similar soils: 85 to 100 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Cathro soils in depressions

• The somewhat poorly drained Hagensville soils in the lower areas

Similar inclusions:
• Soils that have coarser sand
• Soils that have stones in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Rock fragments, droughtiness, water erosion
Management considerations:
• Because of flagstones in the surface layer, seedbed preparation and harvesting may be difficult. Removal of the flagstones can reduce equipment wear.
• The rate of water intake can be increased by growing cover crops, leaving crop residue on the surface, and regularly adding other organic material.
• Crop rotations that include grasses or legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.

Pasture

Major management concern: Seasonal droughtiness
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, plant competition
Management considerations:
• Because of the content of flagstones, machine planting is not practical on this soil.
• Special harvest methods may be needed to control undesirable plants.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Buildings

Major management concerns: Caving of cutbanks, frost action
Management considerations:
• Because of the content of cobbles, excavation is difficult and cutbanks are unstable. Trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concern: Large stones
Management considerations:
• Backfilling the trenches with suitable material helps overcome the high content of rock fragments.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3F
Michigan soil management group: Ga

308C—Krakow flaggy fine sandy loam, 6 to 12 percent slopes

Setting

Landform: Ridges and knolls on ground moraines
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 3 inches—dark grayish brown flaggy fine sandy loam

Subsurface layer:
3 to 8 inches—brown flaggy fine sandy loam

Subsoil:
8 to 15 inches—dark brown very flaggy clay loam

Substratum:
15 to 80 inches—light yellowish brown very flaggy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—flagstones; percentage of surface covered—20
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Krakow soil and similar soils: 85 to 100 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Cathro soils in depressions
- The somewhat poorly drained Hagensville soils in the lower areas

Similar inclusions:
- Soils that have coarser sand
- Soils that have stones in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Rock fragments, droughtiness, water erosion
Management considerations:
- Because of flagstones in the surface layer, seedbed preparation and harvesting may be difficult. Removal of the flagstones can reduce equipment wear.
- The rate of water intake can be increased by growing cover crops, leaving crop residue on the surface, and regularly adding other organic material.
- Crop rotations that include grasses or legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.

Pasture

Major management concern: Seasonal droughtiness
Management considerations:
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, plant competition
Management considerations:
- Because of the content of flagstones, machine planting is not practical on this soil.
- Nearly level areas should be selected as sites for landings.
- Special harvest methods may be needed to control undesirable plants.
- If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Buildings

Major management concerns: Caving of cutbanks, frost action, slope
Management considerations:
- Because of the content of cobbles, excavation is difficult and cutbanks are unstable. Trench walls should be reinforced.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.
- Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Large stones, slope
Management considerations:
- Backfilling the trenches with suitable material helps overcome the high content of rock fragments
- Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3F
Michigan soil management group: Ga

308D—Krakow flaggy fine sandy loam, 12 to 18 percent slopes

Setting

Landform: Ridges and knolls on ground moraines
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 3 inches—dark grayish brown flaggy fine sandy loam

Subsurface layer:
3 to 8 inches—brown flaggy fine sandy loam

Subsoil:
8 to 15 inches—dark brown very flaggy clay loam

Substratum:
15 to 80 inches—light yellowish brown very flaggy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—flagstones; percentage of surface covered—20
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Medium

Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Krakow soil and similar soils: 85 to 100 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Cathro soils in depressions
- The somewhat poorly drained Hagensville soils in the lower areas

Similar inclusions:
- Soils that have coarser sand
- Soils that have stones in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Rock fragments, droughtiness, water erosion
Management considerations:
- Because of flagstones in the surface layer, seedbed preparation and harvesting may be difficult. Removal of the flagstones can reduce equipment wear.
- The rate of water intake can be increased by growing cover crops, leaving crop residue on the surface, and regularly adding other organic material.
- Crop rotations that include grasses or legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.

Pasture

Major management concern: Seasonal droughtiness
Management considerations:
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, plant competition
Management considerations:
- Because of the content of flagstones, machine planting is not practical on this soil.
- Nearly level areas should be selected as sites for landings.
- Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography. The grade should be kept as low as possible.
- Special harvest methods may be needed to control undesirable plants.
- If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Buildings

Major management concerns: Caving of cutbanks, frost action, slope
Management considerations:
- Because of the content of cobbles, excavation is difficult and cutbanks are unstable. Trench walls should be reinforced.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.
- Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Large stones, slope
Management considerations:
- Backfilling the trenches with suitable material helps overcome the high content of rock fragments
- Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3F
Michigan soil management group: Ga

316—Ruse loam

Setting

Landform: Level and nearly level bedrock benches
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 8 inches—black, mottled loam

Subsoil:
8 to 13 inches—dark grayish brown, mottled flaggy sandy loam

Bedrock:
13 to 17 inches—limestone

Soil Properties and Qualities

Depth class: Shallow
Permeability: Moderate
Available water capacity: Low
Drainage class: Poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from September to June
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: High

Composition

Ruse soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Chippeny soils in the lower areas
- The somewhat poorly drained Potagannissing soils in the higher areas

Similar inclusions:
- Bedrock outcrops on slight rises
- Soils that have an organic surface layer

Use and Management

Land use: Woodland

Cropland

Major management concerns: Wetness, ponding, shallow depth to bedrock
Management considerations:
- Because of the shallow depth to bedrock, wetness, and ponding, this soil is generally unsuited to cropland.

Woodland

Major management concerns: Equipment limitations, shallow depth to bedrock, windthrow hazard, plant competition
Management considerations:
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Because of the shallow depth to bedrock, planting is not practical on this soil.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concern: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: 5W
Michigan soil management group: Rbc

350E—Blue Lake sand, 18 to 35 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 3 to 10 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—brown sand
15 to 25 inches—yellowish brown sand
25 to 80 inches—light yellowish brown sand with bands of strong brown sandy loam

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: Low

Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Blue Lake soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The excessively drained Rubicon soils, which have less clay in the subsoil than the Blue Lake soil; in landscape positions similar to those of the Blue Lake soil

Similar inclusions:
- Excessively drained soils that have less than 6 inches of loamy sand bands in the subsoil
- Soils that have a surface layer of loamy sand

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Erosion hazard, equipment limitations, seedling mortality, plant competition
Management considerations:
- Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography. The grade should be kept as low as possible.
- Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
- Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
- Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
- Planting when the soil is moist can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.
- Special harvest methods may be needed to control undesirable plants.
- Carefully managed reforestation helps to control undesirable understory plants.
- Selective cutting or cutting in strips and leaving seed trees along the edge of the openings, where they can naturally regenerate the area, are desirable measures.

Buildings

Major management concerns: Slope, caving of cutbanks
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Because of the slope, this soil is poorly suited to building site development without extensive land shaping.

Septic tank absorption fields

Major management concern: Slope
Management considerations:
- Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3S
Michigan soil management group: 4a

359C—Algonquin-Negwegon-Dorval complex, 0 to 12 percent slopes

Setting

Landform: Lake plains
Position on the landform: Negwegon—the summit and shoulder slopes of low knolls; Algonquin—the backslopes and toeslopes of low knolls; Dorval—depressions and swales between the low knolls
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Algonquin

Surface layer:
0 to 5 inches—very dark gray silt loam

Subsurface layer:
5 to 7 inches—brown silt loam

Subsoil:
7 to 13 inches—reddish brown, mottled clay

13 to 19 inches—reddish brown, mottled silty clay loam
19 to 80 inches—light reddish brown, mottled, stratified silty clay loam and loam

Negwegon

Surface layer:
0 to 9 inches—brown silt loam

Subsurface layer:
9 to 12 inches—brown silt loam

Subsoil:
12 to 14 inches—reddish brown silty clay
14 to 21 inches—reddish brown, mottled silty clay
21 to 51 inches—reddish brown silty clay

Substratum:
51 to 80 inches—reddish brown silty clay loam stratified with brown silt loam

Dorval

Surface layer:
0 to 18 inches—black muck

Substratum:
18 to 80 inches—light gray clay

Soil Properties and Qualities

Permeability: Algonquin and Negwegon—very slow; Dorval—moderately slow to moderately rapid in the organic layers, very slow in the underlying clay
Available water capacity: High
Drainage class: Algonquin—somewhat poorly drained; Negwegon—moderately well drained; Dorval—very poorly drained
Seasonal high water table: Algonquin—perched, 0.5 foot to 1.5 feet below the surface at some time from October to May; Negwegon—perched, 2.5 to 3.5 feet below the surface at some time in October or November or in March, April, or May; Dorval—perched, 1.0 foot above to 1.0 foot below the surface at some time from January to December
Surface runoff: Algonquin—high; Negwegon—very high; Dorval—negligible
Flooding: None
Hazard of water erosion: Algonquin and Negwegon—moderate; Dorval—slight
Hazard of soil blowing: Algonquin and Negwegon—slight; Dorval—moderate
Shrink-swell potential: High
Potential for frost action: Algonquin and Dorval—high; Negwegon—moderate

Composition

Negwegon soil and similar soils: 35 to 45 percent
Algonquin soil and similar soils: 25 to 35 percent
Dorval soil and similar soils: 20 to 30 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Allendale soils, which are sandy in the upper part; in landscape positions similar to those of the Algonquin soil
- The poorly drained Wakeley soils, which are sandy in the upper part; in landscape positions similar to those of the Dorval soil
- The poorly drained Springport soils, which do not have an organic surface layer; in landscape positions similar to those of the Dorval soil
- The very poorly drained Lupton soils, which have more than 50 inches of organic material; in landscape positions similar to those of the Dorval soil

Similar inclusions:
- Soils that have more than 50 inches of muck over a clay substratum
- Soils that are well drained
- Soils that have a thin sand cap over clayey lacustrine sediments
- Soils that have 16 to 50 inches of muck over a sandy substratum

Use and Management

Land use: Dominant uses—pasture, cropland; other uses—woodland, building site development

Cropland

Major management concerns: Negwegon and Algonquin—water erosion, tilth of surface layer, very slow permeability, seasonal wetness, compaction; Dorval—ponding
Management considerations:
- Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations that include grasses and legumes, grade-stabilization structures, or a combination of these.
- Growing grasses and legumes for pasture or hay is effective in controlling erosion.
- Crop residue management, green manure crops, applications of manure, cover crops, and conservation tillage help to maintain or improve tilth and increase the available water capacity and the content of organic matter.

• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.
• Both surface and subsurface drainage systems are needed to reduce the wetness of the Algonquin and Dorval soils.
• Lift pumps are needed in areas where adequate drainage outlets are not available.
• Because of the very slow permeability, subsurface drains should be narrowly spaced.
• Because of ponding, the Dorval soil is generally unsuited to cultivated crops.

Pasture

Major management concerns: Negwegon and Algonquin—compaction; Algonquin—seasonal wetness; Dorval—ponding, seasonal wetness
Management considerations:
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
• The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding in areas of the Algonquin soil.
• Because of ponding and year-round wetness, the Dorval soil is generally unsuited to pasture.

Woodland

Major management concerns: All three soils—equipment limitations, windthrow hazard, plant competition; Algonquin and Dorval—seedling mortality
Management considerations:
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Because of low strength, suitable surfacing material is needed on year-round logging roads and landings.
• Access is easiest during periods in winter when access roads are frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Special harvest methods may be needed to control undesirable plants.
• Selective cutting or cutting in strips and leaving seed trees along the edge of the openings, where they can naturally regenerate the area, are desirable measures.
• Special site preparation, such as bedding before planting, can reduce the seedling mortality rate on the Algonquin soil.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Dorval soil.

Buildings

Major management concerns: All three soils—shrink-swell potential, frost action; Algonquin and Negwegon—seasonal wetness; Negwegon—slope; Dorval—ponding, subsidence
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.
• Because of ponding, the Dorval soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: All three soils—very slow permeability; Algonquin and Negwegon—seasonal wetness; Negwegon—slope; Dorval—ponding
Management considerations:
• Because of ponding, the Dorval soil is generally unsuited to septic tank absorption fields.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system lowers the water table.

Interpretive Groups

Land capability classification: Algonquin—IIIw; Negwegon—IIIe; Dorval—Vw
Woodland ordination symbol: Algonquin—6W; Negwegon—3C; Dorval—2W
Michigan soil management group: Algonquin—1.5b; Negwegon—1.5a; Dorval—M/1c

361B—Allendale-Dorval-Blue Lake complex, 0 to 6 percent slopes

Setting

Landform: Lake plains and till plains
Position on the landform: Allendale—the backslopes and toeslopes of low knolls; Dorval—depressions and swales between the low knolls; Blue Lake—the summit and shoulder slopes of the low knolls
Shape of areas: Irregular
Size of areas: 5 to 10 acres

Typical Profile

Allendale

Surface layer:
0 to 11 inches—very dark grayish brown loamy sand

Subsurface layer:
11 to 13 inches—pale brown, mottled sand

Subsoil:
13 to 20 inches—brown, mottled sand
20 to 22 inches—yellowish brown, mottled sand
22 to 25 inches—reddish brown, mottled sandy loam
25 to 44 inches—reddish brown, mottled silty clay

Substratum:
44 to 80 inches—reddish brown, mottled silty clay

Dorval

Surface layer:
0 to 18 inches—black muck

Substratum:
18 to 80 inches—light gray clay

Blue Lake

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—brown sand
15 to 25 inches—yellowish brown sand
25 to 80 inches—light yellowish brown sand with bands of strong brown sandy loam

Soil Properties and Qualities

Permeability: Allendale—rapid in the sandy upper part, very slow in the clayey lower part; Dorval—moderately slow to moderately rapid in organic layers, very slow in the underlying clay; Blue Lake—moderately rapid
Available water capacity: Allendale—moderate; Dorval—high; Blue Lake—low
Drainage class: Allendale—somewhat poorly drained; Dorval—very poorly drained; Blue Lake—well drained
Seasonal high water table: Allendale—perched, 0.5 foot to 2.5 feet below the surface at some time from September to May; Dorval—perched 1.0 foot above to 1.0 foot below the surface at some time from January to December; Blue Lake—at a depth of more than 6 feet
Surface runoff: Allendale—very low; Dorval and Blue Lake—negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Allendale and Dorval—moderate; Blue Lake—severe
Shrink-swell potential: Allendale—high in the subsoil and substratum; Dorval—high in the clayey substratum; Blue Lake—low
Potential for frost action: Allendale—moderate; Dorval—high; Blue Lake—low

Composition

Allendale soil and similar soils: 35 to 45 percent
Dorval soil and similar soils: 25 to 35 percent
Blue Lake and similar soils: 20 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Chinwhisker soils, which are sandy throughout; in landscape positions similar to or slightly lower than those of the Blue Lake soil
- The poorly drained Wakeley soils, which are sandy in the upper part; in landscape positions similar to those of the Dorval soil
- The poorly drained Springport soils, which have a mineral surface layer; in landscape positions similar to those of the Dorval soil

Similar inclusions:
- Soils that have no bands of loamy sand in the subsoil
- Soils that have a lighter colored subsoil
- Soils that have more than 50 inches of muck over a clayey substratum

Use and Management

Land use: Dominant uses—woodland, pasture; other uses—cropland, building site development

Woodland

Major management concerns: All three soils—

equipment limitations, plant competition; Dorval and Blue Lake—seedling mortality; Allendale and Dorval—windthrow hazard

Management considerations:

• Equipment should be used only when the Allendale and Dorval soils are relatively dry or have an adequate snow cover.

• Because loose sand can interfere with the traction of wheeled equipment, logging roads in areas of the Blue Lake soil should be stabilized.

• Special site preparation, such as bedding before planting, can reduce the seedling mortality rate on the Allendale soil.

• Trees that can withstand seasonal wetness should be selected for planting.

• In areas of the Blue Lake soil, planting seedlings that can withstand droughty conditions can lower the seedling mortality rate. Replanting is needed in some areas.

• In areas of Allendale and Dorval soils, windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

• Special harvest methods may be needed to control undesirable plants.

• Selective cutting or cutting in strips and leaving seed trees along the edge of the openings, where they can naturally regenerate the area, are desirable measures.

Cropland

Major management concerns: Allendale—seasonal wetness, very slow permeability in the subsoil and substratum, soil blowing, tilth of the surface layer; Dorval—ponding, very slow permeability; Blue Lake—soil blowing, seasonal droughtiness, a low content of organic matter in the surface layer

Management considerations:

• Subsurface drains can reduce the wetness of the Allendale and Dorval soils if a suitable outlet is available.

• Because of very slow permeability in the Allendale and Dorval soils, subsurface drains should be narrowly spaced.

• Both surface and subsurface drainage systems are needed to reduce the wetness of Dorval soil. Lift pumps are needed in areas where adequate drainage outlets are not available.

• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing on the Allendale and Blue Lake soils. A permanent plant cover also helps to control soil blowing.

• In areas of the Allendale and Blue lake soils, crop residue management, green manure crops, applications of manure, cover crops, and conservation tillage help to maintain or improve tilth and increase the available water capacity and the content of organic matter.

• Drought-tolerant crops should be selected for planting on the Blue lake soil.

Pasture

Major management concerns: Allendale and Dorval—seasonal wetness; Allendale and Blue Lake—seasonal droughtiness

Management considerations:

• Because of ponding and year-round wetness, the Dorval soil is generally unsuited to pasture

• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Buildings

Major management concerns: Allendale—caving of cutbanks, seasonal wetness, shrink-swell potential, frost action; Dorval—ponding, shrink-swell potential, frost action; Blue Lake—caving of cutbanks

Management considerations:

• Because of ponding, the Dorval soil is generally unsuited to building site development.

• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.

• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.

• In areas of the Allendale and Blue Lake soils, cutbanks are not stable and are subject to caving, trench walls should be reinforced.

• Properly designing and strengthening footings and foundations can help to prevent damage caused by shrinking or by frost action.

Septic tank absorption fields

Major management concerns: Allendale—very slow permeability, wetness, poor filtering capacity; Dorval—ponding, wetness, low strength, very slow permeability

Management considerations:

• Because of ponding and low strength, the Dorval soil is generally unsuited to septic tank absorption fields.

• Filling or mounding with suitable material helps to raise the absorption field above the water table in the Allendale soil.
• A subsurface drainage system lowers the water table in the Allendale soil.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability of the Allendale soil.
• The poor filtering capacity of the Allendale soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.

Interpretive Groups

Land capability classification: Allendale—IIIw; Dorval—Vw; Blue Lake—IIIs
Woodland ordination symbol: Allendale—4W; Dorval—2W; Blue Lake—3S
Michigan soil management group: Allendale—4/1b; Dorval—M/1c; Blue Lake—4a

362D—Millersburg loamy sand, 6 to 18 percent slopes

Setting

Landform: Ground moraines and drumlins
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 3 inches—black loamy sand

Subsurface layer:
3 to 5 inches—grayish brown loamy sand

Subsoil:
5 to 11 inches—strong brown loamy sand
11 to 16 inches—dark yellowish brown loamy sand
16 to 18 inches—grayish brown loamy sand
18 to 27 inches—strong brown sandy clay loam and grayish brown loamy sand
27 to 33 inches—strong brown sandy clay loam

Substratum:
33 to 80 inches—light yellowish brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid or moderate
Available water capacity: Moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Graycalm and well drained Klacking soils, which have less clay in the subsoil and substratum than the Millersburg soil; in positions on the landscape similar to those of the Millersburg soil

Similar inclusions:
• Soils that have darker colors in the upper part of the subsoil
• Soils that are moderately well drained; in the lower areas

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Pasture

Major management concerns: Seasonal droughtiness, overgrazing
Management considerations:
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concern: Plant competition
Management considerations:
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Caving of cutbanks, frost action, slope

Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concern: Slope
Management considerations:
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3A
Michigan soil management group: 3a

362E—Millersburg loamy sand, 18 to 35 percent slopes

Setting

Landform: Ground moraines and drumlins
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 3 inches—black loamy sand

Subsurface layer:
3 to 5 inches—grayish brown loamy sand

Subsoil:
5 to 11 inches—strong brown loamy sand
11 to 16 inches—dark yellowish brown loamy sand
16 to 18 inches—grayish brown loamy sand
18 to 27 inches—strong brown sandy clay loam and grayish brown loamy sand
27 to 33 inches—strong brown sandy clay loam

Substratum:
33 to 80 inches—light yellowish brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderately rapid or moderate
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Graycalm and well drained Klacking soils, which have less clay in the subsoil and substratum than the Millersburg soil; in positions on the landscape similar to those of the Millersburg soil

Similar inclusions:
• Soils that have darker colors in the upper part of the subsoil
• Soils that are moderately well drained; in the lower areas

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Erosion hazard, equipment limitations, plant competition
Management considerations:
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography. The grade should be kept as low as possible.
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Special harvest methods may be needed to control undesirable plants.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

• Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Caving of cutbanks, frost action, slope
Management considerations:
• Because of the slope, this soil is generally unsuited to building site development.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 3a

368A—Au Gres-Deford complex, 0 to 3 percent slopes

Setting

Landform: Lake terraces and outwash plains
Position on the landform: Au Gres—low ridges; Deford—depressions and swales
Shape of areas: Elongated or irregular
Size of areas: 10 to 100 acres

Typical Profile

Au Gres

Organic mat:
0 to 1 inch—partially decomposed leaf litter

Surface layer:
1 to 2 inches—black sand

Subsurface layer:
2 to 10 inches—reddish gray sand

Subsoil:
10 to 14 inches—brown, mottled sand
14 to 28 inches—strong brown, mottled sand
28 to 32 inches—yellowish brown, mottled sand

Substratum:
32 to 80 inches—pale brown, mottled sand

Deford

Surface layer:
0 to 4 inches—black muck
4 to 5 inches—very dark gray sand

Substratum:
5 to 9 inches—gray sand
9 to 40 inches—dark grayish brown sand
40 to 80 inches—grayish brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Au Gres—somewhat poorly drained; Deford—very poorly drained
Depth to a seasonal high water table: Au Gres—apparent, 0.5 foot to 1.5 feet below the surface at some time from October to June; Deford—apparent, 1.0 foot above to 1.0 foot below the surface at some time from September to June
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Au Gres—severe; Deford—moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Au Gres soil and similar soils: 50 to 70 percent
Deford soil and similar soils: 30 to 50 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils in the higher areas on ridges
• The very poorly drained Tawas soils in landscape positions similar to those of the Deford soil

Similar inclusions:
• Soils that have gravel in the substratum
• Soils that have a dark reddish brown, cemented subsoil

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Au Gres and Deford—equipment limitations, windthrow hazard, plant competition; Deford—seedling mortality, wetness

Management considerations:
• Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Landing sites generally can be used only during the driest part of the year.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.
• Special harvest methods may be needed to control undesirable plants.
• If trees are planted on the Au Gres soil, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Because of wetness, severe seedling mortality, and plant competition, trees are generally not planted on the Deford soil.

Buildings

Major management concerns: Au Gres—seasonal wetness, caving of cutbanks; Deford—ponding
Management considerations:
• Because of ponding, the Deford soil is generally unsuited to building site development.
• A surface or subsurface drainage system lowers the water table.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Au Gres—poor filtering capacity, seasonal wetness; Deford—ponding
Management considerations:
• Because of ponding, the Deford soil is generally unsuited to septic tank absorption fields.
• The poor filtering capacity of the Au Gres soil can result in the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: Au Gres—IVw; Deford—Vw
Woodland ordination symbol: Au Gres—6W; Deford—4W
Michigan soil management group: Au Gres—5b; Deford—4c

369—Deford muck

Setting

Landform: Lake plains and outwash plains
Slope: 0 to 2 percent
Shape of areas: Elongated or irregular
Size of areas: 3 to 1,000 acres

Typical Profile

Surface layer:
0 to 4 inches—black muck
4 to 5 inches—very dark gray sand

Substratum:
5 to 9 inches—gray sand
9 to 40 inches—dark grayish brown sand
40 to 80 inches—grayish brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from September to June
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Deford soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils
• The very poorly drained Tawas soils

Similar inclusions:
• Soils that have a surface layer of mucky sand

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, excessive wetness
Management considerations:
• Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Landing sites generally can be used only during the driest part of the year.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.
• Special harvest methods may be needed to control undesirable plants.
• Because of wetness, severe seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 4W
Michigan soil management group: 4c

371—Springport silt loam

Setting

Landform: Depressions on lake plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 15 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark gray, mottled silt loam

Subsurface layer:
9 to 13 inches—light brownish gray, mottled silty clay loam

Subsoil:
13 to 35 inches—reddish brown, mottled silty clay

Substratum:
35 to 60 inches—light reddish brown, mottled silty clay
60 to 80 inches—reddish brown, mottled silty clay loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Very slow
Available water capacity: High
Drainage class: Poorly drained
Seasonal high water table: Perched, 1.0 foot above to 1.5 feet below the surface at some time from September to May
Surface runoff rate: High
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Negwegon soils in the higher areas
• The somewhat poorly drained Algonquin soils in the slightly higher areas

Similar inclusions:
• Soils that have a mucky surface layer

Use and Management

Land use: Dominant uses—woodland, pasture; other uses—cropland, building site development

Cropland

Major management concerns: Seasonal wetness, tilth of the surface layer, soil compaction, very slow permeability, ponding
Management considerations:
• Excess water can be removed by open ditches, subsurface drains, pumps, or a combination of these.
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Because of the very slow permeability, subsurface drains should be narrowly spaced.

• Shallow surface ditches help to remove surface water after heavy rains.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
• Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 6W
Michigan soil management group: 1.5c

373B—Grayling sand, very deep water table, 0 to 6 percent slopes

Setting

Landform: Ridges on lake plains
Shape of areas: Elongated
Size of areas: 50 to 1,000 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsurface layer:
2 to 3 inches—brown sand

Subsoil:
3 to 8 inches—strong brown sand
8 to 15 inches—yellowish brown sand

Substratum:
15 to 80 inches—light yellowish brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: Apparent, 6 to 15 feet below the surface all year
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils
• The moderately well drained Croswell soils

Similar inclusions:
• Soils that have a surface layer of fine sand

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Seedling mortality, seasonal droughtiness, equipment limitations
Management considerations:
• Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.

Buildings

Major management concern: Caving of cutbanks
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concern: Poor filtering capacity
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.7a

374—Thunderbay very fine sandy loam, frequently flooded

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 10 to 200 acres

Typical Profile

Surface layer:
0 to 7 inches—black very fine sandy loam
7 to 14 inches—very dark grayish brown, mottled very fine sandy loam

Substratum:
14 to 19 inches—dark gray, mottled loam
19 to 24 inches—very dark gray, mottled silt loam stratified with brown, mottled sand
24 to 31 inches—grayish brown, mottled sand
31 to 80 inches—greenish gray, mottled sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: Apparent, within a depth of 1.5 feet at some time from January to December
Surface runoff: Negligible
Flooding: Frequent
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

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

Inclusions

Contrasting inclusions:
• The very poorly drained Tawas soils in swales

Similar inclusions:
• Soils that have a surface layer of loamy fine sand
• Soils that have a surface layer of silt loam

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seasonal wetness, seedling mortality, plant competition, windthrow hazard
Management considerations:
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.
• Carefully managed reforestation helps to control undesirable understory plants.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

Major management concern: Seasonal flooding
Management considerations:
• Because of flooding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Seasonal flooding
Management considerations:
• Because of flooding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: 2W
Michigan soil management group: L-2c

376A—Urban land-Udipsamments, deep water table, complex, 0 to 3 percent slopes

Setting

Landform: Level and nearly level lake plains
Shape of areas: Irregular
Size of areas: 20 to 600 acres

Typical Profile

Udipsamments

Surface layer:
0 to 4 inches—very dark gray sand

Substratum:
4 to 42 inches—brownish yellow fine sand and sand
42 to 80 inches—pale brown, mottled fine sand and sand

Soil Properties and Qualities

Udipsamments

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: Apparent, 3.5 to 6.0 feet from the surface all year
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Urban land: 60 to 80 percent
Udipsamments and similar soils: 20 to 40 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils in depressions
• The very poorly drained Tawas soils in depressions

Similar inclusions:
• Soils that have a surface layer of fine sand
• Soils that have a surface layer of loamy sand

Use and Management

Land use: Urban land—streets, parking lots, buildings, and other structures; Udipsamments—yards

Gardens, lawns, and environmental plantings

Major management concerns: Udipsamments—seasonal droughtiness, soil blowing
Management considerations:
• The perennial plants that can withstand the droughtiness should be selected for planting.
• A good plant cover and mulch can help to control soil blowing.

Buildings

Major management concerns: Udipsamments—caving of cutbanks, seasonal wetness
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Udipsamments—poor filtering capacity, seasonal high water table
Management considerations:
• Sanitary facilities should be connected to public sewers and sewage-treatment facilities.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

380—Access denied

Shape of areas: Rectangular
Size of areas: 10 to 320 acres

Composition

Unknown

Use and Management

Management considerations:
• Access was denied; therefore no interpretations are given for these areas. Onsite investigation is needed.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

392—Caffey mucky sand

Setting

Landform: Lake plains, outwash plains, and deltas
Shape of areas: Irregular
Size of areas: 5 to 10 acres

Typical Profile

Surface layer:
0 to 9 inches—black mucky sand

Subsoil:
9 to 14 inches—dark grayish brown sand
14 to 21 inches—light yellowish brown, mottled sand

Substratum:
21 to 50 inches—pale brown, mottled, calcareous, stratified very fine sand to silty clay loam
50 to 80 inches—light brownish gray, mottled, calcareous very fine sand and silt

Soil Properties and Qualities

Permeability: Rapid or moderately rapid in the sandy upper part of the profile, moderately slow in the loamy lower part
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from September to June
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Deford and Wakeley soils, which have a sandy substratum; in landscape positions similar to those of the Caffey soil

Similar inclusions:
• Soils that have a thick, dark mineral surface layer
• Soils that have a loamy, stratified subsoil

Use and Management

Land use: Dominant use—woodland; other use—pasture

Pasture

Major management concerns: Overgrazing, seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Seasonal wetness, equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Skidders should not be used during wet periods, when ruts form easily.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced

and by such harvest methods as selective cutting and strip cutting.
• Special harvest methods may be needed to control undesirable plants.
• Selective cutting or cutting in strips and leaving seed trees along the edge of the openings, where they can naturally regenerate the area, are desirable measures.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 2W
Michigan soil management group: 4/2c

393B—Morganlake loamy sand, 0 to 6 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 6 inches—reddish gray loamy sand

Subsoil:
6 to 19 inches—brown loamy sand
19 to 34 inches—yellowish brown sand
34 to 37 inches—pinkish gray fine sandy loam and reddish brown, mottled loam
37 to 43 inches—reddish brown, mottled loam

Substratum:
43 to 80 inches—reddish brown, mottled fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid in the sandy material, moderately slow in the underlying loamy material
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.0 feet below the surface at some time in September, October, or November or in March, April, or May
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Low

Composition

Morganlake soil and similar soils: 85 to 100 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Ossineke soils; in positions on the landscape similar to those of the Morganlake soil

Similar inclusions:
• Soils that are well drained
• Soils that have more clay in the subsoil

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: A low content of organic matter, soil blowing
Management considerations:
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• Drought-tolerant crops should be selected for planting, or the soil should be irrigated.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concern: Plant competition
Management considerations:
• Exposing the soil just prior to the production of a seed crop, or prior to artificial seeding, can help desirable tree seedlings to become established quickly and to compete better with undesirable vegetation.
• Carefully managed reforestation helps to control undesirable understory plants.
• Species preference can be managed by selective cutting.

Buildings

Major management concerns: Caving of cutbanks, seasonal wetness, shrink-swell potential
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Moderately slow permeability, seasonal wetness
Management considerations:
- Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
- Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 6S
Michigan soil management group: 4/2a

393C—Morganlake loamy sand, 6 to 12 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 6 inches—reddish gray loamy sand

Subsoil:
6 to 19 inches—brown loamy sand
19 to 34 inches—yellowish brown sand
34 to 37 inches—pinkish gray fine sandy loam and reddish brown, mottled loam
37 to 43 inches—reddish brown, mottled loam

Substratum:
43 to 80 inches—reddish brown, mottled fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid in the sandy material, moderately slow in the underlying loamy material
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.0 feet below the surface at some time in September, October, or November or in March, April, or May
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Low

Composition

Morganlake soil and similar soils: 85 to 100 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Ossineke soils; in positions on the landscape similar to those of the Morganlake soil

Similar inclusions:
- Soils that are well drained
- Soils that have more clay in the subsoil

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: A low content of organic matter, soil blowing, water erosion
Management considerations:
- Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.
- Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
- Crop residue management and a cropping sequence that includes close-growing crops help to control water erosion.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concern: Plant competition
Management considerations:
• Exposing the soil just prior to the production of a seed crop, or prior to artificial seeding, can help desirable tree seedlings to become established quickly and to compete better with undesirable vegetation.
• Carefully managed reforestation helps to control undesirable understory plants.
• Species preference can be managed by selective cutting.

Buildings

Major management concerns: Caving of cutbanks, seasonal wetness, shrink-swell potential, slope
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Moderately slow permeability, seasonal wetness, slope
Management considerations:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 6S
Michigan soil management group: 4/2a

396F—Proper-Deford-Rousseau complex, 0 to 40 percent slopes

Setting

Landform: Dunes on lake terraces
Position on the landform: Proper—the gently undulating, lower side slopes of dunes; Deford—level areas between dunes; Rousseau—the rolling to very steep side slopes of dunes
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Typical Profile

Proper

Surface layer:
0 to 3 inches—very dark gray fine sand

Subsurface layer:
3 to 11 inches—pinkish gray fine sand

Subsoil:
11 to 14 inches—dark brown fine sand
14 to 19 inches—strong brown fine sand
19 to 24 inches—reddish yellow fine sand
24 to 41 inches—brown, mottled fine sand

Substratum:
41 to 80 inches—light yellowish brown, mottled fine sand

Deford

Surface layer:
0 to 4 inches—black muck

Subsurface layer:
4 to 5 inches—very dark gray sand

Substratum:
5 to 9 inches—gray sand
9 to 40 inches—dark grayish brown sand
40 to 80 inches—grayish brown sand

Rousseau

Organic mat:
0 to 1 inch—dark reddish brown, undecomposed leaf litter

Surface layer:
1 to 3 inches—very dark gray fine sand

Subsurface layer:
3 to 6 inches—grayish brown fine sand

Subsoil:
6 to 10 inches—brown fine sand
10 to 23 inches—strong brown fine sand
23 to 37 inches—yellowish brown fine sand

Substratum:
37 to 80 inches—yellowish brown fine sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Proper—moderately rapid in the cemented layer, rapid in the rest of the profile; Deford and Rousseau—rapid
Available water capacity: Low
Drainage class: Proper—moderately well drained; Deford—very poorly drained; Rousseau—well drained
Depth to a seasonal high water table: Proper—apparent, 2 to 4 feet below the surface at some time in October, November, or December or from March to June; Deford—apparent, 1 foot above to 1 below the surface at some time from September to June; Rousseau—at a depth of more than 6 feet
Surface runoff: Proper and Deford—negligible; Rousseau—low
Flooding: None
Hazard of water erosion: Proper and Deford—slight; Rousseau—severe
Hazard of soil blowing: Proper and Rousseau—severe; Deford—moderate
Shrink-swell potential: Low
Potential for frost action: Proper and Rousseau—low; Deford—moderate

Composition

Proper soil and similar soils: 40 to 60 percent
Deford soil and similar soils: 15 to 20 percent
Rousseau soil and similar soils: 15 to 20 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Finch soils on the sides of depressions
- The very poorly drained Tawas soils in deep depressions

Similar inclusions:
- Moderately well drained soils that have less than 50 percent ortstein
- Well drained soils that have medium sand

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Proper and Deford—seasonal wetness, windthrow hazard; Proper and Rousseau—seasonal droughtiness, equipment limitations, seedling mortality; Rousseau—slope, erosion hazard
Management considerations:
- Because of the slope of the Rousseau soil, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography. The grade should be kept as low as possible on the Proper soil.
- Constructing logging roads at midslope results in excessive cutting and filling, which increase the risk of erosion on the Rousseau soil.
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.
- Southern exposures may have a higher seedling mortality rate than northern exposures.
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system on the Proper and Deford soils.
- Trees that can withstand seasonal wetness should be selected for planting on the Proper and Deford soils.

Buildings

Major management concerns: Proper—caving of cutbanks, seasonal wetness; Deford—ponding; Rousseau—slope, caving of cutbanks
Management considerations:
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table in the Proper soil.
- Because cutbanks are not stable and are subject to caving, trench walls in areas of the Proper and Rousseau soils should be reinforced.
- Because of ponding, the Deford soil is generally unsuited to building site development.
- Because of the slope, the Rousseau soil is poorly suited to building site development without extensive land shaping.

Septic tank absorption fields

Major management concerns: All three soils—poor filtering capacity; Proper—seasonal wetness; Deford—ponding; Rousseau—slope

Management considerations:

• Filling or mounding with suitable material helps to raise the absorption field above the water table in the Proper soil.

• The poor filtering capacity of all three soils can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.

• Because of ponding, the Deford soil is generally unsuited to septic tank absorption fields.

• Because of the slope, the Rousseau soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Proper—IVs; Deford—Vw; Rousseau—VIe

Woodland ordination symbol: Proper—5W; Deford—4W; Rousseau—5S

Michigan soil management group: Proper—5b-h; Deford—4c; Rousseau—4a

397—Spot peat

Setting

Landform: Depressions on lake plains
Shape of areas: Irregular
Slope: 0 to 2 percent
Size of areas: 3 to 10 acres

Typical Profile

Surface layer:
0 to 3 inches—dark reddish brown peat

Subsurface layer:
3 to 6 inches—black muck
6 to 13 inches—gray and light brownish gray, mottled sand

Subsoil:
13 to 15 inches—brown sand
15 to 21 inches—dark brown, cemented sand
21 to 28 inches—brown sand

Substratum:
28 to 80 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid in the sandy part of the subsurface layer and in the substratum, moderate or moderately rapid in the cemented part of the subsoil
Available water capacity: Low
Drainage class: Poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from September to June
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:

• The somewhat poorly drained Finch soils on low ridges and at the edges of the map unit

• The somewhat poorly drained Au Gres soils on low ridges

Similar inclusions:

• Soils that are very poorly drained

Use and Management

Land use: Wetland wildlife habitat

Management considerations:

• Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 2W
Michigan soil management group: 5c-h

414B—Namur channery silt loam, 0 to 6 percent slopes

Setting

Landform: Karst plains and bedrock benches
Shape of areas: Irregular
Size of areas: 3 to 1,000 acres

Typical Profile

Surface layer:
0 to 5 inches—dark brown channery silt loam

Bedrock:
5 to 9 inches—gray karst limestone

Soil Properties and Qualities

Depth class: Very shallow
Permeability: Moderate in the surface layer, slow to very rapid in the limestone bedrock
Available water capacity: Low
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• Rock outcrop on slight rises and narrow ridges
• The well drained Summerville soils on the lower side slopes

Similar inclusions:
• Soils that have a thin, light colored substratum
• Soils that have more than 35 percent channers in the surface layer

Use and Management

Land use: Dominant use—idle cropland; other uses—woodland, building site development

Cropland

Major management concerns: Very shallow depth to bedrock, nutrient and pesticide loss, seasonal droughtiness
Management considerations:
• Because of the need for protection of ground water, nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
• Including grasses and legumes in the crop rotation can reduce nutrient losses, improve soil structure, and provide nitrogen for use by succeeding crops.
• Integrated pest management, such as scouting and bio-control methods, can help to prevent the leaching of pesticides.
• The rate of water intake can be increased by growing cover crops, leaving crop residue on the surface, and regularly adding other organic material.

Pasture

Major management concern: Seasonal droughtiness
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: Rooting depth, equipment limitations, seasonal droughtiness, windthrow hazard
Management considerations:
• Because of the very shallow depth to bedrock, planting is not practical on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Nearly level areas should be selected as sites for landings.

Buildings

Major management concern: Very shallow depth to bedrock
Management considerations:
• Excavation is hampered by the depth to bedrock.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the bedrock.

Septic tank absorption fields

Major management concern: Very shallow depth to bedrock
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the bedrock.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 2D
Michigan soil management group: Ra

415A—Potagannissing silt loam, 0 to 3 percent slopes

Setting

Landform: Karst plains and glacial lake benches
Shape of areas: Irregular
Size of areas: 3 to 500 acres

Typical Profile

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

Subsurface layer:
6 to 9 inches—brown, mottled very flaggy silt loam

Bedrock:
9 to 11 inches—limestone

Soil Properties and Qualities

Depth class: Very shallow
Permeability: Moderate in the surface layer and subsurface layer, very slow in the limestone bedrock
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, within a depth of 0.7 foot at some time in October or November or in March, April, or May
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: High

Composition

Potagannissing soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The well drained Namur soils in the higher areas

Similar inclusions:
• Soils that have a sandy surface layer

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Very shallow depth to bedrock, seasonal wetness, windthrow hazard
Management considerations:
• Because of the very shallow depth to bedrock, planting is not practical on this soil.
• The depth to bedrock should be considered when sites for logging roads and landings are selected.
• Skidders should not be used during wet periods, when ruts form easily.
• Landing sites generally can be used only during the driest part of the year.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

Major management concerns: Very shallow depth to bedrock, seasonal wetness
Management considerations:
• Excavation is hampered by the very shallow depth to bedrock.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Very slow permeability, seasonal wetness
Management considerations:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 3W
Michigan soil management group: Rbc

416B—Negwegon silt loam, till substratum, 2 to 6 percent slopes

Setting

Landform: Nearly level and gently sloping lake plains, some of which are till floored
Shape of areas: Irregular
Size of areas: 3 to 150 acres

Typical Profile

Surface layer:
0 to 9 inches—brown silt loam

Subsurface layer:
9 to 12 inches—brown silt loam

Subsoil:
12 to 14 inches—reddish brown silty clay and brown silt loam
14 to 21 inches—reddish brown, mottled silty clay
21 to 62 inches—reddish brown silty clay

Substratum:
62 to 80 inches—brown loam

Soil Properties and Qualities

Depth class: Very deep

Permeability: Moderate in the surface layer, subsurface layer, and substratum, very slow in the subsoil
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.5 feet below the surface at some time in October or November or in March, April, or May
Surface runoff rate: Very high
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

Negwegon, till substratum, and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Algonquin soils that have a till substratum; in the lower areas

Similar inclusions:
- Soils that have thinner clayey layers over glacial till

Use and Management

Land use: Dominant use—cropland; other uses—pasture, woodland, building site development

Cropland

Major management concerns: Slow permeability, seasonal wetness, erosion
Management considerations:
- Most climatically adapted crops can be grown if an adequate drainage system is installed.
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Because of the very slow permeability, subsurface drains should be narrowly spaced.
- Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.

Pasture

Major management concerns: Overgrazing, seasonal wetness
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard
Management considerations:
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Skidders should not be used during wet periods, when ruts form easily.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

Major management concerns: Seasonal wetness, shrink-swell potential, frost action
Management considerations:
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.

Septic tank absorption fields

Major management concerns: Seasonal wetness, very slow permeability
Management considerations:
- Filling or mounding with suitable material helps to raise the absorption field above the water table.
- Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
- Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3C
Michigan soil management group: 1.5a

417B—Alpena gravelly sandy loam, 0 to 6 percent slopes

Setting

Landform: Lake terraces and beach ridges
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 6 inches—black gravelly sandy loam

Substratum:
6 to 80 inches—brown extremely gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Very rapid
Available water capacity: Low
Drainage class: Excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Alpena soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils in the lower areas

Similar inclusions:
• Soils that do not have a dark surface layer

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Pasture

Major management concern: Seasonal droughtiness
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Gravel in the surface layer, seasonal droughtiness
Management considerations:
• Because of the content of gravel, machine planting is not practical on this soil.
• Planting when the soil is moist can reduce the seedling mortality rate.

Buildings

Major management concern: Caving of cutbanks
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concern: Poor filtering capacity
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3F
Michigan soil management group: Ga

417C—Alpena gravelly sandy loam, 6 to 12 percent slopes

Setting

Landform: Lake terraces and beach ridges
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 6 inches—black gravelly sandy loam

Substratum:
6 to 80 inches—brown extremely gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Very rapid
Available water capacity: Low
Drainage class: Excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Alpena soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils in the lower areas

Similar inclusions:
• Soils that do not have a dark surface layer

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Pasture

Major management concern: Seasonal droughtiness
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Gravel in the surface layer, seasonal droughtiness
Management considerations:
• Because of the content of gravel, machine planting is not practical on this soil.
• Planting when the soil is moist can reduce the seedling mortality rate.

Buildings

Major management concerns: Caving of cutbanks, slope
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, slope
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3F
Michigan soil management group: Ga

418E—Alpena gravelly sandy loam, esker, 18 to 35 percent slopes

Setting

Landform: Eskers
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 6 inches—black gravelly sandy loam

Substratum:
6 to 80 inches—brown extremely gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Very rapid
Available water capacity: Low
Drainage class: Excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Alpena soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Coppler soils in landscape positions similar to those of the Alpena soil

Similar inclusions:
• Soils that do not have a dark surface layer

Use and Management

Land use: Woodland

Woodland

Major management concerns: Slope, equipment limitations, erosion hazard, gravel in the surface layer, seasonal droughtiness

Management considerations:
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography. The grade should be kept as low as possible.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Because of the content of gravel, machine planting is not practical on this soil.
• Planting when the soil is moist can reduce the seedling mortality rate.

Buildings

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 3F
Michigan soil management group: Ga

419—Chippeny muck

Setting

Landform: Depressions on karst plains and glacial lake benches
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 4 inches—black muck

Subsurface layer:
4 to 19 inches—black muck

Substratum:
19 to 24 inches—light olive brown, mottled very channery silt loam

Bedrock:
24 to 26 inches—gray, fractured limestone

Soil Properties and Qualities

Depth class: Moderately deep
Permeability: Moderately slow in the muck, moderate in the very channery silt loam, moderately slow in the limestone bedrock
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January to December
Surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the substratum
Potential for frost action: High

Composition

Chippeny soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Lupton soils in landscape positions similar to those of the Chippeny soil

Similar inclusions:
• Soils that have sand in the substratum
• Soils that have marl in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seasonal wetness, windthrow hazard, seedling mortality, plant competition
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of wetness, seedling mortality, and plant

competition, trees are generally not planted on this soil.

Buildings

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: 4W
Michigan soil management group: M/Rc

420A—Otisco mucky sand, 0 to 3 percent slopes

Setting

Landform: Outwash plains, lake plains, and moraines
Shape of areas: Linear or irregular
Size of areas: 5 to 10 acres

Typical Profile

Surface layer:
0 to 5 inches—black mucky sand

Subsurface layer:
5 to 10 inches—light brownish gray, mottled sand

Subsoil:
10 to 25 inches—dark brown, mottled sand
25 to 38 inches—light yellowish brown, mottled sand
38 to 45 inches—light yellowish brown, mottled sand with bands of brown, mottled loamy sand
45 to 60 inches—brown, mottled loamy sand

Substratum:
60 to 80 inches—light brown, calcareous sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 1.5 feet below the surface at some time from October to June
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The very poorly drained Deford and Tawas soils, which have less clay in the substratum than the Otisco soil; in depressions and drainageways
• The moderately well drained Chinwhisker and Croswell soils on slight rises and low knolls

Similar inclusions:
• Soils that have less clay in the subsoil and substratum
• Soils that have a surface layer of loamy sand or mucky loamy sand
• Soils that have bands of gravelly loamy sand and gravelly sand in the substratum

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Seasonal wetness, equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Skidders should not be used during wet periods, when ruts form easily.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Trees that can withstand seasonal wetness should be selected for planting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Special harvest methods may be needed to control undesirable plants.
• Carefully managed reforestation helps to control undesirable understory plants.
• Selective cutting or cutting in strips and leaving seed trees along the edge of the openings, where they

can naturally regenerate the area, are desirable measures.

Buildings

Major management concerns: Seasonal wetness, frost action, caving of cutbanks
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, seasonal wetness
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system lowers the water table.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: None assigned
Michigan soil management group: 4b

424B—Morganlake-Ossineke, sandy substratum-Blue Lake complex, 0 to 6 percent slopes

Setting

Landform: Moraines, some of which are disintegration moraines
Shape of areas: Irregular
Size of areas: 5 to 10 acres

Typical Profile

Morganlake

Organic mat:
0 to 4 inches—well decomposed forest litter

Surface layer:
4 to 8 inches—brown loamy sand

Subsoil:
8 to 17 inches—dark brown and dark reddish brown loamy sand
17 to 32 inches—pinkish gray, mottled loamy sand and yellowish red, mottled sandy clay loam
32 to 36 inches—yellowish red clay loam and pinkish gray loamy sand
36 to 43 inches—yellowish red sandy clay loam
43 to 46 inches—reddish brown silty clay loam
46 to 66 inches—reddish brown, calcareous sandy loam

Substratum:
66 to 80 inches—light reddish brown, calcareous loam

Ossineke, sandy substratum

Surface layer:
0 to 8 inches—very dark grayish brown fine sandy loam

Subsoil:
8 to 13 inches—dark brown sandy loam
13 to 21 inches—dark reddish brown sandy clay loam and brown sandy loam
21 to 38 inches—dark reddish brown, mottled sandy clay loam
38 to 51 inches—brown sandy loam

Substratum:
51 to 77 inches—brown, calcareous sandy loam
77 to 80 inches—yellowish brown, calcareous sand

Blue Lake

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—brown sand
15 to 25 inches—yellowish brown sand
25 to 80 inches—light yellowish brown sand that has bands of strong brown sandy loam

Soil Properties and Qualities

Permeability: Morganlake—rapid in the sandy material, moderately slow in the loamy underlying material; Ossineke, sandy substratum—slow; Blue Lake—moderately rapid
Available water capacity: Morganlake—moderate; Ossineke, sandy substratum—high; Blue Lake—low

Drainage class: Morganlake and Ossineke, sandy substratum—moderately well drained; Blue Lake—well drained
Depth to a seasonal high water table: Morganlake—perched, 2.5 to 3.0 feet below the surface at some time in September, October, or November or in March, April, or May; Ossineke, sandy substratum—perched, 1.5 to 3.5 feet below the surface at some time in October or November or in March, April, or May; Blue Lake—at a depth of more than 6.0 feet
Surface runoff: Morganlake and Blue Lake—negligible; Ossineke, sandy substratum—medium
Flooding: None
Hazard of water erosion: Morganlake and Blue Lake—slight; Ossineke, sandy substratum—moderate
Hazard of soil blowing: Morganlake—moderate; Ossineke, sandy substratum—slight; Blue Lake—severe
Shrink-swell potential: Morganlake—moderate; Ossineke, sandy substratum—low in the upper part of the profile, moderate in the lower part; Blue Lake—low
Potential for frost action: Morganlake and Blue Lake—low; Ossineke, sandy substratum—moderate

Composition

Morganlake soil and similar soils: 30 to 45 percent
Ossineke, sandy substratum, and similar soils: 25 to 35 percent
Blue Lake soil and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Coppler soils, which have gravel in the subsoil and substratum; in landscape positions similar to those of the major soils
• The excessively drained Rubicon soils, which are sandy throughout; in landscape positions similar to those of the major soils
• The poorly drained Lupton and Tawas soils in closed depressions

Similar inclusions:
• Soils that have a lighter colored subsoil
• Soils in which the total thickness of the loamy sand bands is less than 6 inches

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Woodland

Major management concerns: All three soils—plant competition; Blue Lake—equipment limitations, seedling mortality; Ossineke, sandy substratum—equipment limitations, windthrow hazard
Management considerations:
• Because of low strength in the Ossineke soil, suitable surfacing material is needed on year-round logging roads and landings.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because loose sand in the Blue Lake soil can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the Blue Lake soil is moist can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions in the Blue Lake soil can lower the seedling mortality rate. Replanting is needed in some areas.
• Special harvest methods may be needed to control undesirable plants.
• Competing vegetation generally can be controlled by mechanical means.
• If trees are planted, site preparation by mechanical or chemical means is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Carefully managed reforestation helps to control undesirable understory plants.
• Selective cutting or cutting in strips and leaving seed trees along the edge of the openings, where they can naturally regenerate the area, are desirable measures.

Cropland

Major management concerns: Water erosion, soil compaction, a low content of organic matter, seasonal droughtiness, soil blowing
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• A system of conservation tillage that leaves crop residue on the surface helps to control water erosion, helps to prevent crusting during periods of heavy rainfall, and increases the rate of water infiltration.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.

• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture and in reducing the hazard of soil blowing.
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.

Pasture

Major management concerns: Compaction, seasonal droughtiness, overgrazing
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Buildings

Major management concerns: Morganlake and Blue Lake—caving of cutbanks; Morganlake and Ossineke, sandy substratum—seasonal wetness; Ossineke, sandy substratum—shrink-swell potential
Management considerations:
• Because cutbanks in areas of the Morganlake and Blue Lake soils are not stable and are subject to caving, trench walls should be reinforced.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concern: Morganlake and Ossineke, sandy substratum—restricted permeability
Management considerations:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: Morganlake and Blue Lake—IIIs; Ossineke, sandy substratum—IIIe
Woodland ordination symbol: Morganlake—6S; Ossineke, sandy substratum—4; Blue Lake—3S
Michigan soil management group: Morganlake—4/2a; Ossineke, sandy substratum—3a; Blue Lake—4a

424C—Morganlake-Ossineke, sandy substratum-Blue Lake complex, 6 to 12 percent slopes

Setting

Landform: Moraines, some of which are disintegration moraines
Shape of areas: Irregular
Size of areas: 5 to 650 acres

Typical Profile

Morganlake

Organic mat:
0 to 4 inches—well decomposed forest litter

Surface layer:
4 to 8 inches—brown loamy sand

Subsoil:
8 to 17 inches—dark brown and dark reddish brown loamy sand
17 to 32 inches—pinkish gray, mottled loamy sand and yellowish red, mottled sandy clay loam
32 to 36 inches—yellowish red clay loam and pinkish gray loamy sand
36 to 43 inches—yellowish red sandy clay loam
43 to 46 inches—reddish brown silty clay loam
46 to 66 inches—reddish brown, calcareous sandy loam

Substratum:
66 to 80 inches—light reddish brown, calcareous loam

Ossineke, sandy substratum

Surface layer:
0 to 8 inches—very dark grayish brown fine sandy loam

Subsoil:
8 to 13 inches—dark brown sandy loam
13 to 21 inches—dark reddish brown sandy clay loam and brown sandy loam
21 to 38 inches—dark reddish brown, mottled sandy clay loam
38 to 51 inches—brown sandy loam

Substratum:
51 to 77 inches—brown, calcareous sandy loam
77 to 80 inches—yellowish brown, calcareous sand

Blue Lake

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—brown sand
15 to 25 inches—yellowish brown sand
25 to 80 inches—light yellowish brown sand that has bands of strong brown sandy loam

Soil Properties and Qualities

Permeability: Morganlake—rapid in the sandy material, moderately slow in the loamy underlying material; Ossineke, sandy substratum—slow; Blue Lake—moderately rapid
Available water capacity: Morganlake—moderate; Ossineke, sandy substratum—high; Blue Lake—low
Drainage class: Morganlake and Ossineke, sandy substratum—moderately well drained; Blue Lake—well drained
Depth to a seasonal high water table: Morganlake—perched, 2.5 to 3.0 feet below the surface at some time in September, October, or November or in March, April, or May; Ossineke, sandy substratum—perched, 1.5 to 3.5 feet below the surface at some time in October or November or in March, April, or May; Blue Lake—at a depth of more than 6.0 feet
Surface runoff rate: Morganlake and Blue Lake—very low; Ossineke, sandy substratum—high
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Morganlake—moderate; Ossineke, sandy substratum—slight; Blue Lake—severe
Shrink-swell potential: Morganlake—moderate; Ossineke, sandy substratum—low in the upper part of the profile, moderate in the lower part; Blue Lake—low
Potential for frost action: Morganlake and Blue Lake—low; Ossineke, sandy substratum—moderate

Composition

Morganlake soil and similar soils: 30 to 45 percent
Ossineke, sandy substratum, and similar soils: 25 to 35 percent
Blue Lake soil and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Coppler soils, which have gravel in the subsoil and substratum; in landscape positions similar to those of the major soils
• The excessively drained Rubicon soils, which are sandy throughout; in landscape positions similar to those of the major soils
• The poorly drained Lupton and Tawas soils in closed depressions

Similar inclusions:
• Soils that have a lighter colored subsoil
• Soils in which the total thickness of the loamy sand bands is less than 6 inches

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Woodland

Major management concerns: All three soils—plant competition; Blue Lake—equipment limitations, seedling mortality; Ossineke, sandy substratum—equipment limitations, windthrow hazard
Management considerations:
• Because of low strength in the Ossineke, sandy substratum, suitable surfacing material is needed on year-round logging roads and landings.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because loose sand in the Blue Lake soil can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the Blue Lake soil is moist can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions in the Blue Lake soil can lower the seedling mortality rate. Replanting is needed in some areas.
• Special harvest methods may be needed to control undesirable plants.
• Competing vegetation generally can be controlled by mechanical means.
• If trees are planted, site preparation by mechanical or chemical means is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Carefully managed reforestation helps to control undesirable understory plants.
• Selective cutting or cutting in strips and leaving seed

trees along the edge of the openings, where they can naturally regenerate the area, are desirable measures.

Cropland

Major management concerns: Water erosion, soil compaction, a low content of organic matter, seasonal droughtiness, soil blowing
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• A system of conservation tillage that leaves crop residue on the surface helps to control water erosion, helps to prevent crusting during periods of heavy rainfall, and increases the rate of water infiltration.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture and in reducing the hazard of soil blowing.
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.

Pasture

Major management concerns: Compaction, seasonal droughtiness, overgrazing
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Buildings

Major management concerns: All three soils—slope; Morganlake and Blue Lake—caving of cutbanks; Morganlake and Ossineke, sandy substratum—seasonal wetness; Ossineke, sandy substratum—shrink-swell potential
Management considerations:
• Because cutbanks in areas of the Morganlake and Blue Lake soils are not stable and are subject to caving, trench walls should be reinforced.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: All three soils—slope; Morganlake and Blue Lake—restricted permeability
Management considerations:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: Morganlake—6S; Ossineke, sandy substratum—4; Blue Lake—3S
Michigan soil management group: Morganlake—4/2a; Ossineke, sandy substratum—3a; Blue Lake—4a

426B—Coppler loamy sand, 0 to 6 percent slopes

Setting

Landform: Stream terraces and glacial drainageways
Shape of areas: Irregular
Size of areas: 3 to 500 acres

Typical Profile

Surface layer:
0 to 3 inches—black loamy sand

Subsurface layer:
3 to 4 inches—brown loamy sand

Subsoil:
4 to 14 inches—brown loamy sand
14 to 21 inches—brown gravelly loamy sand
21 to 26 inches—reddish brown very gravelly sandy loam

Substratum:
26 to 80 inches—yellowish brown, stratified gravelly sand and very gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the surface layer and subsoil, very rapid in the substratum
Available water capacity: Low
Drainage class: Somewhat excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Graycalm and well drained Klacking soils, which do not have very gravelly sand in the substratum; in landscape positions similar to those of the Coppler soil
- The well drained McGinn soils, which have a loamy substratum; in landscape positions similar to those of the Coppler soil

Similar inclusions:
- Soils that are moderately well drained
- Soils that do not have a loamy layer in the subsoil

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Seasonal droughtiness, soil blowing, a low content of organic matter, a limited available water capacity, nutrient loss
Management considerations:
- Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
- Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.
- Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
- Increasing the content of organic matter in the root zone may improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.

Pasture

Major management concerns: Seasonal droughtiness, soil blowing, overgrazing
Management considerations:
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: None

Buildings

Major management concern: Caving of cutbanks
Management considerations:
- Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concern: Poor filtering capacity
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3A
Michigan soil management group: 4a

426C—Coppler loamy sand, 6 to 12 percent slopes

Setting

Landform: Stream terraces and glacial drainageways
Shape of areas: Irregular
Size of areas: 3 to 500 acres

Typical Profile

Surface layer:
0 to 3 inches—black loamy sand

Subsurface layer:
3 to 4 inches—brown loamy sand

Subsoil:
4 to 14 inches—brown loamy sand
14 to 21 inches—brown gravelly loamy sand
21 to 26 inches—reddish brown very gravelly sandy loam

Substratum:
26 to 80 inches—yellowish brown, stratified gravelly sand and very gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the surface layer and subsoil, very rapid in the substratum
Available water capacity: Low
Drainage class: Somewhat excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Graycalm and well drained Klacking soils, which do not have very gravelly sand in the substratum; in landscape positions similar to those of the Coppler soil
• The well drained McGinn soils, which have a loamy substratum; in landscape positions similar to those of the Coppler soil

Similar inclusions:
• Soils that are moderately well drained
• Soils that do not have a loamy layer in the subsoil

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Seasonal droughtiness, soil blowing, a low content of organic matter, water erosion, a limited available water capacity, nutrient loss
Management considerations:
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.
• Crop residue management and a cropping sequence that includes close-growing crops help to control water erosion.
• Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
• Increasing the content of organic matter in the root zone may improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.

Pasture

Major management concerns: Seasonal droughtiness, soil blowing, overgrazing
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: None

Buildings

Major management concerns: Caving of cutbanks, slope
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, slope
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3A
Michigan soil management group: 4a

426D—Coppler loamy sand, 12 to 18 percent slopes

Setting

Landform: Stream terraces and glacial drainageways
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 3 inches—black loamy sand

Subsurface layer:
3 to 4 inches—brown loamy sand

Subsoil:
4 to 14 inches—brown loamy sand
14 to 21 inches—brown gravelly loamy sand
21 to 26 inches—reddish brown very gravelly sandy loam

Substratum:
26 to 80 inches—yellowish brown, stratified gravelly sand and very gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the surface layer and subsoil, very rapid in the substratum
Available water capacity: Low
Drainage class: Somewhat excessively drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Graycalm and well drained Klacking soils, which do not have very gravelly sand in the substratum; in landscape positions similar to those of the Coppler soil
- The well drained McGinn soils, which have a loamy substratum; in landscape positions similar to those of the Coppler soil

Similar inclusions:
- Soils that are moderately well drained
- Soils that do not have a loamy layer in the subsoil

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Pasture

Major management concerns: Seasonal droughtiness, soil blowing, overgrazing
Management considerations:
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concern: Equipment limitations
Management considerations:
- The grade of logging roads should be kept as low as possible.
- Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Buildings

Major management concerns: Caving of cutbanks, slope
Management considerations:
- Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
- Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Poor filtering capacity, slope
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.
- Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3A
Michigan soil management group: 4a

451C—Annalake loamy fine sand, 6 to 12 percent slopes

Setting

Landform: Lake plains, deltas, outwash plains, and moraines
Shape of areas: Irregular
Size of areas: 3 to 10 acres

Typical Profile

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

Subsurface layer:
9 to 11 inches—pinkish gray fine sand

Subsoil:
11 to 16 inches—brown loamy fine sand
16 to 30 inches—light brown loamy sand and reddish brown sandy loam
30 to 37 inches—reddish brown, mottled sandy loam
37 to 46 inches—reddish brown, mottled sandy loam

Substratum:
46 to 80 inches—stratified, light brown and light brownish gray, mottled sandy loam, fine sandy loam, silt loam, silt, loamy sand, sand, and fine sand

Soil Properties and Qualities

Permeability: Moderate
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.5 feet below the surface in September, October, or November or in March, April, or May
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
- The poorly drained Caffey soils, which have more sand in the upper 20 to 40 inches than the Annalake soil; in depressions and drainageways
- The somewhat poorly drained Otisco soils, which have more sand throughout than the Annalake soil; in slight depressions and drainageways

Similar inclusions:
- Soils that are well drained
- Soils that have a lighter colored subsoil

Use and Management

Land use: Dominant use—cropland; other uses—pasture, woodland, building site development

Cropland

Major management concerns: Seasonal droughtiness, soil blowing, water erosion
Management considerations:
- A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture and in reducing the hazard of soil blowing.
- Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
- Crop rotations that include grasses and legumes and small grain help to control runoff and water erosion.

Pasture

Major management concerns: Seasonal droughtiness, overgrazing
Management considerations:
- Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, plant competition
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Because of low strength, suitable surfacing material is needed on year-round logging roads and landings.
- Access is easiest during periods in winter when access roads are frozen.
- Special harvest methods may be needed to control undesirable plants.
- Competing vegetation generally can be controlled by mechanical means.
- Species preference can be managed by selective cutting.

Buildings

Major management concerns: Caving of cutbanks, seasonal wetness, slope, frost action
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Slow permeability, slope, seasonal wetness
Management considerations:
- Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
- Backfilling the trenches with porous material helps to compensate for the restricted permeability.
- Land shaping and installing the distribution lines on the contour help to overcome the slope.
- Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3
Michigan soil management group: 3a-s

477B—Algonquin, till substratum-Springport, till substratum, complex, 0 to 4 percent slopes

Setting

Landform: Algonquin, till substratum—low knolls; Springport, till substratum—depressions; both on till-floored lake plains
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Typical Profile

Algonquin, till substratum

Surface layer:
0 to 5 inches—very dark gray silt loam

Subsurface layer:
5 to 7 inches—brown silt loam

Subsoil:
7 to 13 inches—reddish brown, mottled clay
13 to 19 inches—reddish brown, mottled silty clay loam
19 to 55 inches—light reddish brown, mottled, stratified silty clay loam and loam

Substratum:
55 to 65 inches—light reddish brown, mottled, stratified silty clay loam and loam
65 to 80 inches—reddish brown, mottled loam

Springport, till substratum

Surface layer:
0 to 9 inches—black, mottled silty clay loam

Subsoil:
9 to 16 inches—greenish gray, mottled silty clay loam
16 to 23 inches—reddish brown, mottled silty clay

Substratum:
23 to 67 inches—reddish brown, mottled silty clay
67 to 80 inches—reddish brown, mottled loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Very slow
Available water capacity: High
Drainage class: Algonquin, till substratum—somewhat poorly drained; Springport, till substratum—poorly drained
Seasonal high water table: Algonquin, till substratum—perched, 0.5 foot to 1.5 feet below the surface at some time from October to May; Springport, till substratum—perched, 1.0 foot above to 1.5 feet below the surface at some time from September to May
Surface runoff rate: High
Flooding: None
Hazard of water erosion: Algonquin, till substratum—moderate; Springport, till substratum—slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Algonquin, till substratum, and similar soils: 60 to 70 percent
Springport, till substratum, and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Tacoda soils, which

have a sandy surface layer and subsoil; in landscape positions similar to those of the Algonquin soil
• The moderately well drained Ossineke soils in the higher areas
• The very poorly drained Wakeley soils, which have a sandy surface layer and subsoil; in landscape positions similar to those of the Springport soil

Similar inclusions:
• Soils that have a mucky surface layer; in depressions
• Soils that are deeper to loamy material

Use and Management

Land use: Dominant uses—woodland, pasture; other uses—cropland, building site development

Cropland

Major management concerns: Both soils—seasonal wetness, tilth of the surface layer; Algonquin, till substratum—erosion hazard; Springport, till substratum—ponding
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control runoff and water erosion.
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Shallow surface ditches help to remove surface water after heavy rains.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.
• The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition.
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After the trees are cut, competition from brush can delay or prevent natural regeneration of desired species.

Buildings

Major management concerns: Algonquin, till substratum—shrink-swell potential, seasonal wetness, frost action; Springport, till substratum—ponding
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.
• Because of ponding, the Springport soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Algonquin, till substratum—seasonal wetness, very slow permeability; Springport, till substratum—ponding
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Because of ponding, the Springport soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Algonquin, till substratum—IIIe; Springport, till substratum—Vw
Woodland ordination symbol: 6W

Michigan soil management group: Algonquin, till substratum—1.5b; Springport, till substratum—1.5c

478—Springport silty clay loam, till substratum

Setting

Landform: Depressions on till-floored lake plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 150 acres

Typical Profile

Surface layer:
0 to 9 inches—black, mottled silty clay loam

Subsoil:
9 to 16 inches—greenish gray, mottled silty clay loam
16 to 23 inches—reddish brown, mottled silty clay

Substratum:
23 to 67 inches—reddish brown, mottled silty clay
67 to 80 inches—reddish brown, mottled loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Very slow
Available water capacity: High
Drainage class: Poorly drained
Seasonal high water table: Perched, 1.0 foot above to 1.5 feet below the surface at some time from September to May
Surface runoff rate: High
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Springport, till substratum, and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Negwegon soils that have a till substratum; in the higher areas
- The somewhat poorly drained Algonquin soils that have a till substratum; in the slightly higher areas

Similar inclusions:
- Soils that have a mucky surface layer

Use and Management

Land use: Dominant uses—woodland, pasture; other uses—cropland, building site development

Cropland

Major management concerns: Seasonal wetness, tilth of the surface layer, soil compaction, very slow permeability, ponding
Management considerations:
- Excess water can be removed by open ditches, subsurface drains, pumps, or a combination of these.
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Shallow surface ditches help to remove surface water after heavy rains.
- Because of the very slow permeability, subsurface drains should be narrowly spaced.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
- The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.
- Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
- Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Skidders should not be used during wet periods, when ruts form easily.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Buildings

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concern: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 6W
Michigan soil management group: 1.5c

479A—Algonquin silt loam, till substratum, 0 to 3 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark gray silt loam

Subsurface layer:
5 to 7 inches—brown silt loam

Subsoil:
7 to 13 inches—reddish brown, mottled clay
13 to 19 inches—reddish brown, mottled silty clay loam
19 to 55 inches—light reddish brown, mottled, stratified silty clay loam and loam

Substratum:
55 to 65 inches—light reddish brown, mottled, stratified silty clay loam and loam
65 to 80 inches—reddish brown, mottled loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Very slow
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, 0.5 foot to 1.5 feet below the surface at some time from October to May
Surface runoff rate: High
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Algonguin, till substratum, and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Ossineke soils in the higher areas
• The moderately well drained Negwegon soils that have a till substratum; in the higher areas
• The moderately well drained Annalake soils in the higher areas

Similar inclusions:
• Soils that have a thin surface layer of sandy loam

Use and Management

Land use: Dominant uses—cropland, pasture; other uses—woodland, building site development

Cropland

Major management concerns: Seasonal wetness, very slow permeability, soil compaction, tilth of the surface layer
Management considerations:
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Because of the very slow permeability, subsurface drains should be narrowly spaced.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.

Pasture

Major management concerns: Compaction, seasonal wetness
Management considerations:
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
• Proper stocking rates, a planned grazing system,

and deferred grazing during wet periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seedling mortality
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Trees that can withstand seasonal wetness should be selected for planting.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Shrink-swell potential, seasonal wetness, frost action
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• A surface or subsurface drainage system lowers the water table.

Septic tank absorption fields

Major management concerns: Seasonal wetness, very slow permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system lowers the water table.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Increasing the size of the absorption area helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 6W
Michigan soil management group: 1.5b

480B—Negwegon-Algonquin-Lupton complex, 0 to 6 percent slopes

Setting

Landform: Lake plains
Position on the landform: Negwegon—the summit and upper side slopes of ridges and knolls; Algonquin—the lower side slopes of ridges and knolls; Lupton—depressions
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Typical Profile

Negwegon

Surface layer:
0 to 9 inches—brown silt loam

Subsurface layer:
9 to 12 inches—brown silt loam

Subsoil:
12 to 14 inches—reddish brown silty clay and brown silt loam
14 to 21 inches—reddish brown, mottled silty clay
21 to 51 inches—reddish brown silty clay

Substratum:
51 to 80 inches—reddish brown silty clay loam stratified with brown silt loam

Algonquin

Surface layer:
0 to 5 inches—very dark gray silt loam

Subsurface layer:
5 to 7 inches—brown silt loam

Subsoil:
7 to 13 inches—reddish brown, mottled clay
13 to 19 inches—reddish brown, mottled silty clay loam
19 to 55 inches—light reddish brown, mottled, stratified silty clay loam and loam

Substratum:
55 to 80 inches—light reddish brown, mottled, stratified silty clay loam and loam

Lupton

Surface layer:
0 to 4 inches—black muck

Substratum:
4 to 24 inches—black muck
24 to 80 inches—very dark grayish brown muck

Soil Properties and Qualities

Depth class: Very deep
Permeability: Negwegon and Algonquin—very slow; Lupton—moderately slow to moderately rapid
Available water capacity: Negwegon and Algonquin—high; Lupton—very high
Drainage class: Negwegon—moderately well drained; Algonquin—somewhat poorly drained; Lupton—very poorly drained
Seasonal high water table: Negwegon—perched, 2.5 to 3.5 feet below the surface at some time in October or November or in March, April, or May; Algonquin—perched, 0.5 foot to 1.5 feet below the surface at some time from October to May; Lupton—apparent, 1.0 foot above to 1.0 foot below the surface at some time from January to December
Surface runoff: Negwegon—very high; Algonquin—high; Lupton—negligible
Flooding: None
Hazard of water erosion: Negwegon—moderate; Algonquin and Lupton—slight
Hazard of soil blowing: Negwegon and Algonquin—slight; Lupton—moderate
Shrink-swell potential: Negwegon and Algonquin—high; Lupton—low
Potential for frost action: Negwegon—moderate; Algonquin and Lupton—high

Composition

Negwegon soil and similar soils: 25 to 45 percent
Algonquin soil and similar soils: 25 to 35 percent
Lupton soil and similar soils: 20 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Tacoda soils near the edges of the map unit
- The poorly drained Springport soils in depressions
- The very poorly drained Dorval soils at the edges of depressions

Similar inclusions:
- Soils that have a thin surface layer of sandy material
- Soils that have thin layers of very fine sand in the substratum
- Soils that have more silt and less clay in the subsoil and substratum

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Negwegon—erosion hazard, seasonal wetness, tilth of the surface layer, soil compaction, nutrient loss; Algonquin—seasonal wetness, very slow permeability, soil compaction, tilth of the surface layer; Lupton—ponding
Management considerations:
- Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
- Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations that include grasses and legumes, grade-stabilization structures, or a combination of these.
- Growing grasses and legumes for pasture or hay is effective in controlling erosion.
- Most climatically adapted crops can be grown if an adequate drainage system is installed.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.
- Including grasses and legumes in the crop rotation can reduce nutrient losses, improve soil structure, and provide nitrogen for use by succeeding crops.
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Because of very slow permeability, subsurface drains should be narrowly spaced.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.
- Because of ponding, the Lupton soil is generally unsuited to cultivated crops.

Pasture

Major management concerns: Negwegon—erosion hazard; Negwegon and Algonquin—seasonal wetness, compaction; Lupton—ponding
Management considerations:
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Special harvest methods may be needed to control undesirable plants.
• Exposing the soil just prior to the production of a seed crop, or prior to artificial seeding, can help desirable tree seedlings to become established quickly and to compete better with undesirable vegetation.
• Carefully managed reforestation helps to control undesirable understory plants.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• Trees that can withstand seasonal wetness should be selected for planting.
• Because of wetness and low strength in the Lupton soil, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Lupton soil.

Buildings

Major management concerns: Negwegon and Algonquin—shrink-swell potential, seasonal wetness, frost action; Lupton—ponding, low strength
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• A surface or subsurface drainage system lowers the water table.
• Because of ponding and low strength, the Lupton soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Negwegon and Algonquin—very slow permeability, seasonal wetness; Lupton—ponding, low strength
Management considerations:
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system lowers the water table.
• Because of ponding and low strength, the Lupton soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Negwegon—IIIe; Algonquin—IIIw; Lupton—VIw
Woodland ordination symbol: Negwegon—3C; Algonquin—6W; Lupton—2W
Michigan soil management group: Negwegon—1.5a; Algonquin—1.5b; Lupton—Mc

481C—Negwegon-Lupton complex, 0 to 12 percent slopes

Setting

Landform: Lake plains
Position on the landform: Negwegon—the summit and upper side slopes of ridges and knolls; Lupton—depressions
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Typical Profile

Negwegon

Surface layer:
0 to 9 inches—brown silt loam

Subsurface layer:
9 to 12 inches—brown silt loam

Subsoil:
12 to 14 inches—reddish brown silty clay and brown silt loam
14 to 21 inches—reddish brown, mottled silty clay
21 to 51 inches—reddish brown silty clay

Substratum:
51 to 80 inches—reddish brown silty clay loam stratified with brown silt loam

Lupton

Surface layer:
0 to 4 inches—black muck

Substratum:
4 to 24 inches—black muck
24 to 80 inches—very dark grayish brown muck

Soil Properties and Qualities

Depth class: Very deep
Permeability: Negwegon—very slow; Lupton—moderately slow to moderately rapid
Available water capacity: Negwegon—high; Lupton—very high
Drainage class: Negwegon—moderately well drained; Lupton—very poorly drained
Depth to a seasonal high water table: Negwegon—perched, 2.5 to 3.5 feet below the surface at some time in October or November or in March, April, or May; Lupton—apparent, 1.0 foot above to 1.0 foot below the surface at some time from January to December
Surface runoff: Negwegon—very high; Lupton—negligible
Flooding: None
Hazard of water erosion: Negwegon—moderate; Lupton—slight
Hazard of soil blowing: Negwegon—slight; Lupton—moderate
Shrink-swell potential: Negwegon—high; Lupton—low
Potential for frost action: Negwegon—moderate; Lupton—high

Composition

Negwegon soil and similar soils: 45 to 65 percent
Lupton soil and similar soils: 20 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Tacoda soils near the edges of the map unit
- The somewhat poorly drained Algonquin soils on the lower side slopes
- The poorly drained Springport soils in depressions
- The very poorly drained Dorval soils at the edges of depressions

Similar inclusions:
- Soils that have a thin surface layer of sandy material
- Soils that have thin layers of very fine sand in the substratum
- Soils that have more silt and less clay in the subsoil and substratum

Use and Management

Land use: Dominant use—woodland; other uses—cropland, pasture, building site development

Cropland

Major management concerns: Negwegon—erosion hazard, seasonal wetness, tilth of the surface layer, soil compaction, nutrient loss; Lupton—ponding
Management considerations:
- Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
- Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations that include grasses and legumes, grade-stabilization structures, or a combination of these.
- Growing grasses and legumes for pasture or hay is effective in controlling erosion.
- Most climatically adapted crops can be grown if an adequate drainage system is installed.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.
- Including grasses and legumes in the crop rotation can reduce nutrient losses, improve soil structure, and provide nitrogen for use by succeeding crops.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.

• Because of ponding, the Lupton soil is generally unsuited to cultivated crops.

Pasture

Major management concerns: Negwegon—erosion hazard, seasonal wetness, compaction; Lupton—ponding
Management considerations:
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Special harvest methods may be needed to control undesirable plants.
• Exposing the soil just prior to the production of a seed crop, or prior to artificial seeding, can help desirable tree seedlings to become established quickly and to compete better with undesirable vegetation.
• Carefully managed reforestation helps to control undesirable understory plants.
• Skidders should not be used during wet periods, when ruts form easily.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Trees that can withstand seasonal wetness should be selected for planting.
• Because of wetness and low strength in the Lupton soil, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Lupton soil.

Buildings

Major management concerns: Negwegon—shrink-swell potential, seasonal wetness, frost action, slope; Lupton—ponding, low strength
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.
• Because of ponding and low strength, the Lupton soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Negwegon—very slow permeability, seasonal wetness, slope; Lupton—ponding, low strength
Management considerations:
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.
• Because of ponding and low strength, the Lupton soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Negwegon—IIIe; Lupton—VIw
Woodland ordination symbol: Negwegon—3C; Lupton—2W
Michigan soil management group: Negwegon—1.5a; Lupton—Mc

482B—Summerville fine sandy loam, 0 to 6 percent slopes

Setting

Landform: Low ridges and knolls on karst plains, ground moraines, and glacial lake benches
Shape of areas: Irregular

Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 5 inches—dark brown fine sandy loam

Subsoil:
5 to 16 inches—brown fine sandy loam

Bedrock:
16 to 18 inches—fractured limestone

Soil Properties and Qualities

Depth class: Shallow
Permeability: Moderate in the soil layers, slow to rapid in the bedrock
Available water capacity: Low
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Lachine and Potagannissing soils in the lower areas
• The well drained Namur soils in the higher areas
• The excessively drained Alpena soils on narrow ridges

Similar inclusions:
• Soils that have a lighter colored surface layer
• Soils that are deeper to bedrock

Use and Management

Land use: Dominant uses—cropland, pasture; other uses—woodland, building site development

Cropland

Major management concerns: Soil blowing, nutrient and pesticide loss, seasonal droughtiness, tilth of the surface layer
Management considerations:
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• Because of the need for protection of ground water, nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
• Integrated pest management, such as scouting and bio-control methods, can help to prevent the leaching of pesticides.
• Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Restricted rooting depth, windthrow hazard
Management considerations:
• Because of the shallow depth to bedrock, planting is not practical on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Planting when the soil is moist can reduce the seedling mortality rate.

Buildings

Major management concerns: Depth to bedrock, frost action
Management considerations:
• Excavation is hampered by the shallow depth to bedrock.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the bedrock.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concern: Depth to bedrock
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the bedrock.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 2D
Michigan soil management group: Ra

482C—Summerville fine sandy loam, 6 to 12 percent slopes

Setting

Landform: Ridges and knolls on karst plains and ground moraines
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 5 inches—dark brown fine sandy loam

Subsoil:
5 to 16 inches—brown fine sandy loam

Bedrock:
16 to 18 inches—fractured limestone

Soil Properties and Qualities

Depth class: Shallow
Permeability: Moderate in the soil layers, slow to rapid in the bedrock
Available water capacity: Low
Drainage class: Well drained
Depth to a seasonal high water table: More than 6 feet
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Lachine soils in the lower areas
- The well drained Namur soils in the higher areas
- The excessively drained Alpena soils on narrow ridges

Similar inclusions:
- Soils that have a lighter colored surface layer
- Soils that are deeper to bedrock

Use and Management

Land use: Dominant uses—cropland, pasture; other uses—woodland, building site development

Cropland

Major management concerns: Soil blowing, water erosion, nutrient and pesticide loss, seasonal droughtiness, tilth of the surface layer
Management considerations:
- Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
- Crop rotations that include grasses and legumes and small grain help to control runoff and water erosion.
- Growing grasses and legumes for pasture or hay is effective in controlling erosion.
- Because of the need for protection of ground water, nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
- Integrated pest management, such as scouting and bio-control methods, can help to prevent the leaching of pesticides.
- Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness
Management considerations:
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Restricted rooting depth, windthrow hazard, equipment limitations
Management considerations:
- Because of the shallow depth to bedrock, planting is not practical on this soil.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Planting when the soil is moist can reduce the seedling mortality rate.

• Nearly level areas should be selected as sites for landings.

Buildings

Major management concerns: Depth to bedrock, frost action, slope
Management considerations:
• Excavation is hampered by the shallow depth to bedrock.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the bedrock.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Depth to bedrock, slope
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the bedrock.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 2D
Michigan soil management group: Ra

483A—Lachine loam, 0 to 3 percent slopes

Setting

Landform: Nearly level ground moraines and glacial lake benches
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown loam

Subsoil:
9 to 13 inches—brown, mottled loam

Substratum:
13 to 16 inches—brown, mottled gravelly fine sandy loam

Bedrock:
16 to 20 inches—fractured limestone

Soil Properties and Qualities

Depth class: Shallow
Permeability: Moderate in the soil layers, slow to rapid in the bedrock
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 1.0 to 1.5 feet below the surface at some time from October to May
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: High

Composition

Lachine soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The very shallow Potagannissing soils in landscape positions similar to those of the Lachine soil
• The well drained Namur soils in the slightly higher areas
• The well drained Summerville soils on slight rises

Similar inclusions:
• Soils that have a lighter colored surface layer
• Soils that are deeper to limestone bedrock

Use and Management

Land use: Dominant uses—cropland, pasture; other uses—woodland, building site development

Cropland

Major management concerns: Seasonal wetness, seasonal droughtiness, tilth of the surface layer
Management considerations:
• Most climatically adapted crops can be grown if an adequate drainage system is installed.
• Because of the need for protection of ground water, nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
• Integrated pest management, such as scouting and bio-control methods, can help to prevent the leaching of pesticides.
• Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.

Woodland

Major management concerns: Equipment limitations, seasonal wetness, restricted rooting depth, plant competition, windthrow hazard
Management considerations:
• Skidders should not be used during wet periods, when ruts form easily.
• Landing sites generally can be used only during the driest part of the year.
• Because of the shallow depth to bedrock, planting is not practical on this soil.
• If trees are planted, site preparation by mechanical means is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

Major management concerns: Seasonal wetness, depth to bedrock, frost action
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Excavation is hampered by the shallow depth to bedrock.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Depth to bedrock, seasonal wetness
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the bedrock and the water table.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 4W
Michigan soil management group: Rbc

484A—Elcajon loam, 0 to 3 percent slopes

Setting

Landform: Nearly level ground moraines and glacial lake benches
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 6 inches—dark brown loam

Subsoil:
6 to 12 inches—brown, mottled very fine sandy loam and brown loam
12 to 29 inches—brown, mottled clay loam

Substratum:
29 to 37 inches—bluish gray very flaggy loam

Bedrock:
37 to 41 inches—fractured limestone

Soil Properties and Qualities

Depth class: Moderately deep
Permeability: Moderately slow in the soil layers, slow to rapid in the bedrock
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 3.1 feet below the surface at some time from October to May
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: High

Composition

Elcajon soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The shallow Lachine soils in landscape positions similar to those of the Elcajon soil
• The well drained Namur soils in the slightly higher areas
• The well drained Summerville soils on slight rises

Similar inclusions:
- Soils that have a lighter colored surface layer
- Soils that are deeper to limestone bedrock

Use and Management

Land use: Dominant uses—cropland, pasture; other uses—woodland, building site development

Cropland

Major management concerns: Seasonal wetness, seasonal droughtiness, tilth of the surface layer
Management considerations:
- Most climatically adapted crops can be grown if an adequate drainage system is installed.
- Because of the need for protection of ground water, nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
- Integrated pest management, such as scouting and bio-control methods, can help to prevent the leaching of pesticides.
- Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
- The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.
- Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.

Woodland

Major management concerns: Equipment limitations, seasonal wetness, plant competition, windthrow hazard
Management considerations:
- Skidders should not be used during wet periods, when ruts form easily.
- Landing sites generally can be used only during the driest part of the year.
- If trees are planted, site preparation by mechanical means is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

Major management concerns: Seasonal wetness, frost action
Management considerations:
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Depth to bedrock, seasonal wetness
- Filling or mounding with suitable material helps to raise the absorption field above the bedrock and the water table.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4W
Michigan soil management group: 2/Rbc

485A—Bowers silt loam, 0 to 3 percent slopes

Setting

Landform: Level and nearly level lake plains
Shape of areas: Irregular
Size of areas: 3 to 250 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark grayish brown silt loam

Subsoil:
10 to 14 inches—brown silty clay loam and grayish brown fine sandy loam
14 to 20 inches—brown silty clay loam
20 to 27 inches—brown clay loam

Substratum:
27 to 80 inches—brown silty clay loam stratified with very fine sand and silt loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Slow
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, 1 to 2 feet below the surface at some time from October to May

Surface runoff rate: High
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Composition

Bowers soil and similar soils: 85 to 100 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Negwegon soils on small ridges
• The poorly drained Tonkey soils in depressions
• The somewhat poorly drained Tacoda soils on slight rises

Similar inclusions:
• Soils that do not have thin layers of very fine sand in the substratum
• Soils that have loam in the substratum
• Soils that have a darker surface layer

Use and Management

Land use: Dominant use—cropland; other uses—pasture, woodland

Cropland

Major management concerns: Seasonal wetness, soil compaction, a low content of organic matter
Management considerations:
• Most climatically adapted crops can be grown if an adequate drainage system is installed.
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Subsurface drainage systems should be designed so that the rate of flowing water helps to keep fine sand and silt from plugging the tile lines. Also, suitable filtering material may be needed to keep the silt and fine sand from flowing into the tile lines.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.
• Inclusion of green manure crops in the cropping sequence, conservation tillage, and crop residue management increase the content of organic matter.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
• Skidders should not be used during wet periods, when ruts form easily.
• Landing sites generally can be used only during the driest part of the year.
• Special site preparation, such as bedding before planting, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Seasonal wetness, caving of cutbanks, shrink-swell potential, frost action
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.

Septic tank absorption fields

Major management concerns: Seasonal wetness, slow permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system lowers the water table.
• Enlarging or pressurizing the absorption field or

installing alternating drain fields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 7W
Michigan soil management group: 1.5b

486B—Tonkey-Bowers silt loams, 0 to 4 percent slopes

Setting

Landform: Gently sloping to level lake plains
Position on the landform: Tonkey—depressions; Bowers—the side slopes of low ridges and knolls
Shape of areas: Irregular
Size of areas: 5 to 600 acres

Typical Profile

Tonkey

Surface layer:
0 to 7 inches—black silt loam

Subsoil:
7 to 15 inches—greenish gray, mottled, stratified sandy loam and sand
15 to 22 inches—greenish gray, mottled, stratified silt loam and sandy loam

Substratum:
22 to 80 inches—brown, mottled, stratified silt loam, sandy loam, and sand

Bowers

Surface layer:
0 to 10 inches—very dark grayish brown silt loam

Subsoil:
10 to 14 inches—brown silty clay loam and grayish brown fine sandy loam
14 to 20 inches—brown silty clay loam
20 to 27 inches—brown clay loam

Substratum:
27 to 80 inches—brown silty clay loam stratified with very fine sand and silt loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Tonkey—moderate; Bowers—slow
Available water capacity: Tonkey—moderate; Bowers—high
Drainage class: Tonkey—poorly drained; Bowers—somewhat poorly drained
Depth to a seasonal high water table: Tonkey—apparent, 1 foot above to 1 foot below the surface at some time from September to June; Bowers—perched, 1 to 2 feet below the surface at some time from October to May
Surface runoff: Tonkey—negligible; Bowers—high
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Tonkey—low; Bowers—moderate
Potential for frost action: High

Composition

Tonkey soil and similar soils: 55 to 75 percent
Bowers soil and similar soils: 25 to 45 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
• The poorly drained Springport and Cathro soils in depressions
• The somewhat poorly drained Algonquin soils on slight rises

Similar inclusions:
• Soils that do not have thin layers of very fine sand in the substratum
• Soils that have loam in the substratum
• Soils that are moderately well drained

Use and Management

Land use: Dominant use—woodland; other uses—pasture, building site development

Pasture

Major management concerns: Both soils—seasonal wetness; Tonkey—overgrazing; Bowers—compaction
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
• The hay and pasture plants that can withstand periodic inundation and seasonal wetness should be selected for seeding.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Access is easiest during periods in winter when access roads are frozen.
• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Tonkey soil.
• Landing sites generally can be used only during the driest part of the year.
• Special site preparation, such as bedding before planting, can reduce the seedling mortality rate.

Buildings

Major management concerns: Tonkey—ponding; Bowers—seasonal wetness, caving of cutbanks, shrink-swell potential, frost action
Management considerations:
• Because of ponding, the Tonkey soil is generally unsuited to building site development.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.

Septic tank absorption fields

Major management concerns: Tonkey—ponding; Bowers—seasonal wetness, slow permeability
Management considerations:
• Because of ponding, the Tonkey soil is generally unsuited to septic tank absorption fields.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system lowers the water table.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: Tonkey—Vw; Bowers—IIw
Woodland ordination symbol: Tonkey—5W; Bowers—7W
Michigan soil management group: Tonkey—3c-s; Bowers—1.5b

487B—Slade-Angelica loams, 0 to 4 percent slopes

Setting

Landform: Gently sloping to level ground moraines
Position on the landform: Tonkey—depressions; Bowers—the side slopes of low ridges and knolls
Shape of areas: Irregular
Size of areas: 5 to 500 acres

Typical Profile

Slade

Surface layer:
0 to 5 inches—very dark gray loam

Subsurface layer:
5 to 7 inches—pinkish gray, mottled fine sandy loam

Subsoil:
7 to 9 inches—reddish brown, mottled clay loam and pinkish gray, mottled fine sandy loam
9 to 23 inches—reddish brown, mottled clay loam
23 to 26 inches—brown, mottled loam

Substratum:
26 to 60 inches—reddish brown, mottled loam
60 to 80 inches—brown loam

Angelica

Surface layer:
0 to 8 inches—very dark gray, mottled loam

Subsoil:
8 to 17 inches—gray, mottled loam
17 to 29 inches—pale brown, mottled loam

Substratum:
29 to 80 inches—reddish gray, mottled loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Slade—moderate in the upper part, moderately slow in the lower part; Angelica—moderately slow
Available water capacity: High
Drainage class: Slade—somewhat poorly drained; Angelica—poorly drained
Seasonal high water table: Slade—perched, 0.5 foot to 3.0 feet below the surface at some time from September to May; Angelica—apparent, 1.0 foot above to 1.0 foot below the surface at some time from September to June
Surface runoff rate: Medium
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Composition

Slade soil and similar soils: 45 to 65 percent
Angelica soil and similar soils: 35 to 55 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Ossineke soils in the higher areas
• The very poorly drained Cathro soils in the center of depressions

Similar inclusions:
• Soils that have a surface layer of sandy loam or fine sandy loam

Use and Management

Land use: Dominant use—cropland; other uses—pasture, woodland

Cropland

Major management concerns: Seasonal wetness, tilth of surface layer
Management considerations:
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and deterioration of tilth.

Pasture

Major management concerns: Compaction, seasonal wetness
Management considerations:
• Restricted grazing during wet periods helps to prevent compaction and deterioration of tilth.
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, seasonal wetness, plant competition, windthrow hazard
Management considerations:
• Skidders should not be used during wet periods, when ruts form easily.
• Landing sites generally can be used only during the driest part of the year.
• If trees are planted, site preparation by mechanical means is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Angelica soil.

Buildings

Major management concerns: Slade—seasonal wetness, frost action, shrink-swell potential; Angelica—ponding
Management considerations:
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling or by frost action.
• Because of ponding, the Angelica soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Slade—moderately slow permeability, seasonal wetness; Angelica—ponding
Management considerations:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Because of ponding, the Angelica soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Slade—IIw; Angelica—Vw
Woodland ordination symbol: Slade—3W; Angelica—7W
Michigan soil management group: Slade—1.5b; Angelica—2.5c

489F—Crowell-Proper fine sands, 3 to 40 percent slopes

Setting

Landform: Dunes on lake terraces
Position on the landform: Crowell—rolling to very steep side slopes; Proper—level to gently undulating areas on the lower parts of the landscape
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Crowell

Surface layer:
0 to 2 inches—very dark gray fine sand

Subsurface layer:
2 to 5 inches—gray fine sand

Subsoil:
5 to 10 inches—brown sand
10 to 19 inches—strong brown, cemented sand
19 to 29 inches—strong brown sand

Substratum:
29 to 80 inches—light yellowish brown sand

Proper

Surface layer:
0 to 3 inches—very dark gray fine sand

Subsurface layer:
3 to 11 inches—pinkish gray fine sand

Subsoil:
11 to 14 inches—dark brown fine sand
14 to 19 inches—strong brown fine sand
19 to 24 inches—reddish yellow, cemented fine sand
24 to 41 inches—brown, mottled fine sand

Substratum:
41 to 80 inches—light yellowish, mottled brown fine sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Crowell—rapid; Proper—moderately rapid in the cemented layer, rapid in the rest of the profile
Available water capacity: Low
Drainage class: Crowell—somewhat excessively drained; Proper—moderately well drained
Seasonal high water table: Crowell—at a depth of more than 6 feet; Proper—apparent, 2 to 4 feet below the surface at some time in October, November, or December or from March to June
Surface runoff: Crowell—low; Proper—negligible
Flooding: None
Hazard of water erosion: Crowell—moderate; Proper—slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Crowell soil and similar soils: 65 to 80 percent
Proper soil and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Deford soils in depressions
- The somewhat poorly drained Finch on the sides of depressions
- The well drained Rousseau soils on very steep side slopes

Similar inclusions:
- Soils that are medium sand

Use and Management

Land use: Dominant use—woodland; other use—building site development

Woodland

Major management concerns: Crowell—equipment limitations, erosion hazard, seasonal droughtiness, seedling mortality, slope; Proper—seasonal wetness
Management considerations:
- In areas of the Crowell soil, southern exposures may have a higher seedling mortality rate than northern exposures.
- Because loose sand in the Crowell soil can interfere

with the traction of wheeled equipment, logging roads should be stabilized.
• The risk of erosion on the Crowell soil can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.
• Because of the slope of the Crowell soil, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system on the Proper soil.

Buildings

Major management concerns: Crowell—slope; Proper—seasonal wetness
Management considerations:
• Because of the slope, the Crowell soil is generally unsuited to building site development.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table in the Proper soil.
• Wetness can be reduced by a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Both soils—poor filtering capacity; Crowell—slope; Proper—seasonal wetness
Management considerations:
• Because of the slope, the Crowell soil is generally unsuited to septic tank absorption fields.
• The poor filtering capacity of these soils can result in the pollution of ground water. On large lots an absorption system with shallow trenches, shrubbery planted around the perimeter, and low, uniform application rates minimizes the risk of ground-water pollution.
• Filling or mounding with suitable material helps to raise the absorption field above the water table in the Proper soil.

Interpretive Groups

Land capability classification: Crowell—VIIs; Proper—IVs
Woodland ordination symbol: Crowell—7R; Proper—5W
Michigan soil management group: 5a-h

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 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 for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational areas; and for wildlife habitat. It can be used to identify the potentials 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.

Crops and Pasture

By Mary Dunckel, Michigan State University Extension, Alpena County.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils are identified in tables 5 and 6, the estimated yields of the main crops and hay and pasture plants are listed for each soil, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is defined.

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 Michigan State University Extension.

According to the latest available estimates from the Michigan Department of Agriculture, 55,779 acres in Alpena County is used as cropland, pasture, or hayland (Michigan Department of Agriculture, 1997). The potential of the soils in the county for increased crop production is fair. Applying the latest crop-production technology to all of the cropland in the county can increase production. Alfalfa has the greatest potential for increased production through measures that enhance fertility.

Soil drainage is the major problem on much of the better cropland in Alpena County. In some areas the somewhat poorly drained Algonquin soils have been drained for use as cropland. Most of the poorly drained and very poorly drained soils cannot be economically drained. Such soils are on low-lying plains and in depressions where ponding is frequent and suitable drainage outlets are not readily available. These soils are also subject to low soil temperatures, which hinder seed germination, and extended periods of frost. A drainage system is needed in areas of the somewhat poorly drained Algonquin, Killmaster, and Slade soils. If the excess water is not removed from these soils, tillage, seed germination, and growth are adversely affected.

Subsurface tile drainage systems generally are used to remove excess water. Proper spacing of tile drains is needed to allow for differences in the permeability of the soils. In some areas open ditches are needed as outlets for the drains. Deeper open ditches are needed to provide outlets for surface and subsurface drainage systems. Negwegon and

Ossineke soils are moderately well drained and become saturated with water for short periods after spring snowmelt and during prolonged wet periods. In areas of the well drained Coppler, Klacking, and Zimmerman soils, droughtiness is a problem during long dry periods. Small areas of wet soils along drainageways and in swales commonly are farmed with larger areas of the well drained soils. A drainage system may be needed in some of the wet areas to prevent a delay in fieldwork.

Water erosion is a major hazard on some of the soils used for crops and pasture in Alpena County. Erosion reduces the productive capacity of the soils by removing the surface layer, which contains most of the available plant nutrients and organic matter. Erosion on farmland can result in the pollution of lakes and streams by sediment, nutrients, and pesticides.

The current surface layer of the eroded Negwegon soils has a higher content of clay and a lower content of organic matter than the original surface layer. With an increase in clay content, the plow layer stays wet longer after periods of rainfall, thus delaying field operations. Also, the surface layer tends to be cloddy and provides a poor seedbed. Surface crusting is more common, and plant emergence can be difficult. More energy is required to till eroded soils than uneroded soils.

Erosion-control practices provide a protective cover, reduce the runoff rate, and increase the infiltration rate. Conservation tillage, which leaves crop residue on the surface, increases the infiltration rate and reduces the hazards of runoff and erosion. No-till cropping in areas used for corn also effectively reduces the hazard of erosion. No-till cropping requires high levels of management and relies on herbicides and insecticides for weed and pest control. It is especially effective in minimizing erosion on the sandy, sloping soils in the county. Contour farming or contour stripcropping can control erosion on long slopes, but these practices generally cannot be readily applied to the short, steep slopes in the county.

Grassed waterways are used on both undulating and nearly level soils. Also, they are used to reduce the hazard of channel erosion on sloping soils. Grassed waterways can be used to stabilize previously eroded areas that have been reshaped and seeded. They are established on nearly level soils if a large watershed drains across the land. Subsurface drains generally are installed below the waterway to remove excess water. The drains improve plant growth and result in drier soil conditions, which make the operation of machinery easier.

Grade-stabilization structures help to control erosion where surface water drains into channels. These structures generally are used in conjunction with grassed waterways at both the outlet end and the inlet end. The structures move the water to a lower elevation and at the same time prevent excessive erosion on the sides and bottom of a channel.

Soil blowing is a hazard on soils that have a surface layer of sand, loamy sand, or sandy loam and on soils that have an unprotected surface. Maintaining a cover of mulch, planting small-grain buffer strips, leaving crop residue on the surface, and maintaining a rough surface through tillage help to minimize soil blowing. Vegetative barriers also are effective in controlling soil blowing. Field windbreaks of suitable trees and shrubs planted at right angles to the prevailing wind provide long-term protection from soil blowing.

Soil fertility is naturally low in the sandy soils in the county and medium in most of the loamy soils. Hoist, Killmaster, Ossineke, and other soils on ground moraines are moderately high in natural fertility. Soil fertility is quite variable because of differences in past land use and management. Most of the soils in the county are moderately acid to neutral in the surface layer. Additions of lime and fertilizer should be based on the results of soil tests, the needs of the crop, and the expected level of yields. The Michigan State University Extension can help to determine the kind and amount of all nutrients to be applied (Michigan State University, 1992).

Soil tilth is an important factor affecting the germination of seeds and the workability of the soil. Soils that have good tilth require a minimum of working for seed germination and plant growth. Many of the soils that are used for crops in Alpena County have a surface layer of silt loam, loam, or fine sandy loam. Soils that have good tilth have good granular structure and contain a moderate to high amount of organic matter. The use of machinery when the soils are wet results in soil compaction and surface crusting, which reduce the rate of water infiltration and increase the runoff rate. Soil compaction and the loss of good granular soil structure cause small individual soil particles to form. Wind and water carry these small particles away. Preparing a good seedbed on severely eroded soils is difficult, mainly because of the susceptibility of these soils to erosion. An adequate surface and subsurface drainage system, timely field operations, and forage production, which helps to maintain the content of organic matter, improve soil structure and tilth and minimize soil compaction and erosion.

Oats, barley, and wheat are the main field crops suited to the climate and soils in Alpena County. Alfalfa is the most commonly grown legume. The grasses grown for hay and pasture are mainly bromegrass, orchardgrass, and timothy. The county has a number of Christmas tree plantations. Top yields of the crops commonly grown in the county can be obtained if the best management practices are applied.

Specialty crops, such as strawberries and raspberries, are grown on a limited acreage in the county. The well drained soils that have a surface layer of loamy sand, sandy loam, or loam are suited to these crops. The latest information about growing specialty crops can be obtained from local offices of the Michigan State University Extension.

Much of the permanent pasture in the county is in areas where erosion is a hazard. Other pastured areas are on wet soils. Control of erosion is particularly important during seeding operations. The need for lime and fertilizer should be determined by soil tests, and adequate amounts should be applied as required. Grazing when the soils are wet can result in soil compaction, which hinders the growth of pasture plants. Proper harvesting methods, such as those used for hay or silage, improve plant growth and minimize compaction.

The productivity of a pasture and its ability to protect the surface of the soil are influenced by the number of livestock that the pasture supports, the length of time that the livestock graze, and the distribution of rainfall. Good pasture management includes proper stocking rates, which help to maintain the key forage plants; pasture rotation; timely deferment of grazing; applications of the proper kinds and amounts of fertilizer; and water developments at strategic locations for the livestock.

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 tables 5 and 6. In any given year, yields may be higher or lower than those indicated in the tables because of variations in rainfall and other climatic factors. The land capability classification of map units in the survey area is shown in table 5.

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 tables 5 and 6 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 or of the Michigan State University Extension 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 (USDA, 1961). 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 and for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by 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 few limitations that restrict their use.

Class II soils have moderate limitations or hazards that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations or hazards that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations or hazards that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations or hazards, impractical to remove, that limit their use.

Class VI soils have severe limitations or hazards that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations or hazards that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations or hazards 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 each map unit is given in the section "Detailed Soil Map Units" and in table 5.

Also given at the end of each map unit description is a Michigan soil management group. The soils are assigned to a group according to the dominant profile texture, the natural drainage class, and the major management concerns. For soils making up a complex, the management groups are listed in the same order as the soils named in the complex (Mokma, 1982).

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, pasture, forestland, 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. The 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 100,733 acres in the survey area, or more than 26 percent of the total acreage, meets the soil requirements for prime farmland. Scattered areas of this land are throughout the county, but most are in the southern part, mainly in associations 4, 5, and 7, which are described under the heading "General Soil Map Units."

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 7. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome wetness are needed. Onsite evaluation is needed to determine whether or not this 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 in this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Forestland Management and Productivity

This section describes the major concerns associated with the use and management of woodland and the major types of forest cover and their relationship with the different kinds of soil in the county (USDA, National Forestry Manual).

Originally, a dense forest covered all of the land in the county, except for a few bogs and marshes. With few exceptions, the woodland was logged and the slash burned. Many areas were cleared. Many of the cleared areas have either reverted to natural forest or have been planted to pine.

At present, the county has about 236,000 acres of woodland (Michigan Department of Agriculture, 1997). This acreage represents about 65 percent of the land area in the county. Private forest tracts and hunting clubs have holdings of more than 156,000 acres in the county.

The county has five major types of natural forest cover. Each is distinctly different. Each has a different potential for forest use and for forest products. The soils in the areas of the different kinds of forest cover generally are quite different. The types are described in the following paragraphs.

Jack pine forest cover type.—This type makes up about 7,400 acres in the county. Jack pine and northern pin oak predominate. Other common associated trees include eastern white pine, red pine, and aspen. This cover type is mainly in areas of the very deep, sandy Graycalm and Grayling soils. These soils are characterized by weak profile development. The more droughty and less fertile soils support only northern pin oak and jack pine. Tree growth is slow, and reestablishing a tree cover in cutover areas is difficult.

Oak forest cover type.—This type makes up about 8,100 acres in the county. Northern red oak predominates. Other common associated trees include bigtooth aspen, red pine, eastern white pine, and paper birch. This cover type is mainly in areas of the very deep, sandy and loamy Klacking and McGinn soils. Tree growth is good on these soils. Plantations of red pine and eastern white pine are common within areas of this cover type.

Northern hardwoods forest cover type.—This type makes up about 36,800 acres in the county. Sugar maple is the most common tree and is dominant in nearly all areas. American beech, yellow birch, and red maple are very common. Other common associated trees include black cherry, northern red oak, and aspen. There are varying numbers of American basswood, eastern hemlock, eastern white pine, red pine, and white ash. This cover type is mainly in areas of the moderately well drained, loamy and clayey Hoist, Negwegon, and Ossineke soils. Areas of this cover type have the most productive soils in the county. Tree growth is good or excellent, and the potential for wood products is high.

Aspen-birch forest cover type.—This type makes up about 87,000 acres in the county. Most stands are a mixture of aspen, paper birch, red maple, and conifers and include a wide range of tree species. Paper birch and aspen predominate. Other common associated trees include eastern white pine, northern pin oak, eastern hemlock, white spruce, and balsam poplar. There are varying numbers of sugar maple, northern red oak, and American elm. The majority of the American elm has died from Dutch elm disease. This cover type is mainly in areas of Au Gres, Croswell, and Tacoda soils. These soils are sandy throughout or are sandy in the upper part and clayey in the lower part. Tree growth is fair or good on these soils.

Northern whitecedar forest cover type.—This type makes up about 36,800 acres in the county. Northern whitecedar predominates. Other common associated trees include black spruce, black ash, red maple, eastern hemlock, balsam poplar, and tamarack. This cover type is mainly in areas of the very poorly drained, organic or sandy Deford, Lupton, and Tawas soils. The water table is at or near the surface most of the time in these soils. Tree growth is slow, and reestablishing stands of desirable trees in cutover areas is difficult. Windthrow is a serious hazard in areas that are opened up by cutting.

Management for wood crops varies on the different kinds of soil in Alpena County. It is generally governed by the species in the stand. One management alternative might be to favor northern hardwoods with an uneven-aged approach. Another management alternative could be to favor aspen and white birch with an even-aged approach. Management should include applying erosion-control strategies, planting trees where natural regeneration is undesirable or insufficient, controlling the vegetation that competes with natural or planted regeneration, improving seedling survival, minimizing windthrow on the wetter sites, timely harvesting, controlling the damage caused by insects and diseases, removing cull trees and undesirable species, and maintaining an optimum basal area.

Soil erosion may occur as a result of site preparation for planting and as a result of cutting where the soil is exposed along logging roads, stream crossings, and fire lanes and in landing areas. Forests that have been abused by fire may also be subject to erosion. Erosion is generally a hazard on forestland if the slope of the soil is 18 percent or more. Establishing logging roads and skid roads on the contour helps to control erosion.

Excessive wetness, or too much water, is the result of a high water table, flooding, or ponding. It causes seedling mortality, limits the use of equipment, increases the invasion or growth of undesirable plants following harvest, and increases the likelihood of windthrow by restricting the rooting depth of some trees. Ruts form easily on some soils when wheeled skidders are used during wet periods. Deep ruts tend to restrict lateral drainage, damage tree roots, and alter soil structure and can result in a species change and reduced yields. Wetness can be overcome by using woodland equipment only when the soils are dry or frozen or have an adequate snow cover.

Droughtiness, or too little water, can cause seedling mortality. Steep, south- and west-facing slopes may be especially droughty because of high insolation and evaporation rates on these sites. Planting when the soil is moist can reduce seedling losses. Seedling survival during dry periods can be improved by planting large, vigorous nursery stock or containerized seedlings if natural regeneration is undesirable or insufficient. Special site preparation, such as furrowing to conserve moisture, may also be needed. Containerized planting stock may be necessary on very dry sites.

Slope may limit the use of forestry equipment. Also, it influences the location of landings and log-handling areas. Slopes of 18 percent or more generally limit the use of equipment in logging areas and on skid trails and logging roads. Establishing the logging roads and skid trails on the contour helps to overcome the slope. Nearly level and undulating areas are the best sites for landings and log-handling areas.

Table 8 can help woodland owners or forest managers plan the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table 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; *L*, low strength; and *N*, snowpack. 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, L, and N.

In table 8, *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. 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.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

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 of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, 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.

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 a specified number of 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.

Suggested trees to plant are those that are suitable for commercial wood production.

Equipment Limitations on Forestland

Logging and harvesting of wood resources is an important part of the economy of Alpena County. Table 9 was designed to give expanded information concerning the operability of harvesting equipment on the soils of the county, beyond the interpretations given in table 8. Table 9 can show the woodland manager, owner, or logging operator how soil conditions may improve during the year and when may be the best time to schedule harvesting or thinning operations.

Table 9 shows the limitations that affect the use of equipment in logging areas and on skid roads, on landings, and on logging roads. A rating of *slight* indicates that equipment operability is not restricted for normal logging equipment and procedures. A rating of *moderate* indicates that equipment operability is moderately restricted because of one or more soil factors. In the case of soil wetness, the use of high floatation equipment or special procedures may be required to overcome the effects of soil rutting. A rating of *severe* indicates that the kind of equipment that can be used is severely restricted.

Ratings are given for the *most limiting season(s)* and the *preferred operating season(s).* The latter show how soil conditions may improve if logging operations are conducted during the preferred operating season.

Logging areas and skid roads include areas that are being partially or completely cut. Generally, the frequency of equipment use is at its lowest in the logging area. Skid roads, which are generally located within the logging area, are roads or trails over which logs are dragged or hauled from the stump to a landing.

Log landings are areas where logs are assembled for transportation in loads. The frequency of wheeled equipment use may be at its highest in these areas.

Haul roads are access roads, leading from primary or surfaced roads into the logging area. These roads serve as transportation routes for wheeled logging equipment and logging trucks. Generally, these are unpaved roads. They may be graveled.

Plant Communities on Selected Soils

Table 10 lists plants that are typically associated with soils in Alpena County. Plants are listed in table 10 on the basis of sample site information. Sample sites were selected for vegetative analysis after detailed soil maps and soil series descriptions were completed in an area. Once the soils were verified, representative vegetative communities were selected. The sample sites are in areas that are relatively free of recent disturbances, such as fire, tree harvesting, or noticeable insect or disease infestations, and that exhibit typical stocking densities (Pregitzer et al., 1987).

The sample sites were approximately 10,000 square feet in size. Plant species were identified and recorded, and an ocular estimate was made of the percent coverage for each species. The percentage of canopy coverage was estimated for tree species, and the percentage of ground coverage was estimated for other plants. Coverage values were grouped into seven classes to facilitate compilation and to clarify results. The seven classes are:

Class 1—less than 1 percent coverage
Class 2—1 to 5 percent coverage
Class 3—5 to 25 percent coverage
Class 4—25 to 50 percent coverage
Class 5—50 to 75 percent coverage
Class 6—75 to 95 percent coverage
Class 7—95 to 100 percent coverage

The number after each plant species in table 10 represents the mean coverage class for that species for the map unit component listed. This number can be correlated to the relative dominance of overstory and understory vegetation. Plants that have a high number cover more of the canopy or ground than those with a low number.

The plants are listed in table 10 on the basis of information from 2 to 10 sample sites. They are the typical plants on the specified soil but are not the only plants (Voss, 1972, 1985, 1996). Only the common plant names are shown in table 10. The common names are those on the national list of plant names (USDA, National List of Common Plant Names).

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

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. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

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 11 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 11 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, from the Michigan State University Extension, or from a commercial nursery.

Recreation

Recreation is a major land use in Alpena County. Many areas in the county are developed as sites for second homes or are used for extensive recreational activities, such as fishing, hunting, sightseeing, and wildlife and plant observation. Winter recreational activities include cross-country skiing and snowmobiling. Some areas are sites for intensive recreational uses. These include campgrounds, a Great Lakes harbor, picnic areas, playgrounds, hiking trails, cross-country skiing areas, and golf courses. With the pressures of increasing population and land prices, land use will likely undergo changes in the future. These changes may include a demand for more land for various types of recreation. The appeal of waterfront property is putting great development pressure on the riparian lands of Lake Huron and other water bodies.

The soils of the survey area are rated in table 12 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 and the ability of the soil to support vegetation are also 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 12, 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 measures.

The information in table 12 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 15 and interpretations for dwellings without basements and for local roads and streets in table 14.

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 gentle 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

By Lynn Sampson, Biologist, Natural Resources Conservation Service.

Alpena County has a large and diverse population of wildlife. White-tailed deer, black bear, tree squirrels, snowshoe hare, raccoon, wild turkey, coyote, skunk, and porcupine are abundant. Other species include ruffed grouse, woodcock, hawks, and waterfowl. The lakes and streams support sunfish, northern pike, largemouth bass, smallmouth bass, walleye, perch, and other game fish. The rivers and streams are popular among fisherman for their trout, salmon, smelt, and steelhead populations.

The habitat for wildlife in Alpena County ranges from farmland to northern hardwood climax forests. The county has many streams, inland lakes, and diverse wetlands, which support diverse populations of fish and wildlife.

Much of the habitat in the county can be improved by increasing the amount of available food and cover and providing a diversity of habitats. Timber management techniques can improve the habitat for wildlife that need a young or mature forest. Managing openings in the forest helps to provide the diversity all wildlife species need. Grasses, herbs, and forbs have their place in forest and wildlife management.

Before European settlement, such wildlife species as black bear, mountain lion, bobcat, and timber wolf roamed Alpena County. The passenger pigeon and eastern wild turkey were abundant in the forests of the county. With logging and agricultural development in the late 1800s, the wildlife species adapted to second growth forest, brushy edges, and agriculture became abundant. The population of white-tailed deer, red fox, cottontail rabbit, and raccoons increased.

The animal communities of Alpena County include many wildlife species recognized as rare, threatened, or endangered by the State of Michigan. These species include the common loon, bald eagle, caspian tern, kirtland’s warbler, and channel darter.

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 kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 13, 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, 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 moisture are also considerations. Examples of grain and seed crops are buckwheat, corn, wheat, rye, 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 are also considerations. Examples of grasses and legumes are orchardgrass, lovegrass, bromegrass, red 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 are also considerations. Examples of wild herbaceous plants are little bluestem, goldenrod, aster, and wild carrot.

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, apple, hawthorn, dogwood, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, 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 juniper.

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, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, marsh marigold, wild millet, wildrice, rushes, sedges, and reeds.

Shallow water areas have an average water 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 coyote, gray fox, red fox, woodchucks, opossum, cottontail rabbit, meadowlark, field sparrow, hawks, owls, and numerous songbirds.

Habitat for woodland wildlife consists of areas of deciduous plants and/or coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, warblers, woodpeckers, cardinals, wrens, gray fox, black bear, white-tailed deer, eastern wild turkey, raccoons, skunks, tree squirrels, and mice.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, blue herons, bald eagles, belted kingfishers, woodcock, marsh hawks, shore birds, muskrat, mink, and beaver.

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 6 or 7 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 14 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, and 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, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials 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 15 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.

Table 15 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.

Table 15 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 table 15 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 wind erosion.

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 16 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 6 or 7 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 6 or 7 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 16, 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 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, and bedrock.

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 17 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; embankments, dikes, and levees; and aquifer-fed excavated ponds. 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.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, and permeability of the aquifer. Depth to bedrock and the content of large stones affect the ease of excavation.

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 such as sulfur. 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, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control 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 wind erosion 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, 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. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined 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 grain-size distribution, plasticity, and compaction characteristics.

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 shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 18 gives estimates of the engineering classification and of the range of engineering properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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. "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 as much as about 15 percent, 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 of the American Society for Testing and Materials (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 grain-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 grain-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.

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 grain-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 omitted in the table.

Physical Properties

Table 19 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 this 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 earth-moving 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 drying the soil at 105 degrees C. In this table, 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. Bulk densities 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 estimates indicate the rate of downward movement of water 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 the retention of water and the 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.

Linear extensibility (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 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 factors are shown in table 19 as the K factor (Kw and Kf) and the T factor. 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) and the Revised Universal Soil Loss Equation (RUSLE) 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 and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

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 of soil to soil blowing. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are defined in the “National Soil Survey Handbook” (USDA, 2002).

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Chemical Properties

Table 20 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.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil 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.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table J1a, 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 by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Cation-exchange capacity is the total amount of extractable bases 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. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Effective cation-exchange capacity refers to the sum of extractable bases plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5. Soil reaction is a measure of acidity or alkalinity. The pH of each soil 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.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Soil Features

Table 21 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the thickness of the restrictive layer, which significantly affects the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

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 initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for 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 to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes 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 sulfate and sodium content, 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 or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete 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.

Water Features

Tables 22 and 23 give estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups, which are shown in tables 22 and 23, 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 a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

The *months* identified in table 22 indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. Table 22 indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. Table 22 indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding 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 ponding 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 ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. 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.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

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.

Table 23 gives estimates of the fluctuating water content in the soils in Alpena County. Soil moisture status greatly influences the type of vegetation and plant growth; physical properties of soils, such as permeability, workability, strength, linear extensibility, and frost action; and chemical interactions and transport. Many other properties, qualities, and interpretations also are affected. Soil moisture status is important in the classification of soils, wetland, and habitat.

Table 23 gives estimates of soil moisture for each soil in the county at various depths for every month of the year. The depths displayed are representative values that are indicative of conditions that occur most of the time. *Dry* indicates a moisture condition under which most plants (especially crops) cannot extract water for growth. *Moist* indicates a moisture condition under which soil water is most readily available for plant growth. *Wet* indicates a condition under which water will stand in an unlined hole or at least a condition under which the soil is too wet for the growth of most agricultural species. A rating of “0.0-6.5: Moist” indicates that, in a typical year, the soil is moist from the surface to a depth of 6.5 feet during the month designated. Summer months may show the effects of drying plus intermittent light rains.

Hydric Soils

In this section, hydric soils are defined and described and the hydric soils in the survey area are listed.

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology (Cowardin et al., 1979; U.S. Army Corps of Engineers, 1987; National Research Council, 1995; Tiner, 1985). Criteria for each of the characteristics must be met for areas to be identified as wetlands. Undrained hydric soils that have natural vegetation should support a dominant population of ecological wetland plant species. Hydric soils that have been converted to other uses should be capable of being restored to wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). These soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 1995). These criteria are used to identify a phase of a soil series that normally is associated with wetlands. The criteria used are selected estimated soil properties that are described in “Soil Taxonomy” (Soil Survey Staff, 1999) and “Keys to Soil Taxonomy” (Soil Survey Staff, 1996) and in the “Soil Survey Manual” (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils in this survey area are specified in “Field Indicators of Hydric Soils in the United States” (Hurt et al,, 1998).

Hydric soils are identified by examining and describing the soil to a depth of about 20 inches. This depth may be greater if determination of an appropriate indicator so requires. It is always recommended that soils be excavated and described to the depth necessary for an understanding of the redoximorphic processes. Then, using the completed soil descriptions, soil scientists can compare the soil features required by each indicator and specify which indicators have been matched with the conditions observed in the soil. The soil can be identified as a hydric soil if at least one of the approved indicators is present.

The following map units meet the definition of hydric soils and, in addition, have at least one of the hydric soil indicators. This list can help in planning land uses; however, onsite investigation is recommended to determine the hydric soils on a specific site (National Research Council, 1995; Hurt and others, 1998).

12B Tawas-Au Gres complex, 0 to 4 percent slopes
13 Tawas-Lupton mucks
14 Dawson-Loxley peats
19 Leafriver muck
30 Wheatley muck
35 Kinross muck
38 Tonkey silt loam
43 Wakeley mucky sand
46 Ensley mucky sandy loam
55 Springport clay loam, drained
59B Algonquin-Springport complex, 0 to 6 percent slopes
68 Rondeau muck
69 Loxley peat
70 Lupton muck
71 Tawas muck
72 Dorval muck
77 Rollaway muck, frequently flooded
86 Histosols and Aquents, ponded
87 Ausable muck, frequently flooded
93B Tacoda-Wakeley complex, 0 to 4 percent slopes
113 Angelica loam
127 Cathro muck
128 Dawson peat
316 Ruse loam
359C Algonquin-Negwegon-Dorval complex, 0 to 12 percent slopes
361B Allendale-Dorval-Blue Lake complex, 0 to 6 percent slopes
368A Au Gres-Deford complex, 0 to 3 percent slopes
369 Deford muck
371 Springport silt loam
374 Thunderbay very fine sandy loam, frequently flooded
392 Caffey mucky sand
396F Proper-Deford-Rousseau complex, 0 to 40 percent slopes
397 Spot peat
419 Chippeny muck
477B Algonquin, till substratum-Springport, till substratum, complex, 0 to 4 percent slopes
478 Springport silty clay loam, till substratum
480B Negwegon-Algonquin-Lupton complex, 0 to 6 percent slopes
481C Negwegon-Lupton complex, 0 to 12 percent slopes
486B Tonkey-Bowers silt loams, 0 to 4 percent slopes
487B Slade-Angelica loams, 1 to 4 percent slopes

Map units that are made up of hydric soils may have small areas, or inclusions, of nonhydric soils in the higher positions on the landform, and map units made up of nonhydric soils may have inclusions of hydric soils in the lower positions on the landform.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1996 and 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 24 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 Orthod (*Orth*, meaning the common ones, 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 Haplorthods (*Hapl*, meaning minimal horizonation, plus *orthod*, the suborder of the Spodosols that has a horizon characterized by an accumulation of aluminum, iron, and organic carbon in which no one of the elements dominates).

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 *Entic* identifies the subgroup that intergrades to the order Entisols. An example is Entic Haplorthods.

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 Entic Haplorthods.

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. The Rubicon series is an example.

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” and in “Keys to Soil Taxonomy” (Soil Survey Staff, 1999 and 1996). 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.

Algonquin Series

The Algonquin series consists of somewhat poorly drained soils on lake plains, some of which are till floored. These soils formed in silty and clayey lacustrine deposits. Permeability is very slow. Slopes range from 0 to 6 percent.

Taxonomic class: Fine, mixed, semiactive, frigid Aquic Hapludalfs

Typical pedon of Algonquin silt loam, in an area of Negwegon-Algonquin-Lupton complex, 0 to 6 percent slopes, 230 feet south and 1,220 feet west of the northeast corner of sec. 17, T. 31 N., R. 5 E. USGS Jewett Creek topographic quadrangle; lat. 45 degrees 5 minutes 13.65 seconds north and long. 83 degrees 50 minutes 38.66 seconds west, NAD 27:

A—0 to 5 inches; very dark gray (7.5YR 3/1) silt loam, gray (7.5YR 5/1) dry; moderate medium granular structure; friable; many fine roots; moderately acid; abrupt smooth boundary.

E—5 to 7 inches; brown (7.5YR 5/2) silt loam, pinkish gray (7.5YR 7/2) dry; moderate medium granular structure; friable; few fine roots; many vesicular pores; moderately acid; abrupt wavy boundary.

Bt1—7 to 13 inches; reddish brown (5YR 4/3) clay; strong very coarse prismatic structure parting to strong medium angular blocky; firm; few fine roots; many vesicular pores; common dark reddish brown (5YR 3/3) clay films on faces of peds; common fine prominent strong brown (7.5YR 5/6) accumulations of iron and common fine prominent gray (10YR 6/1) iron depletions; slightly acid; abrupt smooth boundary.

Bt2—13 to 19 inches; reddish brown (5YR 5/3) silty clay loam; strong very coarse prismatic structure parting to weak thick platy; firm; few fine roots; many vesicular pores; common dark brown (7.5YR 3/3) clay films on faces of peds and common dark brown (7.5YR 3/2) organic coatings on faces of peds; common medium prominent strong brown (7.5YR 4/6) accumulations of iron and many medium prominent light gray (10YR 7/1) iron depletions; strongly effervescent; slightly alkaline; abrupt smooth boundary.

BC—19 to 55 inches; light reddish brown (5YR 6/3), stratified silty clay loam and loam; strong very coarse prismatic structure parting to weak thick platy; firm; few fine roots between peds; many medium prominent strong brown (7.5YR 5/6) accumulations of iron and many medium prominent light greenish gray (10G 7/1) iron depletions; violently effervescent; moderately alkaline; abrupt smooth boundary.

C—55 to 80 inches; light reddish brown (5YR 6/3), stratified silty clay loam and loam; massive; firm; weakly expressed platiness derived from deposition; many medium prominent strong brown (7.5YR 5/6) accumulations of iron and many medium prominent light greenish gray (10G 7/1) iron depletions; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 35 to 60 inches. The depth to carbonates ranges from 11 to 15 inches. The content of gravel is 0 to 1 percent throughout the profile. Some pedons have a substratum of loamy glacial till between depths of 60 and 80 inches. In this substratum, the content of gravel is 2 to 5 percent and the content of cobbles is 0 to 5 percent.

The A horizon has hue of 7.5YR, value of 2 or 3, and chroma of 1 or 2. Some pedons have an Ap horizon, which has value of 2 to 4 and chroma of 2 or 3.

The E horizon has hue of 7.5YR, value of 6 or 7, and chroma of 2 or 3.

The Bt1 and Bt2 horizons have hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. They are clay, silty clay, or silty clay loam.

The BC horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is stratified silty clay, silty clay loam, or loam

The C horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is stratified silty clay, silty clay loam, or loam. Some pedons have a 2C horizon. This horizon has hue of 7.5YR, value of 4 to 6, and chroma of 3 or 4. It is loam or fine sandy loam.

Allendale Series

The Allendale series consists of very deep, somewhat poorly drained soils on lake terraces and lake plains. These soils formed in sandy and clayey lacustrine deposits. Permeability is rapid in the sandy materials and very slow in the clayey deposits. Slopes range from 0 to 3 percent.

Taxonomic class: Sandy over clayey, mixed, semiactive, frigid Alfic Epiaquods

Typical pedon of Allendale loamy sand, 0 to 3 percent slopes, 675 feet north and 750 feet west of the southeast corner of sec. 7, T. 28 N., R. 8 E., Alcona County, Michigan; USGS Hubbard Lake topographic quadrangle; lat. 44 degrees 49 minutes 52.53 seconds north and long. 83 degrees 30 minutes 31.46 seconds west, NAD 27:

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) loamy sand, light brownish gray (10YR 6/2) dry; weak coarse granular structure; friable; many fine roots; moderately acid; abrupt smooth boundary.

E—11 to 13 inches; pale brown (10YR 6/3) sand; single grain; loose; few fine roots; common medium cylindrical wormcasts; common coarse distinct dark yellowish brown (10YR 4/4) accumulations of iron; moderately acid; abrupt broken boundary.

Bs—13 to 20 inches; brown (7.5YR 4/4) sand; weak thick platy structure; friable; few fine roots; few patchy prominent black (N 2/0) manganese or iron-manganese coatings on rock fragments; many medium distinct strong brown (7.5YR 5/8) accumulations of iron and common medium prominent grayish brown (10YR 5/2) iron depletions; about 2 percent gravel; moderately acid; abrupt smooth boundary.

E´—20 to 22 inches; yellowish brown (10YR 5/4) sand; massive; friable; few fine roots; common medium distinct dark yellowish brown (10YR 4/6) accumulations of iron and common medium faint brown (10YR 5/3) iron depletions; moderately acid; abrupt smooth boundary.

Bt1—22 to 25 inches; reddish brown (5YR 4/4) sandy loam; massive; friable; few fine roots; many distinct brown (7.5YR 4/4) clay bridges between sand grains; common medium prominent strong brown (7.5YR 4/6) accumulations of iron; slightly acid; abrupt smooth boundary.

2Bt2—25 to 31 inches; reddish brown (5YR 4/3) silty clay; strong medium angular blocky structure; firm; common faint reddish brown (5YR 4/3) clay films on faces of peds; common fine prominent greenish gray (5G 6/1) and strong brown (7.5YR 5/6) accumulations of iron; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2Bt3—31 to 44 inches; reddish brown (5YR 5/3) silty clay; moderate medium subangular blocky structure; firm; common prominent white (5YR 8/1) carbonate coatings on faces of peds; common prominent greenish gray (5GY 6/1) clay films on faces of peds; common fine prominent strong brown (7.5YR 5/6) accumulations of iron; strongly effervescent; moderately alkaline; clear smooth boundary.

2C—44 to 80 inches; reddish brown (5YR 5/3) silty clay; weak fine angular blocky structure; firm; common prominent white (5YR 8/1) carbonate coatings on faces of peds; common fine prominent strong brown (7.5YR 5/6) and common fine prominent greenish gray (5GY 6/1) iron depletions; about percent 1 gravel; strongly effervescent; moderately alkaline.

The thickness of the solum is more than 60 inches. The depth to carbonates ranges from 20 to 45 inches. The thickness of the sandy material ranges from 20 to 40 inches. The content of gravel ranges from 0 to 2 percent throughout the profile.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Some pedons have an A horizon. This horizon has hue of 10YR or is neutral in hue. It has value of 2 and chroma of 0 or 1.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. It is loamy sand or sand.

The Bs horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4 to 6. It is loamy sand or sand.

The E´ horizon has hue of 10YR, value of 5 or 6, and chroma of 4.

The Bt1 horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 4. It is loamy sand or sandy loam.

The 2Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is clay or silty clay.

The C horizon has hue of 5YR, value of 5, and chroma of 3. It is silty clay.

Alpena Series

The Alpena series consists of very deep, excessively drained soils on lake terraces, beach ridges, and eskers. These soils formed in sandy and gravelly beach deposits or in gravelly areas on eskers. Permeability is very rapid. Slopes range from 0 to 35 percent.

Taxonomic class: Sandy-skeletal, mixed, frigid Entic Hapludolls

Typical pedon of Alpena gravelly sandy loam, 0 to 6 percent slopes, 2,640 feet south and 3,860 feet west of the northeast corner of sec. 29, T. 31 N., R. 9 E; USGS North Point topographic quadrangle; lat. 45 degrees 3 minutes 15.16 seconds north and long. 83 degrees 21 minutes 38.27 seconds west, NAD 27:

A—0 to 6 inches; black (7.5YR 2.5/1) gravelly sandy loam, dark gray (7.5YR 4/1) crushed and dry; weak fine granular structure; friable; many fine roots; about 20 percent gravel; slightly effervescent; slightly alkaline; abrupt smooth boundary.

C—6 to 80 inches; brown (10YR 5/3) extremely gravelly coarse sand; single grain; loose; about 75 percent gravel; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 6 to 10 inches. The content of gravel ranges from 15 to 34 percent in the solum and from 35 to 80 percent in the C horizon. The content of cobbles ranges from 0 to 7 percent throughout the profile.

The A horizon has hue of 7.5YR, value of 2.5 or 3, and chroma of 1 or 2. The dry value is 5 or less. This horizon is slightly alkaline. It is gravelly sandy loam.

The C horizon has hue of 10YR, value of 5, and chroma of 3. It is moderately alkaline. It is very gravelly sand to extremely gravelly coarse sand.

Angelica Series

The Angelica series consists of very deep, poorly drained soils on ground moraines. These soils formed in loamy glacial till. Permeability is moderately slow. Slopes range from 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, active, nonacid, frigid Aeric Endoaquepts

Typical pedon of Angelica loam, 100 feet north and 2,600 feet east of the southwest corner of sec. 26, T. 30 N., R. 7 E. USGS Big Ravine Creek topographic quadrangle; lat. 44 degrees 57 minutes 41.88 seconds north and long. 83 degrees 33 minutes 27.11 seconds west, NAD 27:

Ap—0 to 8 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; weak medium granular structure; friable; many fine and common medium roots; many fine prominent brown (7.5YR 4/4) accumulations of iron around roots; about 5 percent gravel and 2 percent cobbles; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bg—8 to 17 inches; gray (5Y 6/1) loam; weak medium subangular blocky structure; friable; common fine roots; common medium prominent yellowish red (7.5YR 5/8) accumulations of iron; about 5 percent gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bw—17 to 29 inches; pale brown (7.5YR 6/3) loam; weak medium subangular blocky structure; friable; few fine roots; many medium prominent strong brown (7.5YR 5/6) accumulations of iron and common fine prominent greenish gray (5GY 6/1) iron depletions; about 5 percent gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Cg—29 to 80 inches; reddish gray (5YR 5/2) loam; massive; friable; few fine roots; common medium prominent strong brown (7.5YR 4/6) accumulations of iron along roots; about 10 percent gravel; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 20 to 30 inches. The content of gravel ranges from 5 to 14 percent throughout the profile, and the content of cobbles ranges from 0 to 5 percent.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The Bg horizon has hue of 7.5YR to 5Y, value of 5 or 6, and chroma of 1 or 2. It is loam or sandy loam.

The Bw horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 or 4. It is loam or sandy loam.

The Cg horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 1 or 2. It is loam or sandy loam.

Annalake Series

The Annalake series consists of very deep, moderately well drained soils on lake plains, deltas, lake terraces, outwash plains, and moraines. These soils formed in stratified sandy and loamy lacustrine and glaciofluvial deposits. Permeability is moderate. Slopes range from 0 to 18 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, frigid Alfic Oxyaquic Haplorthods

Typical pedon of Annalake loamy very fine sand, on a 14 percent slope, in an area of Zimmerman-Annalake complex, 6 to 18 percent slopes, 200 feet north and 1,452 feet west of the southeast corner of sec. 35, T. 29 N., R. 5 E. USGS Spruce topographic quadrangle; lat. 44 degrees 51 minutes 33.60 seconds north and long. 83 degrees 25 minutes 48.53 seconds west, NAD 27:

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loamy very fine sand, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; about 3 percent gravel; moderately acid; abrupt smooth boundary.

E—4 to 6 inches; brown (7.5YR 5/2) loamy very fine sand, pinkish gray (7.5YR 7/2) dry; weak medium subangular blocky structure; friable; common fine roots; about 3 percent gravel; strongly acid; abrupt broken boundary.

Bs1—6 to 12 inches; brown (7.5YR 4/4) loamy very fine sand; moderate medium subangular blocky structure; friable; many fine and common medium roots; about 3 percent gravel; strongly acid; clear wavy boundary.

Bs2—12 to 16 inches; brown (7.5YR 5/4) loamy fine sand; weak medium subangular structure; friable; many fine and common medium roots; very strongly acid; clear wavy boundary.

E/B—16 to 33 inches; about 60 percent brown (7.5YR 5/3) loamy fine sand, pinkish gray (7.5YR 6/2) dry (E´); surrounding peds of reddish brown (5YR 4/4) loam (Bt); moderate medium platy structure; friable; few fine roots; few fine tubular pores;

common distinct brown (7.5YR 4/3) clay films on faces of peds and in root channels; about 3 percent gravel; moderately acid; clear wavy boundary.

Bt and E´—33 to 42 inches; bands and pockets of reddish brown (5YR 4/4) loam (Bt); also, brown (7.5YR 5/3) loamy sand; pinkish gray (7.5YR 6/2) dry (E´); moderate medium subangular blocky structure; friable; few fine medium roots; few fine tubular pores; common distinct brown (7.5YR 4/3) clay films on faces of peds and in root channels; common medium prominent strong brown (7.5YR 5/6) accumulations of iron; about 3 percent gravel; slightly acid; abrupt wavy boundary.

C—42 to 80 inches; light brown (7.5YR 6/4), stratified fine sandy loam and very fine sandy loam; massive; friable; about 3 percent gravel; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. The content of gravel ranges from 0 to 5 percent throughout the profile.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. It is moderately acid or strongly acid. It is dominantly loamy very fine sand but is loamy fine sand in some pedons.

The E horizon has hue of 7.5YR, value of 5 or 6, and chroma of 2. It is strongly acid or very strongly acid. It is loamy very fine sand.

The Bs horizon has hue of 7.5YR, value of 3 to 5, and chroma of 4. It is strongly acid or very strongly acid. It is loamy fine sand or loamy very fine sand.

The E´ part of the E/B horizon and of Bt and E´ horizon has hue of 7.5YR, value of 5 or 6, and chroma of 2. It is moderately acid or slightly acid. It is loamy fine sand or loamy sand.

The Bt part of the E/B horizon and of the Bt and E´ horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 3 to 6. It is strongly acid to slightly acid. It is loam.

The C horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is moderately alkaline. It is stratified fine sandy loam to silt loam.

Aquents

These very deep, very poorly drained soils are in ponded depressions. They formed in sandy to clayey deposits. Permeability is very slow to rapid. Slopes are 0 percent.

Taxonomic class: Mixed, frigid Aquents

These soils have hue of 7.5YR or 10YR or are neutral in hue. They have value of 2 to 4 and chroma of 0 to 2. The texture ranges mainly from sand to clay. In some areas the surface layer is muck.

Au Gres Series

The Au Gres series consists of very deep, somewhat poorly drained soils on lake terraces, stream terraces, and outwash plains. These soils formed in sandy glaciofluvial and lacustrine deposits. Permeability is rapid. Slopes range from 0 to 4 percent.

Taxonomic class: Sandy, mixed, frigid Typic Endoaquods

Typical pedon of Au Gres sand, 0 to 3 percent slopes, 1,360 feet north and 690 feet west of the southeast corner of sec. 25, T. 31 N., R. 7 E. USGS Lake Winyah topographic quadrangle; lat. 45 degrees 2 minutes 9.83 seconds north and long. 83 degrees 33 minutes 19.84 seconds west, NAD 27:

Oe—0 to 1 inch; partially decomposed organic material; many fine roots; very strongly acid; abrupt smooth boundary.

A—1 to 2 inch; black (N 2.5/0) sand, dark gray (N 4/0) dry; moderate fine granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

E—2 to 10 inches; reddish gray (5YR 5/2) sand, light gray (5YR 7/1) dry; single grain; loose; many fine and common medium roots; extremely acid; abrupt wavy boundary.

Bs1—10 to 14 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; friable; many fine roots; few fine prominent strong brown (7.5YR 5/8) accumulations of iron; about 1 percent gravel; strongly acid; clear wavy boundary.

Bs2—14 to 28 inches; strong brown (7.5YR 5/6) sand; weak medium subangular blocky structure; friable; common fine roots; common fine distinct strong brown (7.5YR 5/8) accumulations of iron; columns of moderately cemented, dark reddish brown (5YR 3/3) ortstein, 3 to 6 inches wide, extending into the BC horizon; ortstein columns are 15 to 20 inches apart; ortstein makes up 25 percent of the horizon; about 1 percent gravel; strongly acid; clear wavy boundary.

BC—28 to 32 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few fine roots; common fine prominent strong brown (7.5YR 5/8) accumulations of iron; columns of moderately cemented, dark reddish brown (5YR 3/3) ortstein, 1 to 3 inches wide, extending into this horizon from the Bs2 horizon; ortstein columns are 20 to more than 40 inches apart; ortstein makes up 10 percent of the horizon; about 1 percent gravel; strongly acid; clear smooth boundary.

C—32 to 80 inches; pale brown (10YR 6/3) sand; single grain; loose; common medium prominent strong brown (7.5YR 5/8) accumulations of iron; strongly acid.

The thickness of the solum ranges from 20 to 40 inches. The content of gravel ranges from 0 to 5 percent. The depth to iron accumulations ranges from 8 to 15 inches.

The A horizon has hue of 7.5YR or is neutral in hue. It has value of 2.5 and chroma of 0 or 1. It is very strongly acid. It is sand.

The E horizon has hue of 7.5YR or 5YR, value of 5, and chroma of 2. It is extremely acid to strongly acid. It is sand.

The Bs horizon has hue of 7.5YR, value of 3 to 5, and chroma of 4 to 6. The content of ortstein ranges from 0 to 25 percent. This horizon is strongly acid. It is sand.

The BC horizon has hue of 10YR, value of 5, and chroma of 4 to 6. The content of ortstein ranges from 0 to 10 percent. This horizon is strongly acid. It is sand.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. It is strongly acid. It is sand.

Ausable Series

The Ausable series consists of very deep, very poorly drained soils on flood plains. These soils formed in organic layers underlain by sandy alluvium. Permeability is moderate or moderately rapid in the organic layers and rapid in the sandy deposits. Slopes range from 0 to 2 percent.

Taxonomic class: Sandy, mixed, frigid Histic Humaquepts

Typical pedon of Ausable muck, frequently flooded, 2,440 feet north and 280 feet east of the southwest corner of sec. 14, T. 29 N., R. 5 E. USGS Beaver Lake topographic quadrangle; lat. 44 degrees 54 minutes 25.26 seconds north and long. 83 degrees 48 minutes 24.71 seconds west, NAD 27:

Oa—0 to 11 inches; black (N 2.5/0) (broken face and rubbed) muck; less than 5 percent fiber broken face and rubbed; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

C—11 to 24 inches; brown (10YR 5/3) sand; single grain; loose; common fine roots; common medium very dark gray (N 3/0) organic stains; common fine prominent strong brown (7.5YR 5/6) accumulations of iron and common medium faint grayish brown (10YR 5/2) iron depletions; about 2 percent wood fragments; slightly acid; abrupt smooth boundary.

Cg—24 to 80 inches; gray (5Y 6/1) sand; single grain; loose; bands of black (5YR 2.5/1) muck 1/2 inch to 4 inches thick; common medium black (5YR 2.5/1) organic stains; about 2 percent wood fragments; neutral.

The thickness of the solum ranges from 8 to 15 inches and corresponds to the thickness of the organic surface layer. The content of coarse fragments ranges from 1 to 10 percent. These fragments are mainly woody.

The Oa horizon has hue of 7.5YR or is neutral in hue. It has value of 2.5 and chroma of 0 to 2. It is slightly acid or neutral.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3. It is slightly acid to slightly alkaline. It is sand or loamy sand. Some pedons do not have a C horizon.

The Cg horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 or 2. It is dominantly sand. Thin layers of muck or dark-stained sand are evident. Reaction is slightly acid to slightly alkaline

Bamfield Series

The Bamfield series consists of very deep, well drained soils on moraines. These soils formed in loamy glacial till. Permeability is moderately rapid in the upper part of the profile and moderately slow to very slow in the lower part. Slopes range from 12 to 35 percent.

Taxonomic class: Fine-loamy, mixed, active, frigid Haplic Glossudalfs

Typical pedon of Bamfield fine sandy loam, 18 to 35 percent slopes, 900 feet north and 200 feet west of the southeast corner of sec. 34, T. 30 N., R. 7 E. USGS Big Ravine Creek topographic quadrangle; lat. 44 degrees 56 minutes 56.96 seconds north and long. 83 degrees 34 minutes 5.56 seconds west, NAD 27:

A—0 to 6 inches; black (7.5YR 2.5/1) fine sandy loam, gray (7.5YR 5/1) dry; weak medium granular structure; friable; common fine and few medium roots; about 3 percent gravel; neutral; clear wavy boundary.

E—6 to 8 inches; gray (7.5YR 6/1) fine sandy loam, light gray (7.5YR 7/1) dry; weak medium subangular blocky structure; friable; few fine roots; common black (7.5YR 2.5/1) wormcasts; about 3 percent gravel; slightly acid; abrupt wavy boundary.

Bw—8 to 11 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; few fine roots; about 2 percent gravel and 1 percent cobbles; moderately acid; clear wavy boundary.

E/B—11 to 14 inches; 80 percent brown (7.5YR 5/3) loamy fine sand (E´), pink (7.5YR 7/3) dry; weak medium subangular blocky structure; friable; surrounds peds of reddish brown (5YR 4/4) clay loam (Bt); few faint reddish brown (5YR 4/3) clay films; few fine roots; about 2 percent gravel; slightly acid; abrupt wavy boundary.

Bt1—14 to 21 inches; reddish brown (5YR 4/4) clay loam; moderate coarse angular blocky structure; friable; many faint reddish brown (5YR 4/3) clay films; common fine roots; about 2 percent gravel; neutral; abrupt smooth boundary.

Bt2—21 to 42 inches; reddish brown (5YR 5/3) clay loam; moderate coarse angular blocky structure; friable; common faint reddish brown (5YR 4/3) clay films; few fine roots; about 5 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

C—42 to 80 inches; reddish brown (5YR 5/3) loam; massive; friable; weakly expressed platiness inherited from the parent material; about 5 percent gravel; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 40 to more than 80 inches. The content of gravel ranges from 2 to 10 percent in the solum and from 5 to 14 percent in the substratum. The content of cobbles ranges from 0 to 3 percent throughout the profile.

The A horizon has hue of 7.5YR, value of 2 or 3, and chroma of 1. The dry value is 5. This horizon is fine sandy loam or loamy fine sand.

The E horizon has hue of 7.5YR, value of 5 or 6, and chroma of 1 to 3. The dry value is 7. This horizon is fine sandy loam.

The Bw horizon has hue of 10YR and value and chroma of 4. It is fine sandy loam or loamy fine sand.

The E part of the E/B horizon has colors and textures similar to those of the E horizon. The Bt part of the E/B horizon has colors and textures similar to those of the Bt horizon.

The Bt horizon has hue of 5YR, value of 4, and chroma of 3 or 4. It is clay loam.

The C horizon has hue of 5YR, value of 5, and chroma of 3. It is loam.

Battlefield Series

The Battlefield series consists of very deep, somewhat poorly drained soils on lake terraces and outwash plains. These soils formed in sandy and gravelly beach and outwash deposits. Permeability is rapid in the upper part of the profile and very rapid in the lower part. Slopes range from 0 to 3 percent.

Taxonomic class: Sandy, mixed, frigid Typic Endoaquods

Typical pedon of Battlefield sand, 0 to 3 percent slopes, 600 feet north and 100 feet east of the southwest corner of sec. 10, T. 29 N., R. 8 E. USGS Ossineke topographic quadrangle; lat. 44 degrees 55 minutes 7.62 seconds north and long. 83 degrees 27 minutes 54.62 seconds west, NAD 27:

Ap—0 to 5 inches; dark brown (7.5YR 3/2) sand, brown (7.5YR 5/2) dry; weak medium granular structure; friable; many fine roots; about 10 percent gravel; moderately acid; abrupt smooth boundary.

E—5 to 7 inches; brown (7.5YR 5/2) sand, pinkish gray (7.5YR 7/2) dry; single grain; loose; common fine roots; common medium prominent strong brown (7.5YR 5/6) accumulations of iron; about 10 percent gravel; moderately acid; abrupt broken boundary.

2Bs1—7 to 11 inches; dark brown (7.5YR 3/4) gravelly sand; weak medium subangular blocky structure; friable; common fine roots throughout; about 10 percent dark brown (7.5YR 3/3) spheres of weakly cemented ortstein 1 inch in diameter; common medium prominent strong brown (7.5YR 5/6) accumulations of iron; about 30 percent gravel; moderately acid; abrupt wavy boundary.

2Bs2—11 to 15 inches; strong brown (7.5YR 4/6) gravelly sand; weak medium subangular blocky structure; very friable; common fine roots; about 30 percent gravel; slightly acid; abrupt wavy boundary.

2BC—15 to 23 inches; yellowish brown (10YR 5/4) gravelly sand; single grain; loose; about 30 percent gravel; strongly effervescent; slightly alkaline; abrupt smooth boundary.

2C—23 to 80 inches; pale brown (10YR 6/3), stratified gravelly sand, gravelly coarse sand, and sand; single grain; loose; about 25 percent gravel; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 20 to 40 inches. The content of gravel ranges from 5 to 14 percent in the A and E horizons and from 20 to 34 percent in the 2Bs, 2BC, and 2C horizons. The content of cobbles ranges from 0 to 3 percent throughout the profile.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. It has a dry value of 5. It is sand.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 or 3. It has a dry value of 7. It is sand or coarse sand.

The 2Bs horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 4 to 6. It gravelly sand or gravelly coarse sand.

The 2BC horizon has hue of 10YR, value of 5 or 6, and chroma of 4 or 5. It is gravelly sand or gravelly coarse sand.

The 2C horizon has hue of 10YR to 2.5Y, value of 5 or 6, and chroma of 3 or 4. It is gravelly sand or gravelly coarse sand stratified with sand.

Blue Lake Series

The Blue Lake series consists of very deep, well drained soils on outwash plains and moraines. These soils formed in sandy deposits. Permeability is moderately rapid. Slopes range from 0 to 35 percent.

Taxonomic class: Sandy, mixed, frigid Lamellic Haplorthods

Typical pedon of Blue Lake sand, 0 to 6 percent slopes, 2,565 feet north and 66 feet east of the southwest corner of sec. 10, T. 31 N., R. 4 E. east part of Hillman Township, Montmorency County, Michigan; USGS Hillman Michigan 7.5 minute topographic quadrangle; lat. 45 degrees 5 minutes 41 seconds north and long. 83 degrees 56 minutes 30 seconds west, NAD 27:

A—0 to 3 inches; black (N 2.5/0) sand, very dark gray (N 3/0) dry; weak medium granular structure; very friable; many very fine and fine, common medium, and few coarse roots; slightly acid; abrupt wavy boundary.

E—3 to 6 inches; brown (7.5YR 5/2) sand, pinkish gray (7.5YR 7/2) dry; weak fine subangular blocky structure; very friable; many fine and common medium and coarse roots; strongly acid; clear wavy boundary.

Bs1—6 to 15 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; common very fine and fine and few medium and coarse roots; strongly acid; gradual wavy boundary.

Bs2—15 to 25 inches; yellowish brown (10YR 5/4) sand; weak coarse subangular blocky structure; very friable; common very fine and fine and few medium and coarse roots; about 1 percent gravel; strongly acid; gradual wavy boundary.

E and Bt—25 to 80 inches; light yellowish brown (10YR 6/4) sand (E); single grain; loose; bands of strong brown (7.5YR 4/6) sandy loam (Bt) 1/8 inch to 3 inches thick, with a total thickness of 8 inches; weak coarse subangular blocky structure; friable; clay bridges connecting sand grains in the bands; moderately acid.

The thickness of the solum ranges from 60 to more than 80 inches. The content of gravel ranges from 0 to 4 percent throughout the profile.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is sand.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2. It is sand.

The Bs horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4 to 6. In some pedons it has few or common weakly to strongly cemented ortstein fragments. It is sand.

The E part of the E and Bt horizon makes up 65 to 75 percent of the horizon. It has hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 3 or 4. It is sand.

The Bt part of the E and Bt horizon has hue of 7.5YR, value of 3 to 5, and chroma of 4 to 6. It is dominantly sandy loam or loamy sand, but some pedons have thin bands of sandy clay loam. The individual Bt bands range from 1/8 inch to 3 inches in thickness. The total thickness of the bands ranges from 6 to 12 inches.

Some pedons have a C horizon.

Bowers Series

The Bowers series consists of very deep, somewhat poorly drained soils on lake plains. These soils formed in stratified loamy lacustrine deposits. Permeability is slow. Slopes range from 0 to 4 percent.

Taxonomic class: Fine, mixed, semiactive, frigid Aquic Glossudalfs

Typical pedon of Bowers silt loam, 0 to 3 percent slopes, 790 feet north and 400 feet west of the southeast corner of sec. 9, T. 29 N., R. 6 E. USGS Evans Creek topographic quadrangle; lat. 44 degrees 55 minutes 8.84 seconds north and long. 83 degrees 42 minutes 37.15 seconds west, NAD 27:

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine and common medium roots; slightly acid; abrupt smooth boundary.

B/E—10 to 14 inches; about 70 percent brown (7.5YR 4/4) silty clay loam (Bt); penetrated by tongues of grayish brown (10YR 5/2) fine sandy loam (E), light gray (10YR 7/2) dry; moderate medium subangular blocky structure; friable; many fine roots; common medium distinct strong brown (7.5YR 5/6) accumulations of iron; neutral; abrupt smooth boundary.

Bt1—14 to 20 inches; brown (7.5YR 4/4) silty clay loam; weak coarse prismatic structure parting to strong medium angular blocky; friable; many fine roots; common very fine vesicular pores; common distinct brown (7.5YR 4/3) clay films on faces of peds; common coatings of organic matter along prism faces; common fine prominent gray (7.5YR 6/1) iron depletions in ped interiors and common fine prominent strong brown (7.5YR 5/6) accumulations of iron; neutral; clear smooth boundary.

Bt2—20 to 27 inches; brown (7.5YR 5/4) clay loam; weak coarse prismatic structure parting to strong medium angular blocky; friable; many fine roots; common very fine vesicular pores; common brown (7.5YR 4/4) clay films on faces of peds; common medium prominent greenish gray (5GY 6/1) iron depletions on 30 percent of faces of peds and common medium prominent reddish yellow (7.5YR 6/6) accumulations of iron; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C—27 to 80 inches; brown (7.5YR 5/3) silty clay loam stratified with very fine sand and silt loam; massive; friable; few fine roots; many medium prominent strong brown (7.5YR 5/8) accumulations of iron and common fine prominent greenish gray (5GY 6/1) iron depletions; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 18 to 30 inches.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 1 or 2. The dry value is 6. This horizon is silt loam.

The E part of the B/E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 or 3. It has dry value of 7. It is fine sandy loam, loam, or silt loam.

The Bt horizon and the Bt part of the B/E horizon have hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. They are clay loam or silty clay loam.

The C horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 2 or 3. It is stratified silty clay loam and silt loam.

Caffey Series

The Caffey series consists of very deep, poorly drained and very poorly drained soils in depressions and drainageways on lake plains, outwash plains, and deltas. These soils formed in sandy material underlain by stratified loamy and sandy sediments. Permeability is rapid in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 2 percent.

Taxonomic class: Sandy over loamy, mixed, semiactive, nonacid, frigid Aeric Endoaquents

Typical pedon of Caffey mucky sand, on a 1 percent slope, 430 feet south and 1,070 feet east of the northwest corner of sec. 24, T. 32 N., R. 4 E., east part of Montmorency Township, Montmorency County, Michigan; USGS Royston Michigan 7.5 minute topographic quadrangle; lat. 45 degrees 9 minutes 28 seconds north and long. 83 degrees, 53 minutes, 58 seconds west, NAD 27:

Ap—0 to 9 inches; black (5YR 2.5/1) mucky sand, very dark gray (5YR 3/1) dry; moderate fine and medium granular structure; very friable; many very fine and fine, common medium, and few coarse roots; slightly alkaline; abrupt wavy boundary.

Bg—9 to 14 inches; dark grayish brown (2.5Y 4/2) sand; weak fine subangular blocky structure; very friable; common very fine and fine roots; about 1 percent fine and medium gravel; 15 percent Ap material in vertical and horizontal channels and 10 percent pockets of grayish brown (2.5Y 5/2) sandy loam; slightly alkaline; abrupt wavy boundary.

Bw—14 to 21 inches; light yellowish brown (10YR 6/4) uncoated sand; weak fine and medium subangular blocky structure; very friable; few very fine and fine roots; common coarse distinct brown (10YR 5/3) and few fine prominent reddish brown (5YR 5/3) iron depletions, few fine and medium prominent light olive brown (2.5Y 5/6) accumulations of iron, and few fine prominent grayish brown (2.5Y 5/2) iron depletions throughout; few lenses of light brown (7.5YR 6/4) loamy sand along the lower boundary of the horizon along the contact with the 2C horizon; slightly alkaline; clear smooth boundary.

2C—21 to 50 inches; pale brown (10YR 6/3), stratified very fine sand to silty clay loam; weak thick and very thick platy structure derived from deposition; friable; few very fine and fine roots; common fine, medium, and coarse distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) and common medium prominent light red (2.5YR 6/6) accumulations of iron and common fine and medium prominent light gray (5Y 7/1) and many coarse distinct light brownish gray (10YR 6/2) iron depletions throughout; common fine vertical root channels with light gray (5Y 7/1) coatings and few root channels filled with light yellowish brown (10YR 6/4) sand; violently effervescent; moderately alkaline; clear smooth boundary.

2Cg—50 to 80 inches; light brownish gray (10YR 6/2), stratified very fine sand and silt with a stratum of gray (10YR 5/1) silty clay loam about 1/8 inch thick; massive; friable; common fine and coarse prominent brownish yellow (10YR 6/6) accumulations of iron throughout; violently effervescent; moderately alkaline.

The content of gravel is 0 to 1 percent throughout the profile.

The Ap horizon has hue of 5YR or 7.5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is dominantly mucky sand.

The Bw horizon has hue of 7.5YR, 10YR, or 2.5Y; value of 4 to 6; and chroma of 2 to 4. It is sand, fine sand, loamy sand, or loamy fine sand.

The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. The 2Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The 2C and 2Cg horizons are stratified silt, silt loam, loam, very fine sandy loam, very fine sand, loamy sand, fine sand, or silty clay loam. The strata vary widely in thickness and sequence of layers.

Cathro Series

The Cathro series consists of very deep, very poorly drained soils on lake plains and ground moraines. These soils formed in organic soil material underlain by loamy glacial or lacustrine deposits. Permeability is moderately slow to moderately rapid in the organic material and moderately slow in the loamy deposits. Slopes range from 0 to 2 percent.

Taxonomic class: Loamy, mixed, euic, frigid Terric Haplosaprists

Typical pedon of Cathro muck, on a 0 percent slope, 70 feet south and 2,110 feet east of the northwest corner of sec. 21, T. 32 N., R. 5 E. USGS Hillman NE topographic quadrangle; lat. 45 degrees 9 minutes 38.51 seconds north and long. 83 degrees 50 minutes 7.10 seconds west, NAD 27:

Oa1—0 to 6 inches; black (N 2/0) (broken face, pressed, and rubbed) muck; about 10 percent fiber, 5 percent rubbed; weak medium granular structure; about 5 percent wood fragments; friable; slightly acid; abrupt smooth boundary.

Oa2—6 to 14 inches; black (5YR 2.5/1) (broken face, pressed, and rubbed) muck; about 10 percent fiber, 5 percent rubbed; massive; friable; about 5 percent wood fragments; slightly acid; abrupt smooth boundary.

Oa3—14 to 28 inches; dark reddish brown (5YR 2.5/2) (broken face and rubbed) muck, dark reddish brown (5YR 3/2) pressed; about 5 percent fiber; massive; friable; about 5 percent wood fragments; slightly acid; abrupt smooth boundary.

A—28 to 30 inches; black (10YR 2/1) silt loam; massive; friable; neutral; abrupt wavy boundary.

Cg1—30 to 33 inches; greenish gray (5GY 6/1) silty clay loam; massive; friable; slightly alkaline; abrupt smooth boundary.

Cg2—33 to 80 inches; greenish gray (5GY 6/1) silt loam; massive; friable; moderately alkaline; strongly effervescent.

The thickness of the organic material ranges from 16 to 50 inches. The content of woody fragments in the organic layers ranges from 1 to 10 percent. In the underlying mineral material, the content of gravel ranges from 0 to 10 percent and the content of cobbles ranges from 0 to 3 percent.

The Oa horizon has hue of 5YR, 7.5YR, or 10YR or is neutral in hue. It has value of 2 and chroma of 0 to 2. It is muck.

The A horizon has hue of 10YR, value of 2, and chroma of 1. It is loam or silt loam.

The C horizon has hue of 5YR, 7.5YR, 10YR, or 5GY; value of 5 or 6; and chroma of 1 or 2. It is loam, silt loam, or silty clay loam.

Chinwhisker Series

The Chinwhisker series consists of very deep, moderately well drained soils on stream terraces, outwash plains, and lake terraces. These soils formed in sandy outwash and lacustrine deposits. Permeability is rapid. Slopes range from 0 to 4 percent.

Taxonomic class: Sandy, mixed, frigid Lamellic Haplorthods

Typical pedon of Chinwhisker sand, 0 to 4 percent slopes, 60 feet north and 1,050 feet west of the southeast corner of sec. 31, T. 29 N., R. 5 E. USGS McGinn Creek topographic quadrangle; lat. 44 degrees 51 minutes 25.99 seconds north and long. 83 degrees 52 minutes 19.23 seconds west, NAD 27:

A—0 to 3 inches; black (7.5YR 2.5/1) sand, very dark gray (7.5YR 3/1) dry; weak medium granular structure; friable; many fine and common medium roots; very strongly acid; abrupt smooth boundary.

E—3 to 4 inches; brown (7.5YR 5/2) sand, pinkish gray (7.5YR 6/2 dry; single grain; loose; few fine roots; very strongly acid; abrupt broken boundary.

Bs1—4 to 11 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; friable; common fine and medium roots; strongly acid; clear smooth boundary.

Bs2—11 to 18 inches; strong brown (7.5YR 4/6) sand; weak medium subangular blocky structure; friable; common fine and medium roots; strongly acid; clear wavy boundary.

E´1—18 to 34 inches; light yellowish brown (10YR 6/4) sand, very pale brown (10YR 7/4) dry; single grain; loose; few fine roots; about 2 percent pebbles; very strongly acid; abrupt smooth boundary.

E´2—34 to 48 inches; light yellowish brown (10YR 6/4) sand, very pale brown (10YR 7/4) dry; single grain; loose; few fine roots; common medium prominent strong brown (7.5YR 5/6) accumulations of iron; about 2 percent pebbles; very strongly acid; abrupt wavy boundary.

E and Bt—48 to 80 inches; light yellowish brown (10YR 6/4) sand (E), very pale brown (10YR 7/4) dry; single grain; loose; thin lamellae of brown (7.5YR 5/4) loamy sand (Bt) accumulating to a total thickness of 4 inches; few fine roots; common medium prominent strong brown (7.5YR 5/6) accumulations of iron; about 2 percent pebbles; very strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. The depth to redoximorphic features ranges from 20 to 40 inches. The content of gravel ranges from 0 to 14 percent.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. The dry value is 3. This horizon is sand.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2. The dry value is 6 or 7. This horizon is sand.

The Bs1 horizon has hue of 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is sand.

The Bs2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 5 or 6. It is sand.

The E´ horizon and the E part of the E and Bt horizon have hue of 10YR, value of 5 to 7, and chroma of 3 or 4. They have a dry value of 7. They are sand.

The Bt part of the E and Bt horizon has hue of 7.5YR and value and chroma of 4 or 5. It is loamy sand.

Chippeny Series

The Chippeny series consists of moderately deep, very poorly drained soils on karst plains and glacial lake benches. These soils formed in organic soil material underlain by limestone bedrock. Permeability is moderately slow in the organic material, moderate in the very channery silt loam below the organic material, and moderately slow in the limestone bedrock. Slopes range from 0 to 2 percent.

Taxonomic class: Euic, frigid Lithic Haplosaprists

Typical pedon of Chippeny muck, on a 0 percent slope, 2,100 feet north and 1,360 feet east of the southwest corner of sec. 3, T. 31 N., R. 8 E. USGS Alpena topographic quadrangle; lat. 45 degrees 6 minutes 41.54 seconds north and long. 83 degrees 26 minutes 48.84 seconds west, NAD 27:

Oa1—0 to 4 inches; black (5YR 2.5/1) (broken face and rubbed) muck; about 10 percent fiber, less than 5 percent rubbed; weak fine granular structure; friable; many medium and fine roots; about 7 percent wood fragments; moderately alkaline; abrupt smooth boundary.

Oa2—4 to 18 inches; black (5YR 2.5/1) (broken face and rubbed) muck; about 20 percent fiber, less than 5 percent rubbed; weak medium granular structure; friable; many fine roots; about 5 percent wood fragments; moderately alkaline; abrupt smooth boundary.

Oa3—18 to 19 inches; black (N 2.5/0) (broken face and rubbed) muck; about 10 percent fiber, less than 5 percent rubbed; weak fine granular structure; friable; common fine roots; moderately alkaline; abrupt smooth boundary.

Cr—19 to 24 inches; light olive brown (2.5Y 5/4) very channery silt loam; massive; friable; common fine roots; many medium prominent light olive brown (2.5Y 5/6) accumulations of iron and many medium prominent gray (N 6/0) iron depletions; about 40 percent limestone channers; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2R—24 to 26 inches; gray (N 5/0), fractured, hard limestone.

The thickness of the solum ranges from 20 to 30 inches. The depth to limestone bedrock ranges from 24 to 35 inches. Reaction is moderately alkaline throughout the profile.

The Oa horizon has hue of 5YR or is neutral in hue. It has value of 2 or 2.5 and chroma of 0 or 1. It is muck.

The Cr horizon has hue of 2.5Y or 5Y, value of 5, and chroma of 3 or 4. It is very channery silt loam. The content of channers ranges from 35 to 45 percent.

The 2R horizon is neutral in hue and has value of 5 and chroma of 0. It is fractured, hard limestone.

Colonville Series

The Colonville series consists of very deep, somewhat poorly drained soils on flood plains. These soils formed in loamy and sandy, calcareous alluvium. Permeability is moderately rapid. Slopes range from 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, calcareous, active, frigid Fluvaquentic Endoaquolls

Typical pedon of Colonville very fine sandy loam, 0 to 2 percent slopes, 1,750 feet west and 2,600 feet north of the southeast corner of sec. 24, T. 31 N., R. 4 E., east part of Hillman Township; USGS Hillman Michigan 7.5 minute topographic quadrangle; lat. 45 degrees 3 minutes 59 seconds north and long. 83 degrees 53 minutes 14 seconds west, NAD 27:

A1—0 to 12 inches; dark brown (7.5YR 3/2) very fine sandy loam, brown (7.5YR 5/2) dry; moderate medium subangular blocky structure parting to strong fine granular; friable; many very fine, fine, medium, and coarse roots; few fine prominent light brownish gray (10YR 6/2) iron depletions; about 1 percent gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

A2—12 to 19 inches; dark brown (7.5YR 3/2) very fine sandy loam, brown (7.5YR 5/2) dry; moderate medium subangular blocky structure parting to strong fine granular; friable; many very fine, fine, medium, and coarse roots; many coarse prominent pinkish gray (5YR 6/2) iron depletions and many medium prominent reddish brown (5YR 5/4) accumulations of iron; about 1 percent gravel; strongly effervescent; slightly alkaline; clear irregular boundary.

Bw1—19 to 31 inches; light brown (7.5YR 6/4) fine sandy loam; moderate medium subangular blocky structure; friable; common very fine, fine, medium, and coarse roots; common fine prominent light gray (2.5YR 7/2) iron depletions and many medium prominent strong brown (7.5YR 5/8) accumulations of iron; common medium prominent dark reddish brown (5YR 3/2) organic stains on faces of peds; about 1 percent gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

Bw2—31 to 35 inches; light brown (7.5YR 6/4) very fine sandy loam; weak fine and medium subangular blocky structure; friable; common fine, medium, and coarse roots; many coarse distinct reddish yellow (7.5YR 6/8) accumulations of iron; about 1 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

C1—35 to 65 inches; light brown (7.5YR 6/4) fine sandy loam; massive; friable; few medium and coarse roots; common medium prominent light gray (2.5Y 7/2) iron depletions and common coarse distinct reddish yellow (7.5YR 6/8) accumulations of iron; common medium prominent dark reddish brown (5YR 3/2) organic bands $^{1}/_{8}$ to $^{1}/_{2}$ inch thick; about 1 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—65 to 80 inches; light brownish gray (10YR 6/2) very fine sandy loam; massive; friable; about 1 percent gravel; strongly effervescent; strongly alkaline.

The thickness of the mollic epipedon ranges from 12 to 19 inches. The content of gravel is 0 to 1 percent throughout the profile.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly very fine sandy loam but in some pedons is fine sandy loam or silt loam. Distinct or prominent redoximorphic features are in the lower part of the mollic epipedon.

The Bw horizon has hue of 10YR or 7.5YR, value of 3 to 6, and chroma of 2 to 4. It is very fine sandy loam, fine sandy loam, or sandy loam.

The C horizon has hue of 10YR or 7.5YR, value of 3 to 6, and chroma of 2 to 4. It is very fine sandy loam, fine sandy loam, or sandy loam.

Coppler Series

The Coppler series consists of very deep, well drained soils on stream terraces and in glacial drainageways. These soils formed in sandy and gravelly outwash deposits. Permeability is moderately rapid in the surface layer and subsoil and very rapid in the substratum. Slopes range from 0 to 18 percent.

Taxonomic class: Loamy-skeletal, mixed, semiactive, frigid Arenic Hapludalfs

Typical pedon of Coppler loamy sand, 6 to 12 percent slopes, 1,180 feet south and 1,420 feet east of the northwest corner of sec. 20, T. 31 N., R. 6 E. USGS Lachine topographic quadrangle; lat. 45 degrees 4 minutes 15.64 seconds north and long. 83 degrees 43 minutes 51.69 seconds west, NAD 27:

A—0 to 3 inches; black (7.5YR 2/1) loamy sand, dark gray (7.5YR 4/1) dry; weak medium granular structure; friable; many fine roots; about 5 percent gravel and 1 percent cobbles; neutral; abrupt wavy boundary.

E—3 to 4 inches; brown (7.5YR 5/3) loamy sand, pinkish gray (7.5YR 7/2) dry; weak medium subangular blocky structure; very friable; few fine roots; about 5 percent gravel; neutral; abrupt broken boundary.

Bw1—4 to 14 inches; brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; friable; few fine roots; about 5 percent gravel; neutral; abrupt wavy boundary.

2Bw2—14 to 21 inches; brown (7.5YR 4/4) gravelly loamy sand; moderate fine subangular blocky structure; friable; common fine roots; about 20 percent gravel; neutral; abrupt irregular boundary.

2Bt—21 to 26 inches; reddish brown (5YR 4/3) very gravelly sandy loam; moderate fine subangular blocky structure; friable; common fine roots; reddish brown (5YR 4/3) clay bridging between sand grains; about 40 percent gravel; slightly alkaline; abrupt irregular boundary.

2C—26 to 80 inches; yellowish brown (10YR 5/4), stratified gravelly sand and very gravelly coarse sand; single grain; loose; about 40 percent gravel; strongly effervescent; slightly alkaline.

Depth to the argillic horizon ranges from 20 to 30 inches. The depth to calcium carbonates ranges from 25 to 35 inches. The content of gravel ranges from 5 to 10 percent in the upper layers and from 20 to 45 percent in the lower part of the profile. The content of cobbles ranges from 0 to 10 percent throughout the profile.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. It is loamy sand.

The E horizon has hue of 7.5YR, value of 5 or 6, and chroma of 2 or 3. It is loamy sand.

The Bw1 horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is loamy sand or sand.

The 2Bw2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is gravelly sand or gravelly loamy sand.

The 2Bt horizon has hue of 5YR or 7.5YR, value of 4, and chroma of 3 or 4. It is very gravelly sandy loam or very gravelly sandy clay loam.

The 2C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is very gravelly sand or very gravelly coarse sand with strata of gravelly sand or gravelly coarse sand.

Croswell Series

The Croswell series consists of very deep, moderately well drained soils on stream terraces and lake terraces. These soils formed in sandy glaciofluvial and lacustrine deposits. Permeability is rapid. Slopes range from 0 to 6 percent.

Taxonomic class: Sandy, mixed, frigid Oxyaquic Haplorthods

Typical pedon of Croswell sand, 0 to 3 percent slopes, 40 feet south and 1,000 feet east of the center of sec. 34. T. 31 N., R. 7 E. USGS Lake Winyah topographic quadrangle; lat. 45 degrees 2 minutes 20.57 seconds north and long. 83 degrees 33 minutes 32.58 seconds west, NAD 27:

A—0 to 2 inches; black (N 2.5/0) sand, very dark gray (N 3/0) dry; weak medium granular structure; friable; common fine roots; about 1 percent gravel; moderately acid; abrupt smooth boundary.

E—2 to 3 inches; brown (7.5YR 5/2) sand, gray (N 6/0) dry; single grain; loose; common fine roots; about 1 percent gravel; very strongly acid; abrupt smooth boundary.

Bs1—3 to 6 inches; dark brown (7.5YR 3/4) sand; weak medium subangular blocky structure; friable; common fine and few medium roots; about 1 percent gravel; very strongly acid; clear wavy boundary.

Bs2—6 to 11 inches; strong brown (7.5YR 4/6) sand; weak medium subangular blocky structure; friable; few fine roots; distinct cracked coatings on about 30 percent of the sand grains; about 1 percent gravel; strongly acid; clear wavy boundary.

BC—11 to 24 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few fine roots; about 1 percent gravel; moderately acid; clear broken boundary.

C—24 to 80 inches; pale brown (10YR 6/3) sand; single grain; loose; common fine and medium prominent yellowish red (5YR 5/8) accumulations of iron; about 1 percent gravel; moderately acid.

The thickness of the solum ranges from 20 to 35 inches. The content of gravel is about 1 percent throughout the profile. The depth to iron accumulations ranges from 20 to 30 inches.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2.5 or 3 and chroma of 0 or 1. It is moderately acid. It is sand.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2. It is strongly acid or very strongly acid. It is sand.

The Bs1 horizon has hue of 7.5YR and value and chroma of 3 or 4. Value and chroma of 3 do not occur together. This horizon is very strongly acid or strongly acid. It is sand.

The Bs2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is strongly acid or moderately acid. It is sand.

The BC horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6. It is moderately acid to slightly acid. It is sand.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is moderately acid to neutral. It is sand.

Crowell Series

The Crowell series consists of very deep, somewhat excessively drained soils on dunes. These soils formed in sandy eolian deposits (fig. 2). Permeability is rapid. Slopes range from 3 to 40 percent.

Taxonomic class: Sandy, mixed, frigid, ortstein Entic Haplorthods

Typical pedon of Crowell fine sand, on an 8 percent slope, in an area of Crowell-Proper fine sands, 3 to 40 percent slopes, 2,100 feet north and 400 feet west of the southeast corner of sec. 7, T. 30 N., R. 8 E. USGS Lake Winyah topographic quadrangle; lat. 45 degrees 0 minutes 37.42 seconds north and long. 83 degrees 30 minutes 26.26 seconds west, NAD 27:

A—0 to 2 inches; very dark gray (10YR 3/1) fine sand, dark gray (10YR 4/1) dry; weak fine granular structure; friable; many fine and common medium roots; moderately acid; abrupt smooth boundary.

E—2 to 5 inches; gray (10YR 5/1) fine sand, light gray (10YR 7/1) dry; weak fine subangular blocky structure; friable; many fine and common medium roots; strongly acid; abrupt smooth boundary.

Bs1—5 to 10 inches; brown (7.5YR 4/4) sand; weak fine subangular blocky structure; very friable; many fine roots; strongly acid; clear smooth boundary.

Bs2—10 to 19 inches; strong brown (7.5YR 4/6) sand; single grain; loose; common fine roots; about 70 percent of horizon occupied by weakly cemented ortstein; strongly acid; clear wavy boundary.

Bs3—19 to 29 inches; strong brown (7.5YR 4/6) sand; single grain; few fine roots; moderately acid; diffuse smooth boundary.

C—29 to 80 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; few fine roots; moderately acid.

The thickness of the solum ranges from 25 to 50 inches. The depth to ortstein ranges from 10 to 20 inches.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is moderately acid.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 or 2. It is strongly acid. It is fine sand or sand.

The Bs1 horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 4. It is strongly acid or moderately acid. It is sand.

The Bs2 and Bs3 horizons have hue of 7.5YR, value of 4, and chroma of 4 to 6. Reaction is strongly acid or moderately acid. Ortstein makes up 50 to 80 percent of the Bs2 horizon and 0 to 80 percent of the Bs3 horizon. These horizons are sand.

The C horizon has hue of 10YR, value of 6, and chroma of 4. It is moderately acid or slightly acid. It is sand.

Dawson Series

The Dawson series consists of very deep, very poorly drained soils in depressions on outwash plains, lake plains, and moraines. These soils formed in 16 to 51 inches of herbaceous organic material and in the underlying sandy deposits. Permeability is moderately slow to moderately rapid in the organic material and rapid in the sandy material. Slopes range from 0 to 2 percent.

Taxonomic class: Sandy or sandy-skeletal, mixed, dysic, frigid Terric Haplosaprists

Typical pedon of Dawson peat, on a 0 percent slope, 1,920 feet north and 100 feet west of the southeast corner of sec. 11, T. 32 N., R. 5 E. USGS Hillman NE topographic quadrangle; lat. 45 degrees 10 minutes 54.69 seconds north and long. 83 degrees 46 minutes 53.95 seconds west, NAD 27:

Oi—0 to 6 inches; dark reddish brown (5YR 3/2) (broken face) peat, reddish brown (5YR 5/3) pressed, dark reddish brown (5YR 3/3) rubbed; about 100 percent fiber, 90 percent rubbed; moderate medium granular structure; friable; extremely acid; abrupt smooth boundary.

Oa1—6 to 16 inches; black (5YR 2.5/1) (broken face, pressed, and rubbed) muck; about 15 percent fiber, 5 percent rubbed; weak thick platy structure; friable; extremely acid; abrupt smooth boundary.

Oa2—16 to 31 inches; dark reddish brown (5YR 3/2) (broken face) muck, black (5YR 2.5/1) pressed and rubbed; about 10 percent fiber, 2 percent rubbed; weak thick platy structure; extremely acid; abrupt smooth boundary.

Bs—31 to 34 inches; dark brown (7.5YR 3/4) fine sand; weak medium subangular blocky structure; friable; extremely acid; abrupt wavy boundary.

C—34 to 80 inches; olive brown (2.5Y 4/4) fine sand; single grain; loose; common medium prominent dark grayish brown (10YR 4/2) iron depletions; very strongly acid; abrupt wavy boundary.

Depth to the sandy material ranges from 16 to 40 inches.

The Oi horizon has hue of 5YR, value of 3 to 5, and chroma of 2 or 3. It is peat.

The Oa horizon has hue of 5YR, value of 2.5 or 3, and chroma of 1 or 2. It is muck.

The Bs horizon has hue of 7.5YR, value of 3, and chroma of 4. It is fine sand or sand.

The C horizon has hue of 2.5Y, 7.5YR, or 10YR; value of 4 or 5; and chroma of 3 or 4. It is fine sand or sand.

Deford Series

The Deford series consists of very deep, very poorly drained soils on lake plains, lake terraces, and outwash plains. These soils formed in sandy outwash or lacustrine deposits. Permeability is rapid. Slopes range from 0 to 2 percent.

Taxonomic class: Mixed, frigid Typic Psammaquents

Typical pedon of Deford muck, on a 0 percent slope, 2,500 feet north and 1,380 feet east of the southwest corner of sec. 35, T. 31 N., R. 7 E. USGS Lake Winyah topographic quadrangle; lat. 45 degrees 2 minutes 20.84 seconds north and long. 83 degrees 32 minutes 51.80 seconds west, NAD 27:

Oa—0 to 4 inches; black (N 2.5/0) muck, black (N 2.5/0) dry; moderate fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A—4 to 5 inches; very dark gray (N 3/0) sand, gray (N 5/0) dry; single grain; loose; few fine roots; neutral; abrupt smooth boundary.

Cg1—5 to 9 inches; gray (5Y 6/1) sand; single grain; loose; few fine roots; neutral; abrupt smooth boundary.

Cg2—9 to 40 inches; dark grayish brown (2.5Y 4/2) sand; single grain; loose; neutral; abrupt smooth boundary.

Cg3—40 to 80 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; neutral.

The thickness of the Oa horizon ranges from 0 to 7 inches. The depth to carbonates is more than 60 inches.

The Oa horizon is neutral in hue and has value of 2.5 or 3 and chroma of 0.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is sand or fine sand.

The Cg horizon has hue of 2.5Y, 5Y, 5YR, or 10YR; value of 4 to 7; and chroma of 1 to 3. It is sand or fine sand.

Dorval Series

The Dorval series consists of very deep, very poorly drained soils in depressions on till plains and lake plains. These soils formed in well decomposed organic material underlain by clayey deposits. Permeability is moderately slow to moderately rapid in the organic layers and very slow in the underlying clayey deposits. Slopes range from 0 to 2 percent.

Taxonomic class: Clayey, mixed, euic, frigid Terric Haplosaprists

Typical pedon of Dorval muck, 2,510 feet north and 150 feet west of the southeast corner of sec. 35, T. 32 N., R. 4 E. east part of Montmorency Township, Montmorency County, Michigan; USGS Hillman Michigan 7.5 minute topographic quadrangle; lat. 45 degrees 7 minutes 20 seconds north and long. 83 degrees 54 minutes 9 seconds west, NAD 27:

Oa1—0 to 10 inches; black (N 2.5/0) (broken face) muck; about 40 percent fiber, 7 percent rubbed; moderate medium subangular blocky structure; friable; common medium and coarse and few fine roots; neutral; clear wavy boundary.

Oa2—10 to 18 inches; black (N 2.5/0) (broken face) muck; about 35 percent fiber, 7 percent rubbed; moderate medium subangular blocky structure; friable; common fine, medium, and coarse roots; common thin sand lenses on faces of peds; neutral; clear wavy boundary.

Cg—18 to 80 inches; light gray (5Y 6/1) clay; massive; some cleavage planes; very firm; common fine and medium and few coarse roots in the upper part of the horizon; common very fine and few fine vertical pores; clay films on cleavage planes and in root channels; common shell fragments; slightly effervescent; slightly alkaline.

The organic material is 18 to 21 inches thick.

The Oa horizon has hue of 7.5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It has an unrubbed fiber content of 10 to 35 percent. Pieces of dead wood range in size from twigs to logs.

The Cg horizon has hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 1 or 2. It is clay or silty clay.

East Lake Series

The East Lake series consists of very deep, somewhat excessively drained soils on outwash plains and lake terraces. These soils formed in sandy and gravelly beach deposits. Permeability is rapid in the upper part of the profile and very rapid in the lower part. Slopes range from 0 to 12 percent.

Taxonomic class: Sandy, mixed, frigid Entic Haplorthods

Typical pedon of East Lake sand, 0 to 6 percent slopes, 2,000 feet south and 340 feet east of the center of sec. 34, T. 31 N., R. 7 E. USGS Lake Winyah topographic quadrangle; lat. 45 degrees 2 minutes 8.83 seconds north and long. 83 degrees 33 minutes 24.95 seconds west, NAD 27:

A—0 to 1 inch; black (N 2.5/0) sand, very dark gray (N 3/0) dry; weak coarse granular structure; friable; many fine and common medium roots; about 10 percent gravel; moderately acid; abrupt smooth boundary.

E—1 to 2 inches; brown (7.5YR 5/2) sand, pinkish gray (7.5YR 6/2) dry; single grain; loose; many fine and common medium roots; about 10 percent gravel; very strongly acid; abrupt broken boundary.

Bs1—2 to 4 inches; dark brown (7.5YR 3/4) sand; weak medium subangular blocky structure; friable; many fine and common medium roots; about 10 percent gravel; strongly acid; clear wavy boundary.

Bs2—4 to 11 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; few fine roots; about 10 percent gravel; strongly acid; clear wavy boundary.

BC—11 to 34 inches; strong brown (7.5YR 5/6) sand; single grain; loose; few fine roots; about 15 percent gravel; moderately acid; abrupt wavy boundary.

2C—34 to 80 inches; brown (10YR 5/3), stratified gravelly sand and very gravelly sand; single grain; loose; about 35 percent gravel; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 20 to 40 inches. The content of gravel ranges from 5 to 14 percent in the solum and from 15 to 35 percent in the substratum. The content of cobbles ranges from 0 to 10 percent throughout the profile.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is sand.

The E horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 or 3. It is sand.

The Bs1 horizon has hue of 7.5YR and value and chroma of 3 or 4. Value and chroma of 3 do not occur together. This horizon is sand.

The Bs2 horizon has hue of 7.5YR and value and chroma of 4 or 5. It is sand.

The BC horizon has hue of 7.5YR, value of 5, and chroma of 5 or 6. It is sand.

The 2C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 or 4. It is gravelly sand or stratified sand to very gravelly sand

Eastport Series

The Eastport series consists of very deep, excessively drained soils on beach ridges. These soils formed in sandy beach deposits. Permeability is rapid. Slopes range from 0 to 6 percent.

Taxonomic class: Mixed, frigid Spodic Udipsamments

Typical pedon of Eastport sand, 0 to 6 percent slopes, 1,600 feet north and 550 feet west of the southeast corner of sec. 4, T. 28 N., R. 9 E. USGS Black River topographic quadrangle; lat. 44 degrees 50 minutes 56.32 seconds north and long. 83 degrees 20 minutes 46.83 seconds west, NAD 27:

A—0 to 1 inch; black (10YR 2/1) sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; common medium and fine roots; moderately acid; abrupt smooth boundary.

E—1 to 8 inches; grayish brown (10YR 5/2) sand; weak medium granular structure; very friable; common medium and fine roots; strongly acid; clear smooth boundary.

Bs1—8 to 14 inches; strong brown (7.5YR 4/6) sand; weak medium subangular blocky structure; very friable; common medium and fine roots; few chunks of dark brown (7.5YR 3/4), weakly cemented ortstein; moderately acid; clear irregular boundary.

Bs2—14 to 23 inches; yellowish brown (10YR 5/6) sand; moderate medium subangular blocky structure; friable; few medium and few fine roots; moderately acid; gradual wavy boundary.

BC—23 to 29 inches; very pale brown (10YR 7/4) sand; weak medium subangular blocky structure; friable; slightly acid; gradual wavy boundary.
C—29 to 80 inches; very pale brown (10YR 7/3) sand; single grain; loose; neutral.

The thickness of the solum ranges from 25 to 35 inches. The content of gravel ranges from 0 to 5 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 2.

The Bs horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 5 or 6.

The C horizon has hue of 10YR, value of 5 to 7, and chroma of 3 or 4.

Elcajon Series

The Elcajon series consists of moderately deep, somewhat poorly drained soils on ground moraines and glacial lake benches. These soils formed in loamy glacial till underlain by karst limestone bedrock. Permeability is moderately slow in the loamy material and very rapid in the limestone. Slopes range from 0 to 3 percent.

Taxonomic class: Fine-loamy, mixed, active, frigid Aquic Glossudalfs

Typical pedon of Elcajon loam, 0 to 3 percent slopes, 2,600 feet south and 430 feet west of the northeast corner of sec. 18, T. 32 N., R. 8 E. USGS Long Lake East topographic quadrangle; lat. 45 degrees 10 minutes 13.33 seconds north and long. 83 degrees 29 minutes 47.47 seconds west, NAD 27:

Ap—0 to 6 inches; dark brown (7.5YR 3/2) loam, brown (7.5YR 5/2) dry; weak very fine and fine granular structure; friable; many very fine and fine roots; neutral; abrupt smooth boundary.
E/B—6 to 12 inches; brown (7.5YR 5/2) very fine sandy loam, pale brown (10YR 6/3) dry (E); weak medium and coarse subangular blocky structure; friable; common fine prominent yellowish red (5YR 4/6) accumulations of iron and few fine prominent greenish gray (5GY 5/1) iron depletions; E material makes up about 60 percent of the horizon and surrounds peds of brown (7.5YR 4/3) loam (Bt); moderate medium and coarse subangular blocky structure; firm; common fine prominent yellowish red (5YR 4/6) accumulations of iron; common fine and very fine roots; common fine vesicular pores; neutral; clear wavy boundary.
Bt—12 to 29 inches; brown (7.5YR 4/3) clay loam; moderate medium and coarse subangular blocky structure; firm; few fine and medium roots; common fine vesicular pores; common distinct faint dark reddish brown (5YR 3/3) clay films on faces of peds; many coarse distinct strong brown (7.5YR 4/6) accumulations of iron and few fine faint brown (7.5YR 4/2) iron depletions; about 14 percent gravel and 1 percent cobbles; neutral; abrupt wavy boundary.
Cr—29 to 37 inches; bluish gray (5B 5/1) very flaggy loam; very few very fine and fine roots; 50 percent flagstones; strongly effervescent; moderately alkaline; abrupt smooth boundary.
R—37 to 41 inches; fractured karst limestone; slightly effervescent.

The thickness of the solum and the depth to bedrock range from 20 to 40 inches.

The Ap horizon has hue of 5YR, 7.5YR, or 10YR; value of 2 to 4; and chroma of 1 to 3. Undisturbed areas have an A horizon. This horizon is typically less than 5 inches thick. It has hue of 5YR, 7.5YR, or 10YR and value and chroma of 2 or 3. The Ap and A horizons are neutral or slightly alkaline. They are loam.

Some pedons have a thin E horizon. This horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. It is neutral or slightly alkaline. It is very fine sandy loam or loam.

The E part of the E/B horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 or 3. It has a dry color value of 7 or 8. It is very fine sandy loam.

The Bt part of the E/B horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is neutral or slightly alkaline. It is loam. The content of gravel ranges from 0 to 5 percent.

The Bt horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 3 or 4. It is clay loam. The control section averages 27 to 35 percent clay. Iron depletions with chroma of 2 or less are in the upper 10 inches of the argillic horizon. Reaction is neutral or slightly alkaline. The content of gravel ranges from 5 to 14 percent.

The Cr horizon has hue of 7.5YR, 5YR, or 5B; value of 4 to 6; and chroma of 1 to 3. It is moderately alkaline. It is the very flaggy analogs of loam, fine sandy loam, or sandy loam. The content of flagstones ranges from 35 to 60 percent, and the content of gravel ranges from 0 to 10 percent.

Ensley Series

The Ensley series consists of very deep, poorly drained soils on ground moraines. These soils formed in loamy glacial till. Permeability is moderate. Slopes range from 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, active, nonacid, frigid Aeric Endoaquents

Typical pedon of Ensley mucky sandy loam, 2,360 feet north and 500 feet west of the southeast corner of sec. 13, T. 28 N., R. 7 E. USGS Hubbard Lake topographic quadrangle; lat. 44 degrees 49 minutes 16.81 seconds north and long. 83 degrees 31 minutes 37.35 seconds west, NAD 27:

A—0 to 8 inches; black (N 2/0) mucky sandy loam, dark gray (N 4/0) dry; weak coarse granular structure; friable; many fine and common medium roots; about 2 percent gravel and 1 percent cobbles; neutral; abrupt smooth boundary.

Bw1—8 to 15 inches; grayish brown (10YR 5/2) sandy loam; weak very thick platy structure parting to weak medium subangular blocky; friable; many fine and common medium roots; many distinct very dark grayish brown (10YR 3/2) organic coatings throughout; many medium prominent yellowish brown (10YR 5/8) accumulations of iron and few fine faint gray (10YR 5/1) iron depletions; about 7 percent gravel and 1 percent cobbles; neutral; abrupt smooth boundary.

Bw2—15 to 29 inches; light reddish brown (5YR 6/3) sandy loam; weak very thick platy structure parting to weak medium subangular blocky; friable; common fine and medium roots; few fine prominent strong brown (7.5YR 5/6) accumulations of iron and many medium prominent light greenish gray (5GY 7/1) iron depletions; about 7 percent gravel and 1 percent cobbles; moderately alkaline; gradual wavy boundary.

Cg1—29 to 42 inches; pinkish gray (7.5YR 6/2) sandy loam; massive; friable; common medium and fine roots; many coarse prominent yellowish brown (10YR 5/6) accumulations of iron; about 5 percent gravel and 1 percent cobbles; slightly effervescent; moderately alkaline; gradual wavy boundary.

Cg2—42 to 80 inches; gray (10YR 5/1) sandy loam; massive; friable; few fine roots; about 5 percent gravel and 3 percent cobbles; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 20 to 30 inches. The content of gravel ranges from 1 to 10 percent in the solum and from 5 to 14 percent in the substratum. The content of cobbles ranges from 0 to 7 percent throughout the profile.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 and chroma of 0 or 1. It is mucky sandy loam.

The Bw horizon has hue of 5YR or 10YR, value of 5 or 6, and chroma of 2 or 3. It is sandy loam.

The Cg horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 or 2. It is sandy loam.

Finch Series

The Finch series consists of very deep, somewhat poorly drained soils on lake plains. These soils formed in sandy lacustrine deposits. They have an ortstein layer. Permeability is moderately rapid in the ortstein layer and rapid in the rest of the profile. Slopes range from 0 to 3 percent.

Taxonomic class: Sandy, mixed, frigid, shallow, ortstein Typic Duraquods

Typical pedon of Finch sand, 0 to 3 percent slopes, 2,300 feet south and 2,430 feet west of the northeast corner of sec. 35, T. 31 N., R. 7 E. USGS Lake Winyah topographic quadrangle; lat. 45 degrees 2 minutes 23.30 seconds north and long. 83 degrees 32 minutes 29.45 seconds west, NAD 27:

Oa—0 to 1 inch; black (5YR 2.5/1), partially decomposed organic material, very dark gray (5YR 3/1) dry; moderate medium platy structure; friable; many fine and few medium roots; very strongly acid; abrupt wavy boundary.

E—1 to 11 inches; light brownish gray (10YR 6/2) sand, light gray (10YR 7/2) dry; single grain; loose; common fine and few medium roots; very strongly acid; abrupt irregular boundary.

Bs—11 to 16 inches; dark reddish brown (5YR 3/4) sand; weak medium subangular blocky structure; friable; few fine and medium roots; common fine prominent strong brown (7.5YR 5/6) accumulations of iron; tongues of E material penetrating about 10 percent of the horizon; strongly acid; abrupt wavy boundary.

Bsm—16 to 23 inches; strong brown (7.5YR 4/6) and dark reddish brown (5YR 3/3) sand; massive; very firm; few fine roots in a mat at the top of the horizon; many medium prominent strong brown (7.5YR 5/8) accumulations of iron; strongly cemented ortstein making up about 90 percent of the horizon; tongues of E material penetrating about 10 percent of the horizon; strongly acid; abrupt wavy boundary.

C—23 to 80 inches; pale brown (10YR 6/3) sand; single grain; loose; common medium prominent strong brown (7.5YR 4/6) accumulations of iron; moderately acid.

The thickness of the solum ranges from 20 to 23 inches. The depth to iron accumulations ranges from 11 to 14 inches.

The Oa horizon has hue of 5YR, value of 2 or 3, and chroma of 1. It is very strongly acid. It is sand.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 or 2. It is very strongly acid. It is sand.

The Bs horizon has hue of 5YR or 7.5YR and value and chroma of 3 or 4. Value and chroma of 3 do not occur together. This horizon is strongly acid. It is sand.

The Bsm horizon has hue of 5YR or 7.5YR, value of 4, and chroma of 6. It is strongly acid. It is sand. The content of ortstein ranges from 90 to 95 percent.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is moderately acid. It is sand or fine sand.

Graycalm Series

The Graycalm series consists of very deep, somewhat excessively drained soils on outwash plains and stream terraces. These soils formed in sandy outwash deposits (fig. 3). Permeability is rapid. Slopes range from 0 to 35 percent.

Taxonomic class: Mixed, frigid Lamellic Udipsamments

Typical pedon of Graycalm sand, 18 to 35 percent slopes, 2,500 feet south and 2,640 feet west of the northeast corner of sec. 15, T. 29 N., R. 5 E. USGS Beaver Lake topographic quadrangle; lat. 44 degrees 54 minutes 28.16 seconds north and long. 83 degrees 49 minutes 3.78 seconds west, NAD 27:

A—0 to 1 inch; black (N 2.5/0) sand, very dark gray (N 3/0) dry; weak fine granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

E—1 to 5 inches; grayish brown (10YR 5/2) sand, light gray (10YR 7/2) dry; single grain; loose; many fine roots; very strongly acid; abrupt wavy boundary.

Bw1—5 to 15 inches; yellowish brown (10YR 5/4) sand; weak medium subangular blocky structure; friable; common fine and few medium roots; about 1 percent gravel; very strongly acid; clear wavy boundary.

Bw2—15 to 24 inches; yellowish brown (10YR 5/6) sand; weak medium subangular blocky structure; friable; common fine roots; about 1 percent gravel; strongly acid; clear wavy boundary.

E´—24 to 38 inches; light yellowish brown (10YR 6/4) sand, very pale brown (10YR 8/4) dry; single grain; loose; few fine roots; about 1 percent gravel; strongly acid; abrupt wavy boundary.

E and Bt—38 to 80 inches; light yellowish brown (10YR 6/4) sand (E), very pale brown (10YR 8/4) dry; thin lamellae of brown (7.5YR 4/4) loamy sand (Bt) accumulating to a total thickness of 2 inches; single grain; loose; clay bridging sand grains; few fine roots; about 1 percent gravel; moderately acid.

The solum is more than 80 inches thick. The content of gravel ranges from 0 to 5 percent.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. The dry value is 5. This horizon is sand.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. The dry value is 7. This horizon is sand.

The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is sand.

The E´ horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The dry value is 8. This horizon is sand.

The E part of the E and Bt horizon has colors and textures similar to those of the E´ horizon. The Bt part has hue of 7.5YR, value of 3 or 4, and chroma of 4 or 5. It is loamy sand.

Grayling Series

The Grayling series consists of very deep, somewhat excessively drained soils on lake plains. These soils formed in sandy lacustrine deposits. Permeability is rapid. Slopes range from 0 to 6 percent.

Taxonomic class: Mixed, frigid Typic Udipsamments

Typical pedon of Grayling sand, very deep water table, 0 to 6 percent slopes, 1,300 feet south and 360 feet east of the northwest corner of sec. 16, T. 30 N., R. 8 E. USGS Alpena topographic quadrangle; lat. 45 degrees 0 minutes 8.08 seconds north and long. 83 degrees 28 minutes 59.89 seconds west, NAD 27:

A—0 to 2 inches; black (N 2.5/0) sand, very dark gray (N 3/0) dry; weak medium granular structure; friable; many fine roots; strongly acid; abrupt smooth boundary.

E—2 to 3 inches; brown (7.5YR 5/2) sand, pinkish gray (7.5YR 6/2) dry; single grain; loose; common fine and few medium roots; very strongly acid; abrupt broken boundary.

Bw1—3 to 8 inches; strong brown (7.5YR 5/6) sand; weak medium subangular blocky structure; very friable; common fine and few medium roots; about 1 percent gravel; very strongly acid; clear smooth boundary.

Bw2—8 to 15 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few fine roots; about 1 percent gravel; strongly acid; clear smooth boundary.

C—15 to 80 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; about 1 percent gravel; slightly acid.

The thickness of the solum ranges from 15 to 20 inches. The content of gravel is 0 to 1 percent.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 1 or 0. It is strongly acid. It is sand.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2. It is very strongly acid. It is sand.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is strongly acid. It is sand.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 or 5. It is slightly acid. It is sand.

Hagensville Series

The Hagensville series consists of very deep, somewhat poorly drained soils on ground moraines. These soils formed in loamy glacial till. Permeability is moderate. Slopes range from 0 to 3 percent.

Taxonomic class: Coarse-loamy, mixed, semiactive, frigid Aquic Hapludolls

Typical pedon of Hagensville fine sandy loam, 0 to 3 percent slopes, 300 feet south and 1,000 feet east of the northwest corner of sec. 6, T. 31 N., R. 7 E. USGS Lachine topographic quadrangle; lat. 45 degrees 6 minutes 58.91 seconds north and long. 83 degrees 37 minutes 48.00 seconds west, NAD 27:

A—0 to 7 inches; black (7.5YR 2/1) fine sandy loam, dark brown (7.5YR 3/2) dry; moderate medium granular structure; friable; many fine and common medium roots; about 5 percent gravel and 2 percent cobbles; slightly acid; abrupt smooth boundary.

Bw1—7 to 16 inches; yellowish brown (10YR 5/4) fine sandy loam; moderate medium subangular blocky structure; friable; common fine and medium roots; common medium distinct (10YR 5/6) accumulations of iron and few fine distinct (10YR 5/2) iron depletions; about 10 percent gravel; neutral; clear wavy boundary.

Bw2—16 to 18 inches; dark yellowish brown (10YR 4/6) fine sandy loam; moderate medium subangular blocky structure; friable; common fine and medium roots; many medium distinct brownish yellow (10YR6/6) accumulations of iron and many medium prominent (2.5Y 6/2) iron depletions; about 10 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

C1—18 to 64 inches; brown (7.5YR 5/3) gravelly fine sandy loam; massive; weakly expressed plates derived from deposition; friable but firm in place; common fine roots; many coarse prominent brownish yellow (10YR 6/6) accumulations of iron and many coarse prominent light brownish gray (10YR 6/2) iron depletions; about 20 percent gravel and 1 percent cobbles; strongly effervescent; slightly alkaline; clear wavy boundary.

C2—64 to 80 inches; brown (7.5YR 5/4) gravelly fine sandy loam; massive; weakly expressed plates derived from deposition; friable; few fine distinct strong brown (7.5YR 5/6) accumulations of iron; about 20 percent gravel; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 13 to 20 inches. The depth to calcium carbonates ranges from 10 to 17 inches. The content of gravel ranges from 5 to 10 percent throughout the solum and from 10 to 20 percent in the substratum. The content of cobbles ranges from 0 to 5 percent throughout the profile.

The A horizon has hue of 7.5YR or 10YR, value of 2.5 or 3, and chroma of 1 or 2. It is fine sandy loam.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma 4 to 6. It is fine sandy loam.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 or 4. It is fine sandy loam or gravelly fine sandy loam.

Histosols

These very deep, very poorly drained soils are in depressions. They formed in organic deposits. Permeability is moderately slow to moderately rapid. Slopes are 0 percent.

Taxonomic class: Mixed, frigid Histosols

These soils are in areas that are ponded. They have hue of 7.5YR or 10YR or are neutral in hue. They have value of 2 or 3 and chroma of 0 to 2. The texture is dominantly muck. In some areas, however, the surface layer is peat or mucky peat.

Hoist Series

The Hoist series consists of very deep, moderately well drained soils on ground moraines and drumlins. These soils formed in loamy glacial till. Permeability is moderately rapid in the upper part of the profile, moderately slow in the middle part, and very slow in the lower part. Slopes range from 0 to 12 percent.

Taxonomic class: Coarse-loamy, mixed, semiactive, frigid Oxyaquic Glossudalfs

Typical pedon of Hoist sandy loam, 0 to 6 percent slopes, 750 feet west and 380 feet north of the southeast corner of sec. 28, T. 29 N., R. 8 E. USGS Spruce topographic quadrangle; lat. 44 degrees 52 minutes 27.44 seconds north and long. 83 degrees 28 minutes 5.74 seconds west:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sandy loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; common very fine roots throughout; about 5 percent gravel and 1 percent cobbles; moderately acid; abrupt smooth boundary.

E—9 to 10 inches; gray (10YR 5/1) sandy loam, light gray (10YR 7/1) dry; weak thin platy structure; friable; common very fine roots throughout; about 5 percent gravel; slightly acid; abrupt broken boundary.

Bw—10 to 15 inches; brown (10YR 4/3) sandy loam; weak coarse subangular blocky structure; friable; few fine roots throughout; about 5 percent gravel; neutral; abrupt smooth boundary.

E/B—15 to 21 inches; grayish brown (10YR 5/2) sandy loam (E), light gray (7.5YR 7/1) dry; massive; firm; few fine roots throughout; few medium tubular and common very fine vesicular pores; E material makes up about 80 percent of the horizon and surrounds peds of brown (7.5YR 4/4) sandy loam (Bt); moderate medium subangular blocky structure; firm; common faint brown (7.5YR 4/3) clay films on the faces of peds; about 5 percent gravel; neutral; abrupt wavy boundary.

Bt1—21 to 28 inches; brown (7.5YR 4/4) loam; strong medium subangular blocky structure; firm; common fine roots throughout; few medium tubular pores; many distinct dark brown (7.5YR 3/4) clay films on the faces of peds and in pores; common medium distinct strong brown (7.5YR 4/6) accumulations of iron; about 5 percent gravel; neutral; abrupt wavy boundary.

Bt2—28 to 47 inches; light brown (7.5YR 6/3) sandy loam; weak thick platy structure; firm; few fine roots throughout; common distinct brown (7.5YR 4/4) clay films on the vertical faces of peds; about 5 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

Cd—47 to 80 inches; light brown (7.5YR 6/3) sandy loam; massive; weakly expressed plates derived from deposition; very firm; about 7 percent gravel; strongly effervescent; moderately alkaline.

The thickness of the solum, the depth to carbonates, and the depth to dense glacial till range from 40 to 50 inches. The content of gravel ranges from 5 to 14 percent throughout the profile, and the content of cobbles ranges from 0 to 5 percent.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 1 or 2. The dry value is 6. This horizon is sandy loam.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 to 3. The dry value is 7. This horizon is sandy loam.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is sandy loam.

The E part of the E/B horizon has colors and textures similar to those of the E horizon. The Bt part has colors and textures similar to the Bt horizon.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. It is sandy loam or loam.

The Cd horizon has hue of 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is sandy loam.

Iosco Series

The Iosco series consists of very deep, somewhat poorly drained soils on ground moraines, lake terraces, and till-floored lake plains. These soils formed in sandy lacustrine deposits underlain by loamy glacial till (fig. 4). Permeability is rapid in the sandy material and moderate in the glacial till. Slopes range from 0 to 3 percent.

Taxonomic class: Sandy over loamy, mixed, active, frigid Argic Endoaquods

Typical pedon of Iosco loamy sand, 0 to 2 percent slopes, 130 feet south and 390 feet east of the northwest corner of sec. 8, T. 29 N., R. 8 E. USGS Big Ravine Creek topographic quadrangle; lat. 44 degrees 55 minutes 42.91 seconds north and long. 83 degrees 30 minutes 15.58 seconds west, NAD 27:

Ap—0 to 10 inches; brown (7.5YR 4/2) loamy sand, pinkish gray (7.5YR 6/2) dry; weak medium granular structure; very friable; many fine roots;

about 3 percent gravel; neutral; abrupt smooth boundary.

Bs—10 to 19 inches; reddish brown (5YR 4/4) loamy sand; weak fine subangular blocky structure; friable; common fine and common medium roots; common medium distinct yellowish red (5YR 5/6) accumulations of iron; about 8 percent gravel; moderately acid; clear wavy boundary.

E—19 to 24 inches; brown (7.5YR 5/3) loamy sand, pink (7.5YR 7/3) dry; weak medium subangular blocky structure; friable; few fine roots; common medium distinct strong brown (7.5YR 5/6) accumulations of iron; about 4 percent gravel; slightly acid; abrupt wavy boundary.

Bt—24 to 27 inches; brown (7.5YR 4/3) sandy loam; moderate medium subangular blocky structure; friable; few fine roots; common fine distinct yellowish red (5YR 4/6) accumulations of iron; about 3 percent gravel; neutral; abrupt wavy boundary.

2Bt—27 to 37 inches; reddish brown (5YR 4/3) clay loam; moderate fine angular blocky structure; friable; few fine roots on faces of peds; many faint dark reddish gray (5YR 4/2) clay films on faces of peds; common medium prominent pinkish gray (7.5YR 6/2) iron depletions; about 3 percent gravel; slightly alkaline; clear wavy boundary.

2BC—37 to 52 inches; brown (7.5YR 5/3) loam; moderate coarse prismatic structure; friable; few fine roots on vertical prism faces; moderate medium platiness inherited from the parent material; few fine prominent reddish yellow (5YR 6/6) accumulations of iron and many medium prominent light gray (10YR 7/2) iron depletions; about 5 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

2C—52 to 80 inches; brown (7.5YR 5/3) sandy loam; massive; friable; moderate medium platiness inherited from the parent material; common fine distinct strong brown (7.5YR 5/6) accumulations of iron; about 5 percent gravel; violently effervescent; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 35 to 45 inches. The content of gravel ranges from 2 to 10 percent throughout the profile, and the content of cobbles ranges from 0 to 3 percent.

The Ap horizon has hue of 7.5YR, value of 4, and chroma of 2. The dry value is 6. This horizon is loamy sand.

The Bs horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 4. It is loamy sand.

The E horizon has hue of 7.5YR, value of 5, and chroma of 3. The dry value is 7. This horizon is loamy sand.

The 2Bt horizon has hue of 5YR or 7.5YR, value of 4, and chroma of 3. It is sandy loam, loam, or clay loam.

The 2C horizon has hue of 7.5YR, value of 5, and chroma of 3. It is loam, sandy loam, or fine sandy loam.

Johnswood Series

The Johnswood series consists of very deep, moderately well drained soils on ground moraines. These soils formed in loamy glacial till. They are shallow to dense glacial till. Permeability is slow. Slopes range from 1 to 6 percent.

Taxonomic class: Loamy-skeletal, mixed, semiactive, frigid Oxyaquic Argiudolls

Typical pedon of Johnswood very flaggy loam, 1 to 6 percent slopes, stony, 980 feet south and 920 feet east of the northwest corner of sec. 34, T. 32 N., R. 7 E. USGS Long Lake West topographic quadrangle; lat. 45 degrees 7 minutes 50.30 seconds north and long. 83 degrees 34 minutes 14.80 seconds west, NAD 27:

A—0 to 5 inches; black (10YR 2/1) very flaggy loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; common fine and medium roots; about 10 percent gravel and 20 percent flagstones; slightly acid; clear wavy boundary.

Bt—5 to 12 inches; yellowish brown (10YR 5/4) very gravelly clay loam; moderate medium subangular blocky structure; firm; common fine roots; few brown (10YR 4/3) clay films; common medium prominent brownish yellow (10YR 6/6) accumulations of iron; about 30 percent gravel and 5 percent flagstones; neutral; clear wavy boundary.

Cd—12 to 80 inches; pale brown (10YR 6/3) very gravelly sandy loam; massive; moderately expressed plates derived from deposition; firm; common medium prominent yellowish brown (10YR 5/6) accumulations of iron; about 40 percent gravel; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 11 to 15 inches. Reaction ranges from slightly acid to slightly alkaline in the A horizon and is neutral or slightly alkaline in the Bt horizon.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The content of flagstones

Figure 2.—Typical profile of Crowell fine sand, which formed in eolian deposits on dunes. Depth is marked in feet.

Figure 3.—Typical profile of Graycalm sand, which formed in sandy outwash. Depth is marked in feet.

Figure 4.—Typical profile of Iosco loamy sand, which formed in sandy lacustrine deposits underlain by loamy glacial till . Depth is marked in feet.

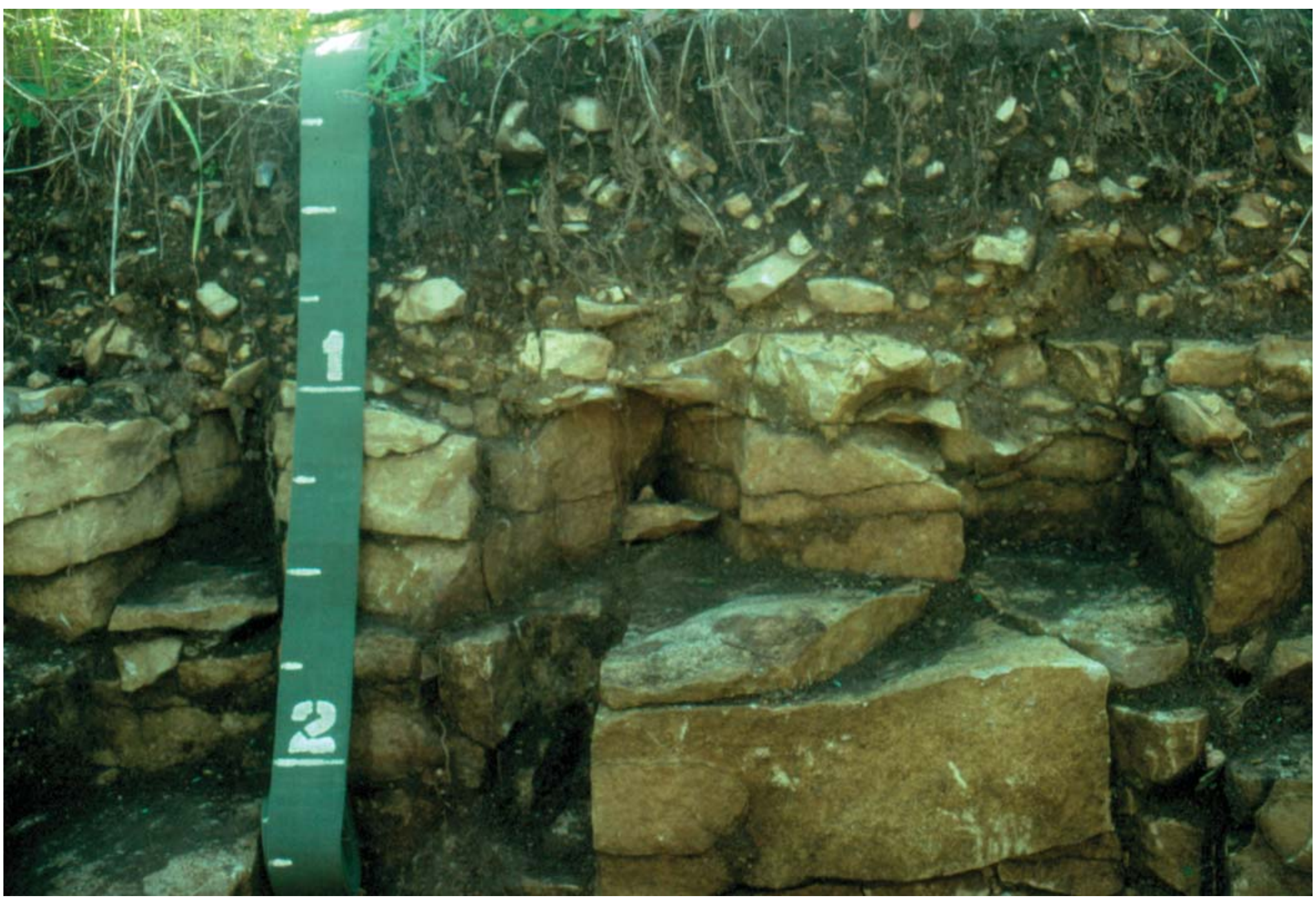

Figure 5.—Typical profile of Namur channery silt loam. This very shallow soil has limestone bedrock within a depth of about 10 inches. Depth is marked in feet.

Figure 6.—Typical profile of Rousseau fine sand, which formed in eolian deposits on dunes. Depth is marked in feet.

Figure 7.—Typical profile of Spot peat. The cemented zone between depths of 15 and 21 inches results in bog vegetation of spagnum moss, leatherleaf, and wintergreen.

ranges from 15 to 35 percent, and the content of gravel ranges from 5 to 25 percent.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is very gravelly clay loam, gravelly clay loam, or very gravelly loam. The content of flagstones ranges from 5 to 10 percent, and the content of gravel ranges from 20 to 50 percent.

The Cd horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is the gravelly or very gravelly analogs of loam or sandy loam. The content of flagstones ranges from 0 to 5 percent, the content of gravel ranges from 25 to 50 percent, and the content of cobbles ranges from 0 to 10 percent.

Kawkawlin Series

The Kawkawlin series consists of very deep, somewhat poorly drained soils on till plains. These soils formed in loamy glacial till. Permeability is slow. Slopes range from 1 to 4 percent.

Taxonomic class: Fine, mixed, semiactive, frigid Aquic Glossudalfs

Typical pedon of Kawkawlin loam, 1 to 4 percent slopes, 340 feet south and 675 feet east of the northwest corner of sec. 15, T. 28 N., R. 8 E., Alcona County, Michigan; USGS Spruce topographic quadrangle; lat. 44 degrees 49 minutes 43.23 seconds north and long. 83 degrees 27 minutes 45.12 seconds west, NAD 27:

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; moderate medium subangular blocky structure; friable; about 5 percent gravel; neutral; abrupt smooth boundary.

B/E—10 to 13 inches; about 80 brown (7.5YR 4/4) clay loam (Bt); surrounded by brown (10YR 5/3) loam (E); moderate medium subangular blocky structure, friable; few patchy faint brown (7.5YR 4/4) clay films; common fine distinct strong brown (7,5YR 5/6) accumulations of iron and few fine prominent grayish brown (10YR 5/2) iron depletions; about 5 percent gravel; common very dark grayish brown (10YR 3/2) wormcasts; common fine roots; neutral; abrupt broken boundary.

Bt—13 to 16 inches; strong brown (7.5YR 4/6) clay loam; strong fine angular blocky structure; firm; many fine roots between peds; many distinct brown (7.5YR 5/2 and 4/4) clay films on faces of peds; many medium cylindrical wormcasts; many fine faint strong brown (7.5YR 5/6) accumulations of iron and common fine prominent grayish brown (10YR 5/2) iron depletions; about 5 percent gravel; neutral; clear smooth boundary.

BC—16 to 30 inches; strong brown (7.5YR 4/6) loam; moderate medium angular blocky structure; friable; few fine roots between peds; many fine faint strong brown (7.5YR 5/6) accumulations of iron and common fine prominent grayish brown (10YR 5/2) iron depletions; about 5 percent gravel; slightly alkaline; abrupt smooth boundary.

C—30 to 80 inches; reddish brown (5YR 5/3) clay loam; weak medium prismatic structure; very firm; common coarse prominent strong brown (7.5YR 5/6) accumulations of iron and common coarse prominent light greenish gray (5GY 7/1) iron depletions; about 5 percent gravel and 1 percent cobbles; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 20 to 35 inches. The content of gravel ranges from 0 to 5 percent throughout the profile, and the content of cobbles ranges from 0 to 3 percent.

The Ap horizon has hue of 10YR, value of 3, and chroma of 2.

The E part of the B/E horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3.

The Bt part of the B/E horizon and the Bt horizon have hue of 5YR or 7.5YR, value of 4, and chroma of 4 to 6. They are clay loam or clay.

The C horizon has hue of 5YR, value of 5 or 6, and chroma of 3. It is loam or clay loam.

Killmaster Series

The Killmaster series consists of very deep, somewhat poorly drained soils on ground moraines and drumlins. These soils formed in loamy glacial till. Permeability is moderate in the solum and very slow in the underlying glacial till. Slopes range from 0 to 3 percent.

Taxonomic class: Coarse-loamy, mixed, semiactive, frigid Aquic Glossudalfs

Typical pedon of Killmaster sandy loam, 0 to 3 percent slopes, 1,750 feet east and 350 feet south of the northwest corner of sec. 34, T. 29 N., R. 8 E. USGS Spruce topographic quadrangle; lat. 44 degrees 52 minutes 20.49 seconds north and long. 83 degrees 27 minutes 32.56 seconds west, NAD 27:

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) sandy loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable;

many very fine and few medium roots; about 2 percent gravel; slightly acid; abrupt smooth boundary.

E—11 to 12 inches; grayish brown (10YR 5/2) sandy loam, light gray (10YR 7/2) dry; weak thick platy structure; friable; common very fine roots; many very fine vesicular and few medium tubular pores; common fine prominent strong brown (7.5YR 4/6) accumulations of iron; about 2 percent gravel; neutral; abrupt broken boundary.

E/B—12 to 15 inches; grayish brown (10YR 5/2) sandy loam (E), light gray (7.5YR 7/2) dry; weak thick platy structure; friable; common very fine roots; few medium tubular and many very fine vesicular pores; common fine prominent strong brown (7.5YR 4/6) accumulations of iron; E material makes up about 80 percent of the horizon and surrounds peds of brown (7.5YR 4/4) sandy loam (Bt); common faint brown (7.5YR 4/4) clay bridges between sand grains; common fine prominent greenish gray (5GY 5/1) iron depletions; about 2 percent gravel; neutral; clear wavy boundary.

B/E—15 to 17 inches; brown (7.5YR 4/3) sandy loam (Bt); moderate medium subangular blocky structure; firm; common very fine roots; many very fine vesicular and few medium tubular pores; common distinct dark brown (7.5YR 3/4) clay films on faces of peds; many medium distinct strong brown (7.5YR 4/6) accumulations of iron and common fine prominent greenish gray (5GY 6/1) iron depletions; Bt material makes up about 70 percent of the horizon and surrounds peds of grayish brown (10YR 5/2) sandy loam, light gray (10YR 7/2) dry; about 2 percent gravel; neutral; abrupt wavy boundary.

Bt—17 to 22 inches; brown (7.5YR 4/3) sandy loam; moderate medium subangular blocky structure; firm; common very fine roots; common distinct dark brown (7.5YR 3/4) clay films on faces of peds; many medium distinct strong brown (7.5YR 4/6) accumulations of iron; about 2 percent gravel; neutral; abrupt wavy boundary.

Cd—22 to 80 inches; brown (7.5YR 5/3) sandy loam; massive; moderately expressed plates derived from deposition; very firm; about 5 percent gravel; strongly effervescent; moderately alkaline.

The thickness of the solum, the depth to carbonates, and the depth to dense glacial till range from 20 to 40 inches. The content of gravel ranges from 2 to 10 percent in the solum and from 5 to 14 percent in the underlying glacial till. The content of cobbles ranges from 0 to 5 percent throughout the profile.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2. The dry value is 6. This horizon is sandy loam.

The E horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 2 or 3. The dry value is 7. This horizon is sandy loam.

The E part of the E/B and B/E horizons has colors and textures similar to those of the E horizon, and the Bt part has colors and textures similar to those of the Bt horizon.

The Bt horizon has hue of 7.5YR, value of 4, and chroma of 3 or 4. It is loam or sandy loam.

The Cd horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is sandy loam.

Kinross Series

The Kinross series consists of very deep, very poorly drained soils on lake plains and outwash plains. These soils formed in sandy deposits. Permeability is rapid. Slopes are 0 to 1 percent.

Taxonomic class: Sandy, mixed, frigid Typic Endoaquods

Typical pedon of Kinross muck, on a 0 percent slope, 1,670 feet south and 2,200 feet east of the northwest corner of sec. 23, T. 31 N., R. 7 E. USGS Lake Winyah topographic quadrangle; lat. 45 degrees 4 minutes 15.39 seconds north and long. 83 degrees 32 minutes 37.51 seconds west, NAD 27:

Oa1—0 to 3 inches; dark reddish brown (5YR 3/2) (broken face) muck, dark reddish brown (5YR 2.5/2) rubbed; about 20 percent fiber, 5 percent rubbed; weak thick platy structure; friable; many fine and common medium roots; sodium pyrophosphate light brown (7.5YR 6/3); primarily herbaceous fibers; extremely acid; abrupt smooth boundary.

Oa2—3 to 5 inches; black (5YR 2.5/1) (broken face) muck, dark reddish brown (5YR 2.5/2) rubbed; about 5 percent fiber, 1 percent rubbed; weak thick platy structure; friable; many fine roots; sodium pyrophosphate brown (7.5YR 4/3); primarily herbaceous fibers; extremely acid; abrupt smooth boundary.

Eg1—5 to 6 inches; dark gray (10YR 4/1) fine sand, light gray (10YR 7/1) dry; single grain; loose; few fine roots; extremely acid; abrupt smooth boundary.

Eg2—6 to 9 inches; gray (10YR 5/1) fine sand, white (10YR 8/1) dry; single grain; loose; few fine roots; common fine prominent reddish yellow (7.5YR 6/6) accumulations of iron; extremely acid; abrupt wavy boundary.

Bhs—9 to 13 inches; dark reddish brown (5YR 3/3) fine sand; moderate, thick platy structure; friable; few fine roots; common fine distinct yellowish red (5YR 4/6) accumulations of iron; extremely acid; abrupt wavy boundary.

Bs—13 to 19 inches; brown (7.5YR 4/4) fine sand; weak medium subangular blocky structure; very friable; few fine roots; common fine prominent yellowish red (5YR 5/6) accumulations of iron and common medium prominent grayish brown (10YR 5/2) iron depletions; extremely acid; clear smooth boundary.

BC—19 to 27 inches; brownish yellow (10YR 6/6) fine sand; single grain; loose; few coarse distinct strong brown (7.5YR 5/6) accumulations of iron; very strongly acid; gradual smooth boundary.

C—27 to 51 inches; pale brown (10YR 6/3) fine sand; single grain; loose; common medium prominent strong brown (7.5YR 5/6) accumulations of iron; very strongly acid; abrupt smooth boundary.

Cg—51 to 80 inches; grayish brown (10YR 5/2) fine sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 20 to 27 inches. The depth to iron accumulations ranges from 5 to 9 inches.

The Oa horizon has hue of 5YR or is neutral in hue. It has value of 2.5 or 3 and chroma of 0 to 2. It is extremely acid or very strongly acid. It is muck.

The Eg horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 1 or 2. It is extremely acid or very strongly acid. It is fine sand or sand.

The Bhs horizon has hue of 5YR or 7.5YR and value and chroma of 3. It is extremely acid or very strongly acid. It is fine sand or sand.

The Bs horizon has hue of 7.5YR and value and chroma of 4. It is extremely acid or very strongly acid. It is fine sand or sand.

The BC horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6. It is very strongly acid to moderately acid. It is fine sand or sand.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is very strongly acid to neutral. It is fine sand or sand.

The Cg horizon has hue of 10YR, value of 5 or 6, and chroma of 2. It is slightly acid. It is fine sand.

Klacking Series

The Klacking series consists of very deep, well drained soils on outwash plains, moraines, and kames. These soils formed in sandy and loamy glacial drift. Permeability is rapid. Slopes range from 0 to 50 percent.

Taxonomic class: Loamy, mixed, semiactive, frigid Arenic Glossudalfs

Typical pedon of Klacking loamy sand, on a 30 percent slope, in an area of Klacking-McGinn loamy sands, 8 to 50 percent, dissected, 2,920 feet north and 1,540 feet east of the southwest corner of sec. 22, T. 30 N., R. 5 E. USGS Beaver Lake topographic quadrangle; lat. 44 degrees 58 minutes 50.53 seconds north and long. 83 degrees 49 minutes 20.75 seconds west, NAD 27:

A—0 to 4 inches; very dark gray (7.5YR 3/1) loamy sand, gray (7.5YR 5/1) dry; weak fine granular structure; friable; many fine roots; about 2 percent gravel and 1 percent cobbles; very strongly acid; abrupt smooth boundary.

E—4 to 12 inches; pinkish gray (7.5YR 6/2) loamy sand, pinkish gray (7.5YR 7/2) dry; weak fine subangular blocky structure; very friable; common fine roots; about 2 percent gravel and 1 percent cobbles; strongly acid; abrupt wavy boundary.

Bw—12 to 25 inches; brown (7.5YR 5/4) loamy sand; weak medium subangular blocky structure; friable; common fine roots; about 2 percent gravel; strongly acid; clear wavy boundary.

E and Bt—25 to 33 inches; about 80 percent pale brown (10YR 6/3) sand (E), very pale brown (10YR 7/3) dry; single grain; loose; lamellae, $^{1}/_{4}$ inch thick, and pockets, 1 to 2 inches thick, of reddish brown (5YR 4/4) loamy sand; weak fine subangular blocky structure; friable; clay bridging and coating sand grains (Bt); few fine roots; about 2 percent gravel; moderately acid; abrupt wavy boundary.

B/E—33 to 64 inches; about 70 percent reddish brown (5YR 4/4) sandy loam (Bt); weak coarse subangular blocky structure; friable; few patchy faint reddish brown (5YR 4/3) clay films; clay bridging and coating sand grains; tongues of light brown (7.5YR 6/4) sand, pink (7.5YR 7/4) dry; single grain; loose (E); few fine roots; about 2 percent gravel; neutral; abrupt irregular boundary.

C—64 to 80 inches; pale brown (10YR 6/3) sand; single grain; loose; about 2 percent gravel; strongly effervescent; slightly alkaline.

The thickness of the solum ranges from 60 to 80 inches. The content of gravel ranges from 0 to 5 percent throughout the profile, and the content of cobbles is 0 to 1 percent.

The A horizon has hue of 7.5YR, value of 2 or 3, and chroma of 1 or 2. It is very strongly acid or strongly acid. It is loamy sand.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 or 3. It is very strongly acid or strongly acid. It is loamy sand or sand.

The Bw horizon has hue of 7.5YR or 10YR and value and chroma of 4 or 5. It is strongly acid or moderately acid. It is loamy sand or sand.

The E part of the E and Bt horizon and of the B/E horizon has hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 3 or 4. It is strongly acid or moderately acid. It is sand or loamy sand.

The Bt part of the E and B horizon and of the B/E horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It ranges from moderately acid to neutral. It is sandy loam or loamy sand.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is slightly alkaline. It is sand.

Krakow Series

The Krakow series consists of very deep, well drained soils on ground moraines and glacial lake benches. These soils formed in loamy glacial till. Permeability is moderate. Slopes range from 1 to 12 percent.

Taxonomic class: Loamy-skeletal, mixed, semiactive, frigid Inceptic Hapludalfs

Typical pedon of Krakow flaggy fine sandy loam, 1 to 6 percent slopes, 50 feet south and 2,640 feet east of the northwest corner of sec. 19, T. 32 N., R. 6 E. USGS Hillman NE topographic quadrangle; lat. 45 degrees 9 minutes 42.25 seconds north and long. 83 degrees 45 minutes 6.08 seconds west, NAD 27:

A—0 to 3 inches; dark grayish brown (10YR 4/3) flaggy fine sandy loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine and very fine roots; about 20 percent flagstones; neutral; abrupt smooth boundary.

E1—3 to 6 inches; brown (7.5YR 5/4) flaggy fine sandy loam, light brown (7.5YR 6/3) dry; moderate coarse subangular blocky structure; friable; many very fine roots; about 20 percent flagstones; neutral; abrupt broken boundary.

E2—6 to 8 inches; brown (7.5YR 5/3) flaggy fine sandy loam, pinkish gray (7.5YR 7/2) moderate medium subangular blocky structure; friable; many very fine roots; about 20 percent flagstones; neutral; clear wavy boundary.

Bt—8 to 15 inches; dark brown (7.5YR 3/4) very flaggy clay loam; moderate fine angular blocky structure; friable; many very fine roots; many faint dark brown (7.5YR 3/3) clay films on faces of peds; about 40 percent flagstones and 5 percent stones; slightly alkaline; abrupt irregular boundary.

C—15 to 80 inches; light yellowish brown (2.5YR 6/3) very flaggy loam; massive; about 40 percent flagstones and 5 percent stones; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 12 to 24 inches. The content of flagstones and channers ranges from 15 to 25 percent in the A and E horizons and from 35 to 55 percent in the Bt and C horizons. The content of gravel ranges from 0 to 15 percent throughout the profile, and the content of stones ranges from 0 to 5 percent.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It has a dry value of 5 or 6. It is flaggy fine sandy loam.

The E horizon has hue of 7.5YR, value of 5 or 6, and chroma of 3 or 4. It has a dry value of 6 or 7. It is flaggy fine sandy loam.

The Bt horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 4. It is very flaggy clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 or 4. It is very flaggy loam.

Lachine Series

The Lachine series consists of shallow, somewhat poorly drained soils on ground moraines and glacial lake benches. These soils formed in loamy glacial till underlain by karst limestone. Permeability is moderate in the glacial till and slow to rapid in the limestone bedrock. Slopes range from 0 to 3 percent.

Taxonomic class: Loamy, mixed, superactive, frigid Lithic Hapludolls

Typical pedon of Lachine loam, 0 to 3 percent slopes, 2,600 feet north and 750 feet east of the southwest corner of sec. 18, T. 32 N., R. 8 E. USGS Long Lake West topographic quadrangle; lat. 45 degrees 10 minutes 4.44 seconds north and long. 83 degrees 30 minutes 40.55 seconds west, NAD 27:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many very fine and fine roots; about 5 percent gravel; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bw—9 to 13 inches; brown (10YR 4/3) loam; moderate medium subangular blocky structure; friable; common fine roots; common fine prominent strong brown (7.5YR 5/6) accumulations of iron and common fine faint grayish brown (10YR 5/2) iron depletions; about 5 percent gravel and 1 percent cobbles; common fine vesicular pores; slightly effervescent; slightly alkaline; abrupt wavy boundary.

C—13 to 16 inches; brown (10YR 5/3) gravelly fine sandy loam; massive; firm; few fine roots; common fine vesicular pores; common fine prominent strong brown (7.5YR 5/6) accumulations of iron and common fine faint grayish brown (10YR 5/2) iron depletions; about 20 percent gravel and 1 percent cobbles; strongly effervescent; slightly alkaline; abrupt smooth boundary.

R—16 to 20 inches; gray (10YR 5/1), fractured karst limestone; fractures 1 to 4 inches wide and about 24 inches apart, making up about 8 percent of the horizon, and filled with brown (10YR 5/3) fine sandy loam.

The thickness of the solum and the depth to bedrock range from 10 to 20 inches. The content of gravel is 0 to 20 percent throughout the profile, the content of cobbles is 0 to 5 percent, and the content of stones is 0 to 5 percent.

The Ap horizon has hue of 5YR, 7.5YR, or 10YR; value of 2 to 4; and chroma of 1 to 3. The A horizon in undisturbed areas typically is more than 7 inches thick. It has hue of 5YR, 7.5YR, or 10YR and value and chroma of 2 or 3. The Ap or A horizon is loam. Reaction is neutral to moderately alkaline.

The Bw horizon has hue of 5YR, 7.5YR, or 10YR; value of 3 to 5; and chroma of 3 to 6. It is loam, flaggy loam, flaggy sandy loam, or flaggy very fine sandy loam. The content of flagstones ranges from 0 to 15 percent. Reaction is neutral to moderately alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4. It is fine sandy loam, sandy loam, loam, or the gravelly or flaggy analogs of those textures. The content of flagstones ranges from 0 to 15 percent. Reaction is slightly alkaline or moderately alkaline.

Leafriver Series

The Leafriver series consists of very deep, very poorly drained soils on lake plains and outwash plains. These soils formed in sandy lacustrine and outwash deposits. Permeability is rapid. Slopes are 0 to 1 percent.

Taxonomic class: Sandy, mixed, frigid Histic Humaquepts

Typical pedon of Leafriver muck, 1,860 feet east and 100 feet north of the southwest corner of sec. 14, T. 28 N., R. 9 E., Alcona County, Michigan; USGS Black River topographic quadrangle; lat. 44 degrees 48 minutes 57.40 seconds north and long. 83 degrees 19 minutes 05.32 seconds west, NAD 27:

Oa—0 to 9 inches; black (N 2/0) (broken face, pressed, and rubbed) muck; about 15 percent fiber, less than 5 percent rubbed; weak medium granular structure; friable; many fine and few medium roots; slightly acid; abrupt smooth boundary.

Bw—9 to 21 inches; brown (10YR 5/3) sand; single grain; loose; few fine roots; common medium distinct yellowish brown (10YR 5/6) accumulations of iron; neutral; clear smooth boundary.

Cg1—21 to 27 inches; grayish brown (10YR 5/2) sand; single grain; loose; common medium distinct yellowish brown (10YR 5/4) accumulations of iron; about 10 percent gravel and 5 percent cobbles; strongly effervescent; slightly alkaline; gradual wavy boundary.

Cg2—27 to 80 inches; dark grayish brown (10YR 4/2) sand; single grain; loose; strongly effervescent; slightly alkaline.

The thickness of the solum ranges from 10 to 25 inches. The depth to carbonates is more than 20 inches. The content of gravel ranges from 0 to 14 percent throughout the mineral horizons, and the content of cobbles ranges from 0 to 5 percent.

The Oa horizon has hue of 10YR or is neutral in hue. It has chroma of 0 or 1.

The Bw horizon has hue of 10YR, value of 3 to 5, and chroma of 3. It is sand or loamy sand.

The Cg horizon has hue of 10YR, 5Y, 5GY, or 2.5Y; value of 4 to 6; and chroma of 1 or 2. It is sand.

Loxley Series

The Loxley series consists of very deep, very poorly drained soils on lake plains and outwash plains. These soils formed in more than 51 inches of organic soil material. Permeability is moderately slow to moderately rapid. Slopes range from 0 to 2 percent.

Taxonomic class: Dysic, frigid Typic Haplosaprists

Typical pedon of Loxley peat, on a 0 percent slope, 290 feet north and 1,810 feet east of the southwest corner of sec. 31, T. 30 N., R. 8 E. USGS Big Ravine Creek topographic quadrangle; lat. 44 degrees 56 minutes 51.32 seconds north and long. 83 degrees 31 minutes 9.40 seconds west, NAD 27:

Oi—0 to 4 inches; dark yellowish brown (10YR 3/4) (broken face) peat, light yellowish brown (10YR 6/4) pressed, dark yellowish brown (10YR 4/4) rubbed; about 90 percent fiber, 90 percent rubbed; massive; very friable; about 5 percent wood fragments; extremely acid; abrupt smooth boundary.

Oa1—4 to 16 inches; dark reddish brown (5YR 3/3) (broken face) muck, dark reddish brown (5YR 3/2) pressed and rubbed, darkening to black (5YR 2.5/1) after exposure to air; about 20 percent fiber, 5 percent rubbed; weak thick platy structure; very friable; about 5 percent wood fragments; extremely acid; abrupt smooth boundary.

Oa2—16 to 76 inches; dark reddish brown (5YR 3/3) (broken face) muck, dark reddish brown (5YR 3/2) pressed and rubbed, darkening to black (5YR 2.5/1) after exposure to air; about 20 percent fiber, 5 percent rubbed; weak thick platy structure; very friable; extremely acid; abrupt smooth boundary.

Oa3—76 to 80 inches; black (N 2.5/0) (broken face, pressed, and rubbed) muck; about 2 percent fiber; weak thick platy structure; very friable; extremely acid.

The organic material is more than 51 inches thick. Reaction is extremely acid or very strongly acid throughout the solum.

The Oi horizon has hue of 10YR, value of 3 to 5, and chroma of 4. The content of fibers ranges from 85 to 95 percent after rubbing.

The Oa horizon has hue of 5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3. The content of fibers ranges from 2 to 15 percent after rubbing.

Lupton Series

The Lupton series consists of very deep, very poorly drained soils on lake plains, outwash plains, and moraines. These soils formed in more than 51 inches of organic soil material. Permeability is moderately slow to moderately rapid. Slopes range from 0 to 2 percent.

Taxonomic class: Euic, frigid Typic Haplosaprists

Typical pedon of Lupton muck, on a 0 percent slope, 260 feet south and 1,820 feet east of the northwest corner of sec. 17, T. 30 N., R. 8 E. USGS Alpena topographic quadrangle; lat. 45 degrees 0 minutes 13.40 seconds north and long. 83 degrees 29 minutes 54.85 seconds west, NAD 27:

Oa1—0 to 4 inches; black (N 2.5/0) (broken face and rubbed) muck; about 15 percent fiber, 5 percent rubbed; weak medium granular structure; friable; many fine roots; about 5 percent wood fragments; neutral; abrupt smooth boundary.

Oa2—4 to 24 inches; black (N 2.5/0) (broken face and rubbed) muck; about 20 percent fiber, 5 percent rubbed; weak very thick platy structure parting to weak medium subangular blocky; friable; about 5 percent wood fragments; neutral; abrupt smooth boundary.

Oa3—24 to 80 inches; very dark grayish brown (10YR 3/2) (broken face) muck, very dark brown (10YR 2/2) rubbed, darkening to black (10YR 2/1) after exposure to air; about 60 percent fiber, 5 percent rubbed; moderate medium platy structure; friable; sodium pyrophosphate brown (10YR 5/3); primarily herbaceous fibers; neutral.

The organic material is more than 80 inches thick. The content of woody fragments ranges from 2 to 7 percent. Reaction is slightly acid or neutral.

The O horizon has hue of 10YR or is neutral in hue. It value of 2 or 3 and chroma of 0 to 2. It is muck.

Mancelona Series

The Mancelona series consists of very deep, somewhat excessively drained soils on stream terraces and in glacial drainageways. These soils formed in deposits of sand and gravel. Permeability is moderately rapid in the upper part of the profile and very rapid in the lower part. Slopes range from 0 to 50 percent.

Taxonomic class: Sandy, mixed, frigid Alfic Haplorthods

Typical pedon of Mancelona sand, 0 to 6 percent slopes, 2,100 feet west and 50 feet north of the southeast corner of sec. 34, T. 32 N., R. 2 E., west-central part of Montmorency Township, Montmorency County, Michigan; USGS Atlanta Michigan 7.5 minute topographic quadrangle; lat. 45 degrees 6 minutes 47 seconds north and long. 84 degrees 10 minutes 21 seconds west, NAD 27:

A—0 to 3 inches; black (N 2.5/) sand, very dark gray (10YR 3/1) dry; weak fine and medium granular structure; very friable; common very fine and fine roots; about 1 percent gravel; very strongly acid; abrupt smooth boundary.

E—3 to 6 inches; pinkish gray (7.5YR 6/2) sand, pinkish white (10YR 8/2) dry; weak fine granular structure; very friable; many very fine, fine, medium, and coarse roots; about 1 percent gravel; very strongly acid; abrupt wavy boundary.

Bs1—6 to 16 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; common very fine and fine and many medium and coarse roots; about 1 percent cobbles and 3 percent gravel; moderately acid; clear wavy boundary.

Bs2—16 to 20 inches; yellowish brown (10YR 5/6) sand; weak fine subangular blocky structure; very friable; common fine and many medium and coarse roots; about 2 percent cobbles and 3 percent gravel; moderately acid; clear wavy boundary.

E´—20 to 29 inches; light yellowish brown (10YR 6/4) sand; weak medium subangular blocky structure; very friable; few medium and coarse roots; about 2 percent cobbles and 5 percent gravel; lamellae of yellowish red (5YR 5/6) loamy sand ranging from $^{1}/_{4}$ to $^{1}/_{2}$ inch in thickness and making up less than 10 percent of the horizon; moderately acid; abrupt wavy boundary.

2Bt—29 to 35 inches; reddish brown (5YR 4/4) gravelly sandy loam; weak medium subangular blocky structure parting to weak very fine subangular blocky; very friable; many fine, medium, and coarse roots; about 1 percent stones, 5 percent cobbles, and 25 percent gravel; prominent reddish brown (5YR 4/4) clay bridges between mineral grains and coating surfaces of rock fragments; neutral; clear wavy boundary.

2C—35 to 80 inches; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; about 2 percent stones, 10 percent cobbles, and 40 percent gravel; slightly effervescent; slightly alkaline.

The thickness of the solum ranges from 26 to 40 inches. The content of gravel ranges from 0 to 25 percent in the solum and from 20 to 50 percent in the substratum. The content of cobbles ranges from 0 to 10 percent throughout the profile, and the content of stones is 0 to 2 percent.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is dominantly sand but in some pedons is loamy sand.

The E horizon has hue of 5YR, 7.5YR, or 10YR; value of 4 to 6; and chroma of 2 to 4. It is sand, loamy sand, or the gravelly analogs of those textures.

The Bs horizon has hue of 5YR, 7.5YR, or 10YR; value of 3 to 5; and chroma of 2 to 6. It is sand, loamy sand, or the gravelly analogs of those textures.

The E´ horizon has hue of 7.5YR or 10YR, value of 6, and chroma of 4. It is sand, loamy sand, or the gravelly analogs of those textures. Some pedons do not have an E´ horizon.

The 2Bt horizon has hue of 5YR, 7.5YR, or 10YR; value of 4 or 5; and chroma of 3 to 6. It is loamy sand, sandy loam, sandy clay loam, or the gravelly analogs of those textures.

The 2C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 6. It is commonly stratified gravelly sand, gravelly coarse sand, very gravelly sand, coarse sand, or sand.

McGinn Series

The McGinn series consists of very deep, well drained soils on moraines. These soils formed in loamy glacial till. Permeability is moderately rapid in the upper part of the profile and moderate in the lower part. Slopes range from 0 to 50 percent.

Taxonomic class: Coarse-loamy, mixed, semiactive, frigid Haplic Glossudalfs

Typical pedon of McGinn loamy sand, in an area of Klacking-McGinn loamy sands, 8 to 50 percent slopes, dissected; 260 feet north and 2,630 feet west of the southeast corner of sec. 31, T. 29 N., R. 5 E. USGS McGinn Creek topographic quadrangle; lat. 44 degrees 51 minutes 27.55 seconds north and long. 83 degrees 52 minutes 43.63 seconds west, NAD 27:

A—0 to 2 inches; black (N 2.5/0) loamy sand, very dark gray (N 3/0) dry; weak medium granular structure; friable; many fine roots; about 10 percent gravel; extremely acid; abrupt smooth boundary.

E—2 to 3 inches; grayish brown (10YR 5/2) loamy sand, light gray (10YR 7/2) dry; weak fine subangular blocky structure; friable; common fine roots; about 10 percent gravel; very strongly acid; abrupt broken boundary.

Bw—3 to 12 inches; yellowish brown (10YR 5/4) loamy sand; weak medium subangular blocky structure; friable; common fine roots; about 5 percent gravel; very strongly acid; clear wavy boundary.

E´—12 to 18 inches; grayish brown (10YR 5/2) loamy sand, light gray (10YR 7/2) dry; weak medium subangular blocky structure; friable; few fine roots; about 5 percent gravel; very strongly acid; abrupt wavy boundary.

2B/E—18 to 22 inches; about 70 percent reddish brown (5YR 4/4) loam (Bt); weak medium subangular blocky structure; friable; tongues of grayish brown (10YR 5/2) loamy sand, light gray (10YR 7/2) dry (E); few fine roots; common patchy faint dark reddish brown (5YR 3/4) clay films on faces of peds; about 5 percent gravel; very strongly acid; abrupt wavy boundary.

2Bt—22 to 26 inches; reddish brown (5YR 4/4) loam; moderate medium subangular blocky structure; friable; few fine roots; common patchy faint dark reddish brown (5YR 3/4) clay films on faces of peds; about 5 percent gravel; strongly acid; abrupt wavy boundary.

2C—26 to 80 inches; reddish brown (5YR 5/4) sandy loam; massive; friable; about 5 percent gravel; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 24 to 40 inches. The content of gravel is 0 to 10 percent throughout the profile, and the content of cobbles is 0 to 5 percent.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 1 or 2. It is loamy sand.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2. The dry value is 7. This horizon is loamy sand.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is loamy sand.

The E´ horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2. It is loamy sand.

The E part of the 2B/E horizon has colors and textures similar to those of the E´ horizon.

The 2Bt part of the 2B/E horizon and the 2Bt horizon have hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 4. They are loam or sandy loam.

The 2C horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is sandy loam.

Millersburg Series

The Millersburg series consists of very deep, well drained soils on ground moraines and drumlins. These soils formed in sandy and loamy glacial till. Permeability is moderate or moderately rapid. Slopes range from 6 to 35 percent.

Taxonomic class: Coarse-loamy, mixed, active, frigid Haplic Glossudalfs

Typical pedon of Millersburg loamy sand, 12 to 18 percent slopes, 70 feet south and 2,200 feet west of the northeast corner of sec. 24, T. 29 N., R. 5 E. USGS Beaver Lake topographic quadrangle; lat. 44 degrees 54 minutes 0.7 second north and long. 83 degrees 46 minutes 35.7 seconds west, NAD 27:

A—0 to 3 inches; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; many fine and medium and common coarse roots; about 2 percent gravel; very strongly acid; abrupt wavy boundary.

E—3 to 5 inches; grayish brown (10YR 5/2) loamy sand, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; friable; many fine and medium and common coarse roots; about 2 percent gravel; very strongly acid; abrupt wavy boundary.

Bw1—5 to 11 inches; strong brown (7.5YR 4/6) loamy sand; weak medium subangular blocky structure; friable; many medium and common fine roots; about 2 percent gravel; strongly acid; clear wavy boundary.

Bw2—11 to 16 inches; dark yellowish brown (10YR 4/6) loamy sand; moderate medium subangular blocky structure; friable; common fine and medium roots; about 2 percent gravel; strongly acid; abrupt wavy boundary.

E´—16 to 18 inches; grayish brown (10YR 5/2) loamy sand, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; friable; common fine roots; about 2 percent gravel; strongly acid; clear smooth boundary.

2B/E—18 to 27 inches; about 75 percent strong brown (7.5YR 4/6) sandy clay loam (Bt); interfingered with grayish brown (10YR 5/2) loamy sand, very pale brown (10YR 7/3 dry (E); moderate medium subangular blocky structure; firm in the Bt part and friable in the E part; common fine roots; many fine vesicular pores; about 5 percent gravel; moderately acid; clear wavy boundary.

2Bt—27 to 33 inches; strong brown (7.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; firm; common fine roots; few dark brown (7.5YR 3/4) clay films on faces of peds; about 5 percent gravel; moderately acid; abrupt wavy boundary.

2C—33 to 80 inches; light yellowish brown (10YR 6/4) sandy loam; massive; friable; about 5 percent gravel; strongly effervescent; slightly alkaline.

The thickness of the solum ranges from 30 to 45 inches and corresponds to the depth to the base of the argillic horizon and the depth to calcium carbonates. The content of gravel ranges from 0 to 10 percent throughout the profile, and the content of cobbles ranges from 0 to 5 percent.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is loamy sand. Reaction is very strongly acid or strongly acid.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, chroma of 2 or 3. It is loamy sand or sand. Reaction ranges from very strongly acid to moderately acid.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 5 or 6. It is loamy sand or sand. Reaction ranges from very strongly acid to moderately acid.

The E´ horizon and the E part of the B/E horizon have hue of 10YR, value of 5 or 6 and, chroma of 2 or 3. They are loamy sand or sand.

The 2Bt horizon and the B part of the B/E horizon have hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. They are loam or sandy clay loam. Reaction is moderately acid or slightly acid.

The 2C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 or 4. It is sandy loam. Reaction is slightly alkaline or moderately alkaline.

Morganlake Series

The Morganlake series consists of very deep, moderately well drained soils on moraines. These soils formed in sandy outwash underlain by loamy glacial till. Permeability is rapid in the sandy deposits and moderately slow in the glacial till. Slopes range from 0 to 6 percent.

Taxonomic class: Sandy over loamy, mixed, active, frigid Alfic Oxyaquic Haplorthods

Typical pedon of Morganlake loamy sand, 0 to 6 percent slopes, 2,320 feet north and 180 feet west of the southeast corner of sec. 3, T. 29 N., R. 6 E. USGS Evans Creek topographic quadrangle; lat. 44 degrees 56 minutes 12.79 seconds north and long. 83 degrees 41 minutes 19.19 seconds west, NAD 27:

A—0 to 2 inches; black (N 2.5/0) loamy sand, dark gray (N 4/0) dry; weak medium granular structure; friable; many fine roots; about 1 percent gravel; extremely acid; abrupt smooth boundary.

E—2 to 6 inches; reddish gray (5YR 5/2) loamy sand, pinkish gray (5YR 7/2) dry; weak fine subangular blocky structure; friable; common fine roots; about 1 percent gravel; extremely acid; clear wavy boundary.

Bs1—6 to 11 inches; brown (7.5YR 4/3) loamy sand; weak medium subangular blocky structure; friable; common fine roots; about 1 percent gravel; very strongly acid; clear wavy boundary.

Bs2—11 to 19 inches; brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; common fine roots; about 1 percent gravel; very strongly acid; clear smooth boundary.

Bs3—19 to 34 inches; yellowish brown (10YR 5/4) sand; single grain; loose; few fine roots; about 1 percent gravel; very strongly acid; abrupt smooth boundary.

2E/B—34 to 37 inches; about 70 percent pinkish gray (7.5YR 6/2) fine sandy loam (E), pinkish gray (7.5YR 7/2) dry; E material surrounding peds of reddish brown (5YR 4/4) loam (Bt); few faint reddish brown (5YR 4/4) clay films on faces of peds; weak thin platy structure; friable; few fine roots; common fine prominent strong brown (7.5YR 5/6) accumulations of iron; about 3 percent gravel; very strongly acid; abrupt wavy boundary.

2Bt—37 to 43 inches; reddish brown (5YR 4/4) loam; weak medium subangular blocky structure; friable; common fine roots; common distinct dark reddish brown (5YR 3/4) clay films on faces of peds; common fine roots; common fine prominent strong brown (7.5YR 5/6) accumulations of iron; about 3 percent gravel and 1 percent cobbles; slightly acid; abrupt wavy boundary.

2C—43 to 80 inches; reddish brown (5YR 5/4) fine sandy loam; friable; weak thin platiness inherited from the parent material; firm with moderate medium platiness in about 20 percent of the horizon; very few prominent pinkish gray (7.5YR 7/2) carbonate coatings between plates; common medium distinct strong brown (7.5YR 5/6) accumulations of iron between plates; about 5 percent gravel and 1 percent cobbles; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 40 to 60 inches. The content of gravel ranges from 0 to 5 percent in the sandy upper part of the profile and 5 to 14 percent in the loamy layers. The content of cobbles ranges from 0 to 5 percent throughout the profile.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is loamy sand.

The E horizon has hue of 5YR, 7.5YR, or 10YR; value of 5 or 6; and chroma of 2 or 3. The dry value is 7. This horizon is loamy sand or loamy fine sand.

The upper part of the Bs horizon has hue of 7.5YR and value and chroma of 3 or 4. Value and chroma of 3 do not occur together. The lower part of the Bs horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The Bs horizon is loamy sand, sand, or loamy fine sand.

The E part of the 2B/E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 or 3. It has a dry value of 7. It is fine sandy loam or sandy loam.

The Bt part of the 2E/B horizon has hue of 5YR and value and chroma of 4. It is loam. Some pedons do not have a 2E/B horizon.

The 2Bt horizon has colors and textures similar to the those of the Bt part of the 2E/B horizon.

The C horizon has hue of 7.5YR or 5YR, value of 5 or 6, and chroma of 3 or 4. It is fine sandy loam or loam.

Namur Series

The Namur series consists of very shallow, well drained soils on karst plains and bedrock benches. These soils formed in loamy residuum underlain by karst limestone (fig. 5). Permeability is moderate in the loamy material and slow to rapid in the limestone. Slopes range from 0 to 6 percent.

Taxonomic class: Loamy, mixed, semiactive, frigid Lithic Hapludolls

Typical pedon of Namur channery silt loam, 0 to 6 percent slopes, 2,120 feet north and 2,600 feet west of the southeast corner of sec. 12, T. 31 N., R. 8 E. USGS Alpena topographic quadrangle; lat. 45 degrees 5 minutes 48.63 seconds north and long. 83 degrees 23 minutes 58.98 seconds west, NAD 27:

A—0 to 5 inches; dark brown (7.5YR 3/2) channery silt loam, dark gray (7.5YR 4/1) dry; moderate medium granular structure; friable; common fine roots; about 30 percent limestone channers and 5 percent limestone flagstones; strongly effervescent; moderately alkaline; abrupt smooth boundary

2R—5 to 9 inches; gray (N 5/0), thinly bedded karst limestone; rectilinear pattern of vertical cracks, 1 to 3 inches wide, partially filled with A material from above.

The thickness of the solum ranges from 5 to 10 inches and corresponds to the depth to limestone bedrock. The content of channers ranges from 20 to 30 percent in the A horizon, and the content of flagstones ranges from 0 to 5 percent. Reaction ranges from neutral to moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 3, and chroma of 1 or 2. The dry value is 4 or 5. This horizon is channery silt loam.

The R horizon is neutral in hue and has value of 5 and chroma of 0. The limestone is thinly bedded and vertically fractured at intervals of 2 to 6 feet.

Negwegon Series

The Negwegon series consists of very deep, moderately well drained soils on lake plains, some of which are till floored. These soils formed in stratified silty and clayey lacustrine deposits. Permeability is very slow. Slopes range from 2 to 12 percent.

Taxonomic class: Fine, mixed, semiactive, frigid Oxyaquic Glossudalfs

Typical pedon of Negwegon silt loam, till substratum, 2 to 6 percent slopes, 1,050 feet south and 10 feet west of the northeast corner of sec. 27, T. 30 N., R. 6 E. USGS Evans Creek topographic quadrangle; lat. 44 degrees 58 minutes 19.31 seconds north and long. 83 degrees 41 minutes 16.21 seconds west, NAD 27:

Ap—0 to 9 inches; brown (7.5YR 4/2) silt loam, pinkish gray (7.5YR 6/2) dry; moderate coarse subangular blocky structure parting to weak medium granular; friable; common fine roots; slightly acid; abrupt smooth boundary.

E—9 to 12 inches; brown (7.5YR 5/2) silt loam, pinkish gray (7.5YR 7/2) dry; weak medium subangular blocky structure; firm; few fine roots; moderately acid; abrupt smooth boundary.

B/E—12 to 14 inches; about 60 percent reddish brown (5YR 4/3) silty clay (Bt); surrounded by brown (7.5YR 5/2) silt loam (E), pinkish gray (7.5YR 7/2) dry; moderate medium angular blocky structure parting to weak medium subangular blocky; friable; few fine roots; few patchy distinct reddish brown (5YR 4/4) clay films; slightly acid; abrupt broken boundary.

Bt1—14 to 21 inches; reddish brown (5YR 4/3) silty clay; weak coarse prismatic structure parting to moderate coarse angular blocky; firm; common faint dark reddish brown (5YR 3/3) clay films on faces of peds; many fine prominent strong brown (7.5YR 5/6) accumulations of iron; slightly acid; abrupt smooth boundary.

Bt2—21 to 51 inches; reddish brown (5YR 5/3) silty clay; moderate coarse prismatic structure parting to moderate medium angular blocky; firm; many prominent dark reddish brown (5YR 3/4) clay films on vertical faces of peds; about 1 percent pebbles; slightly effervescent; slightly alkaline; clear wavy boundary.

BC—51 to 62 inches; reddish brown (5YR 5/4) silty clay; moderate coarse prismatic structure parting to moderate coarse angular blocky; firm; common prominent pinkish gray (5YR 7/1) carbonate coatings; about 1 percent pebbles; strongly effervescent; moderately alkaline; abrupt wavy boundary.

2C—62 to 80 inches; brown (7.5YR 5/4) loam; weak coarse platiness inherited from the parent material; firm; common medium prominent yellowish brown (10YR 5/6) accumulations of iron; about 5 percent pebbles; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 20 to 65 inches. The depth to carbonates ranges from 40 to 50 inches. The content of gravel is 0 to 1 percent above the 2C horizon. The depth to redoximorphic features ranges from 12 to 20 inches.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3. The dry value is 6. Reaction is slightly acid or neutral. This horizon is silt loam.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2. It is moderately acid. It is silt loam.

The E part of the B/E horizon has colors similar to those of the E horizon. The B part of the B/E horizon has colors similar to those of the Bt horizon.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. Reaction is slightly acid to slightly alkaline. This horizon is silty clay.

The BC horizon has hue of 5YR, value of 5 or 6, and chroma of 3 or 4. It is moderately alkaline. It is silty clay or silty clay loam stratified in some pedons with thin layers of silt loam.

The 2C horizon has hue of 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is moderately alkaline. It is loam or fine sandy loam. The content of gravel is 0 to 7 percent. Some pedons do not have a 2C horizon.

Ossineke Series

The Ossineke series consists of very deep, moderately well drained soils on moraines and drumlins. These soils formed in loamy glacial till. Permeability is moderately rapid in the upper part of the profile and moderately slow or slow in the lower part. Slopes range from 0 to 12 percent.

Taxonomic class: Fine-loamy, mixed, semiactive, frigid Oxyaquic Glossudalfs

Typical pedon of Ossineke fine sandy loam, 0 to 6 percent slopes, 1,780 feet north and 2,200 east of the southwest corner of sec. 19, T. 30 N., R. 6 E. USGS Beaver Lake topographic quadrangle; lat. 44 degrees 58 minutes 42.67 seconds north and long. 83 degrees 45 minutes 32.12 seconds west, NAD 27:

Ap—0 to 10 inches; dark brown (7.5YR 3/2) fine sandy loam, pinkish gray (7.5YR 6/2) dry; moderate medium subangular blocky structure; friable; common fine roots; about 5 percent gravel; moderately acid; abrupt smooth boundary.

Bw—10 to 15 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium platy structure; friable; common fine roots; about 5 percent gravel; strongly acid; abrupt broken boundary.

E/B—15 to 22 inches; about 60 percent light brown (7.5YR 6/3) fine sandy loam, pinkish gray (7.5YR 7/2) dry (E); surrounding peds of reddish brown (5YR 4/3) clay loam (Bt); weak medium platy structure; friable; brittle in about 40 percent of the horizon; few fine roots; few thin patchy faint reddish brown (5YR 4/4) clay films; common fine prominent strong brown (7.5YR 5/6) accumulations of iron; about 5 percent gravel; strongly acid; abrupt wavy boundary.

Bt1—22 to 35 inches; reddish brown (5YR 4/3) clay loam; weak very coarse prismatic structure parting to moderate medium angular blocky; firm; common fine roots; many medium distinct dark brown (5YR 3/4) clay films on faces of peds; common fine prominent strong brown (7.5YR 5/6) accumulations of iron; about 5 percent gravel; slightly acid; clear wavy boundary.

Bt2—35 to 41 inches; reddish brown (5YR 4/4) loam; weak very coarse prismatic structure parting to weak medium subangular blocky; firm; common fine roots on faces of peds; common medium faint reddish brown (5YR 4/3) clay films on faces of peds; common fine faint strong brown (7.5YR 4/6) accumulations of iron; about 5 percent gravel and 1 percent cobbles; neutral; clear wavy boundary.

C—41 to 80 inches; brown (7.5YR 5/3) fine sandy loam; weak medium platiness inherited from the parent material; firm in place, slight brittleness; about 5 percent gravel and 3 percent cobbles; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 35 to 60 inches. The depth to carbonates ranges from 20 to 35 inches. The solum ranges from strongly acid to moderately alkaline. The content of gravel ranges from 0 to 10 percent throughout the profile, and the content of cobbles ranges from 0 to 3 percent. Iron accumulations occur in the lower part of the E/B horizon and in the Bt horizon, on faces of peds.

The Ap horizon has hue of 7.5YR or 10YR, value of 3, and chroma of 1 or 2. It is fine sandy loam. The A horizon in undisturbed areas is 2 to 6 inches thick. It has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1.

The Bw horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 3 or 4. It is fine sandy loam or sandy loam.

The E part of the E/B horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 or 3. It has a dry value of 7 or 8. It is fine sandy loam or sandy loam. The Bt part has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is clay loam or loam. Some pedons have a B/E horizon, which has colors and textures similar to those of the E/B horizon.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The Bt1 horizon is clay loam. The Bt2 horizon is clay loam, sandy clay loam, or loam.

The C horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is loam, fine sandy loam, or clay loam. The consistence of individual plates ranges from firm to extremely firm. Where it is extremely firm, the C horizon is characterized by strongly expressed medium platiness and redoximorphic features along fracture planes.

Some pedons have a 2C horizon. This horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 to 5. It is sand, loamy sand, or the gravelly analogs of those textures.

Otisco Series

The Otisco series consists of very deep, somewhat poorly drained soils on outwash plains, lake plains, and moraines. These soils formed in sandy deposits. Permeability is rapid. Slopes range from 0 to 3 percent.

Taxonomic class: Sandy, mixed, frigid Argic Endoaquods

Typical pedon of Otisco mucky sand, 0 to 3 percent slopes, 875 feet west and 2,130 feet south of the northeast corner of sec. 19, T. 31 N., R. 2 E., north part of Briley Township, Montmorency County, Michigan; USGS Atlanta Michigan 7.5 minute topographic quadrangle; lat. 45 degrees 3 minutes 54 seconds north and long. 84 degrees 13 minutes 45 seconds west, NAD 27:

A—0 to 5 inches; black (10YR 2/1) mucky sand, very dark gray (5YR 3/1) dry; moderate fine and medium granular structure; very friable; many very fine and fine and common medium and coarse roots; very strongly acid; clear wavy boundary.

E—5 to 10 inches; light brownish gray (10YR 6/2) sand, white (10YR 8/2) dry; weak medium subangular blocky structure; friable; common very fine and fine and few medium roots; common medium prominent strong brown (7.5YR 5/8) and few medium prominent brownish yellow (10YR 6/6) accumulations of iron; about 3 percent gravel; strongly acid; clear wavy boundary.

Bs—10 to 25 inches; dark brown (7.5YR 3/4) sand; weak medium subangular blocky structure; friable; many medium and coarse prominent yellowish red (5YR 4/6) accumulations of iron; about 3 percent gravel; strongly acid; clear wavy boundary.

E´—25 to 38 inches; light yellowish brown (10YR 6/4) sand, very pale brown (10YR 7/4) dry; single grain; loose; common medium prominent strong brown (7.5YR 5/8) accumulations of iron; about 3 percent gravel; strongly acid; clear wavy boundary.

E and Bt—38 to 45 inches; light yellowish brown (10YR 6/4) sand (E); single grain; loose; bands of brown (7.5YR 5/4) loamy sand (Bt); weak fine subangular blocky structure; friable; common medium prominent strong brown (7.5YR 5/6 and 5/8) accumulations of iron; about 3 percent gravel; slightly acid; clear wavy boundary.

Bt—45 to 60 inches; brown (7.5YR 5/4) loamy sand; weak fine subangular blocky structure; friable; clay bridging between sand grains; common medium prominent strong brown (7.5YR 5/8) accumulations of iron; a thin lens of gravelly loamy sand at a depth of 52 inches; about 5 percent gravel; neutral; clear wavy boundary.

C—60 to 80 inches; light brown (7.5YR 6/4) sand; single grain; loose; a lens of gravelly sand 1 to 2 inches thick; about 7 percent gravel; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 25 to 65 inches. The content of gravel ranges from 0 to 7 percent. The solum ranges from very strongly acid to neutral.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly mucky sand but in some pedons is sand or loamy sand.

The E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2.

The Bs horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 4. The content of ortstein in this horizon commonly ranges from 0 to 10 percent.

The E´ horizon and the E part of the E and Bt horizon have hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4.

The Bt horizon and the Bt part of the E and Bt horizon have hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 4.

The C horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 3 to 6.

Potagannissing Series

The Potagannissing series consists of very shallow, somewhat poorly drained soils on karst plains and glacial lake benches. These soils formed in loamy residuum underlain by limestone bedrock. Permeability is moderate in the loamy material and slow in the limestone bedrock. Slopes range from 0 to 3 percent.

Taxonomic class: Loamy, mixed, superactive, frigid Lithic Hapludolls

Typical pedon of Potagannissing silt loam, 0 to 3 percent slopes, 2,070 feet north and 1,450 feet east of the southwest corner of sec. 12, T. 31 N., R. 7 E. USGS Lake Winyah topographic quadrangle; lat. 45 degrees 5 minutes 45.73 seconds north and long. 83 degrees 31 minutes 39.00 seconds west, NAD 27:

A1—0 to 6 inches; dark brown (10YR 3/2) silt loam, brown (7.5YR 5/2) dry; moderate fine granular structure; friable; common fine roots; about 5 percent channers; slightly effervescent; moderately alkaline; abrupt wavy boundary.

A2—6 to 9 inches; brown (10YR 4/2) very flaggy silt loam, pinkish gray (7.5YR 6/2) dry; moderate fine granular structure; friable; common fine roots; few fine prominent strong brown (7.5YR 5/6) accumulations of iron; about 40 percent flagstones; strongly effervescent; moderately alkaline; abrupt smooth boundary.

R—9 to 11 inches; gray (10YR 5/1) limestone bedrock; slightly fractured.

The depth to bedrock ranges from 7 to 10 inches.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2. It is moderately alkaline. It is silt loam, flaggy silt loam, or very flaggy silt loam. The content of channers is 0 to 5 percent, and the content of flagstones is 0 to 45 percent.

The R horizon has hue of 10YR, value of 5, and chroma of 1. It is limestone bedrock.

Proper Series

The Proper series consists of very deep, moderately well drained soils on dunes. These soils formed in sandy eolian deposits. They have an ortstein layer. Permeability is moderately rapid in the ortstein layer and rapid in the rest of the profile. Slopes range from 0 to 6 percent.

Taxonomic class: Sandy, mixed, frigid, ortstein Oxyaquic Haplorthods

Typical pedon of Proper fine sand, on a 4 percent slope, in an area of Proper-Deford-Rousseau complex, 0 to 40 percent slopes, 420 feet south and 2,560 feet west of the northeast corner of sec. 20, T. 31 N., R. 7 E. USGS Lake Winyah topographic quadrangle; lat. 45 degrees 4 minutes 25.88 seconds north and long. 83 degrees 36 minutes 13.80 seconds west, NAD 27:

A—0 to 3 inches; very dark gray (N 3/0) fine sand, dark gray (N 4/0) dry; weak medium granular structure; friable; many fine roots; extremely acid; abrupt smooth boundary.

E—3 to 11 inches; pinkish gray (5YR 6/2) fine sand, pinkish gray (5YR 7/2) dry; single grain; loose; many fine and common medium roots; extremely acid; abrupt wavy boundary.

Bs1—11 to 14 inches; dark brown (7.5YR 3/4) fine sand; weak medium subangular blocky structure; friable; many fine and few medium roots; extremely acid; abrupt wavy boundary.

Bs2—14 to 19 inches; strong brown (7.5YR 5/6) fine sand; weak medium subangular blocky structure; very friable; common fine roots in mats on top of the ortstein; columns of brown (7.5YR 4/4), strongly cemented ortstein make 42 percent of the horizon; extremely acid; clear irregular boundary.

Bs3—19 to 24 inches; reddish yellow (7.5YR 6/6) fine sand; massive; brittle; columns of brown (7.5YR 4/4), strongly cemented ortstein extending from the Bs2 horizon make up 78 percent of the Bs3 horizon; extremely acid; clear smooth boundary.

BC—24 to 41 inches; brown (10YR 5/3) fine sand; single grain; loose; common coarse prominent strong brown (7.5YR 5/8) accumulations of iron; very strongly acid; clear smooth boundary.

C—41 to 80 inches; light yellowish brown (10YR 6/4) fine sand; single grain; loose; common medium prominent strong brown (7.5YR 5/6) accumulations of iron; very strongly acid.

The thickness of the solum ranges from 35 to 41 inches. The depth to iron accumulations ranges from 20 to 30 inches.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2.5 or 3 and chroma of 0 to 2. It is extremely acid to strongly acid. It is fine sand.

The E horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 2. It is extremely acid to strongly acid. It is fine sand.

The Bs horizon has hue of 7.5YR, value of 3 to 5, and chroma of 4 to 6. The content of ortstein ranges from 50 to 80 percent in some part of this horizon. Reaction is extremely acid to strongly acid. This horizon is fine sand.

The BC horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is very strongly acid to slightly acid. It is fine sand.

The C horizon has hue of 10YR, value of 6, and chroma of 4. It is very strongly acid to slightly acid. It is fine sand.

Richter Series

The Richter series consists of very deep, somewhat poorly drained soils on lake plains and in glacial drainageways. These soils formed in stratified sandy and loamy lacustrine and glaciofluvial sediments. Permeability is moderate. Slopes range from 0 to 6 percent.

Taxonomic class: Coarse-loamy, mixed, semiactive, frigid Argic Endoaquods

Typical pedon of Richter loamy fine sand, 0 to 3 percent slopes, 30 feet south and 1,200 feet west of the northeast corner of sec. 10, T. 26 N., R. 8 E., Alcona County, Michigan; USGS Barton City topographic quadrangle; lat. 44 degrees 40 minutes 12.62 seconds north and long. 83 degrees 26 minutes 56.50 seconds west, NAD 27:

A—0 to 8 inches; black (10YR 2/1) loamy fine sand, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; many fine and common medium roots; strongly acid; abrupt wavy boundary.

E—8 to 12 inches; light gray (10YR 7/2) loamy sand; weak medium subangular blocky structure; very friable; common fine roots; moderately acid; clear broken boundary.

Bs—12 to 18 inches; brown (7.5YR 4/4) loamy sand; weak thick platy structure parting to weak fine subangular blocky; friable; common fine roots; common patchy distinct dark brown (10YR 4/3) organic coatings; many coarse distinct strong brown (7.5YR 4/6) accumulations of iron and dark reddish brown (5YR 3/3) iron depletions; moderately acid; abrupt wavy boundary.

B/E—18 to 26 inches; about 80 percent brown (7.5YR 5/4) sandy loam (Bt); surrounded by pale brown (10YR 6/3) loamy sand (E); moderate thick platy structure parting to moderate medium subangular blocky; friable; few fine roots; common medium distinct pinkish gray (7.5YR 6/2) and common medium distinct strong brown (7.5YR 5/8) accumulations of iron; moderately acid; clear wavy boundary.

Bt—26 to 37 inches; brown (7.5YR 5/4) and reddish brown (5YR 5/4), stratified fine sandy loam and clay loam; weak thick platy structure parting to moderate fine angular blocky; friable; few fine roots; common faint reddish brown (5YR 5/3) clay films on faces of peds; common fine prominent greenish gray (5GY 5/1) and common medium prominent strong brown (7.5YR 5/8) accumulations of iron; neutral; abrupt smooth boundary.

C—37 to 80 inches; pinkish gray (7.5YR 6/2) and reddish brown (5YR 5/3), stratified loamy sand and silt loam; massive; friable; few medium prominent greenish gray (5GY 6/1) and few medium prominent strong brown (7.5YR 5/8) accumulations of iron; about 5 percent gravel; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 22 to 40 inches. The content of gravel ranges from 0 to 5 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The E horizon has hue of 10YR or 7.5YR, value of 6 or 7, and chroma of 1 or 2. It is loamy sand or very fine sandy loam.

The Bs horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is loamy sand or sandy loam.

The E part of the B/E horizon has hue of 10YR, value of 6 or 7, and chroma of 2 to 4. It is loamy sand, fine sandy loam, or very fine sandy loam.

The Bt part of the B/E horizon and the Bt horizon have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. They are stratified fine sandy loam to clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 or 3. It is stratified loamy sand to silt loam.

Rollaway Series

The Rollaway series consists of very deep, very poorly drained soils on flood plains. These soils formed in stratified sandy to silty alluvium underlain by clayey lacustrine deposits. Permeability is moderate in the alluvial deposits and very slow in the clayey deposits. Slopes range from 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, semiactive, nonacid, frigid Histic Humaquepts

Typical pedon of Rollaway muck, frequently flooded, on a 0 percent slope, 1,480 feet east and 30 feet south of the center of sec. 5, T. 29 N., R. 6 E. USGS Evans Creek topographic quadrangle; lat. 44 degrees 56 minutes 14.07 seconds north and long. 83 degrees 43 minutes 58.73 seconds west, NAD 27:

Oa—0 to 10 inches; very dark gray (7.5YR 3/1) (broken face) muck, black (7.5YR 2.5/1) rubbed; about 15 percent fiber, 3 percent rubbed; moderate coarse and medium granular structure; friable; many fine and very fine and common coarse roots; moderately acid; abrupt smooth boundary.

Cg1—10 to 20 inches; gray (10YR 5/1) fine sandy loam stratified with very dark gray (10YR 3/1) silt loam; weak thick platy and moderate medium subangular blocky structure; many fine and common medium roots; common medium prominent strong brown (7.5YR 5/6) accumulations of iron; slightly acid; abrupt smooth boundary.

Cg2—20 to 33 inches; gray (5Y 6/1) silt loam; weak coarse subangular blocky structure; friable; few fine roots; thin very dark gray (10YR 3/1) organic stains; few medium prominent strong brown (7.5YR 5/6) and common medium prominent yellowish brown (10YR 6/5) accumulations of iron; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Cg3—33 to 42 inches; light brownish gray (10YR 6/2) loamy fine sand; massive; friable; weak medium platiness inherited from the parent material; few fine and few medium roots; about 2 percent gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2Cg—42 to 80 inches; grayish brown (10YR 5/2) silty clay; massive; firm; many medium prominent brownish yellow (10YR 6/6) accumulations of iron; strongly effervescent; moderately alkaline.

Depth to the clayey substratum ranges from 40 to 60 inches. The depth to carbonates ranges from 20 to 40 inches. The content of gravel is 0 to 5 percent in the Oa and Cg horizons and 0 to 2 percent in the 2Cg horizon.

The Oa horizon has hue of 7.5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is muck.

The Cg horizon has hue of 5YR to 10YR, value of 5 or 6, and chroma of 1 or 2. It is silt loam, fine sandy loam, or loamy fine sand.

The 2Cg horizon has hue of 10YR, value of 5, and chroma of 2. It is silty clay or clay.

Rondeau Series

The Rondeau series consists of very deep, very poorly drained soils in depressional areas on lake plains. These soils formed in organic soil material underlain by marly limnic material. Permeability is moderately slow to moderately rapid in the organic material and slow in the marl deposits. Slopes range from 0 to 2 percent.

Taxonomic class: Marly, euic, frigid Limnic Haplosaprists

Typical pedon of Rondeau muck, on a 0 percent slope, 500 feet south and 400 feet west of the northeast corner of sec. 18, T. 32 N., R. 6 E. USGS Long Rapids topographic quadrangle; lat. 45 degrees 10 minutes 28.80 seconds north and long. 83 degrees 44 minutes 34.62 seconds west, NAD 27:

Oa1—0 to 10 inches; black (10YR 2/1) (broken face and rubbed) muck; about 5 percent fiber, 1 percent rubbed; moderate fine granular structure; friable; many very fine to medium roots; moderately acid; abrupt wavy boundary.

Oa2—10 to 27 inches; black (10YR 2/1) (broken face and rubbed) muck; about 5 percent fiber, 1 percent rubbed; strong medium subangular blocky structure; friable; common very fine and fine roots; slightly acid; abrupt smooth boundary.

Lca—27 to 80 inches; light gray (5Y 7/2) marl; massive; friable; about 5 percent snail and mollusk shells; many coarse prominent pinkish gray (7.5YR 7/2) and common medium prominent gray (5Y 5/1) iron depletions; strongly effervescent; moderately alkaline.

The organic material ranges from 16 to 40 inches in thickness.

The Oa horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Reaction ranges from moderately acid to neutral.

The Lca horizon has hue of 5Y to 10YR, value of 7 or 8, and chroma of 1 or 2.

Rousseau Series

The Rousseau series consists of very deep, well drained soils on dunes. These soils formed in sandy eolian deposits (fig. 6). Permeability is rapid. Slopes range from 6 to 40 percent.

Taxonomic class: Sandy, mixed, frigid Entic Haplorthods

Typical pedon of Rousseau fine sand, on an 18 percent slope, in an area of Proper-Deford-Rousseau complex, 0 to 40 percent slopes, 660 feet south and 1,320 feet west of the northeast corner of sec. 36, T. 31 N., R. 7 E. USGS Lake Winyah topographic quadrangle; lat. 45 degrees 2 minutes 40.14 seconds north and long. 83 degrees 31 minutes 0.17 second west, NAD 27:

Oi—0 to 1 inch; dark reddish brown (5YR 2.5/2), undecomposed organic material; weak medium platy structure; friable; moderately acid; abrupt smooth boundary.

A—1 to 3 inches; very dark gray (10YR 3/1) fine sand, gray (10YR 6/1) dry; weak medium granular structure; friable; many fine and common medium roots; strongly acid; clear smooth boundary.

E—3 to 6 inches; grayish brown (10YR 5/2) fine sand, light gray (10YR 7/2) dry; weak medium subangular blocky structure; very friable; common fine and few medium roots; strongly acid; abrupt wavy boundary.

Bs1—6 to 10 inches; brown (7.5YR 4/4) fine sand; weak medium subangular blocky structure; very friable; common fine and few medium roots; strongly acid; clear smooth boundary.

Bs2—10 to 23 inches; strong brown (7.5YR 4/6) fine sand; weak medium subangular blocky structure;

very friable; common fine roots; strongly acid; clear wavy boundary.

BC—23 to 37 inches; yellowish brown (10YR 5/6) fine sand; single grain; loose; few fine roots; moderately acid; gradual smooth boundary.

C—37 to 80 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; neutral.

The thickness of the solum ranges from 34 to 37 inches. The texture is fine sand throughout the profile.

The Oi horizon has hue of 5YR and value and chroma of 2. It is moderately acid.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. Reaction ranges from very strongly acid to moderately acid.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2. Reaction ranges from very strongly acid to moderately acid.

The Bs horizon has hue of 7.5YR, value of 3 or 4, and chroma of 4 to 6. Reaction ranges from strongly acid to moderately acid.

The BC horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 6. Reaction is moderately acid or slightly acid.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6. Reaction ranges from moderately acid to neutral.

Rubicon Series

The Rubicon series consists of very deep, excessively drained soils on lake terraces and outwash plains. These soils formed in sandy outwash and lacustrine deposits. Permeability is rapid. Slopes range from 0 to 35 percent.

Taxonomic class: Sandy, mixed, frigid Entic Haplorthods

Typical pedon of Rubicon sand, 0 to 6 percent slopes, 370 feet north and 1,460 feet east of the southwest corner of sec. 27, T. 31 N., R. 7 E. USGS topographic quadrangle; lat. 45 degrees 2 minutes 54.60 seconds north and long. 83 degrees 33 minutes 58.73 seconds west, NAD 27:

A—0 to 2 inches; black (N 2.5/0) sand, dark gray (N 4/0) dry; weak medium granular structure; friable; many fine roots; moderately acid; abrupt smooth boundary.

E—2 to 4 inches; grayish brown (10YR 5/2) sand, light gray (10YR 7/2) dry; single grain; loose; common fine roots; very strongly acid; abrupt smooth boundary.

Bs1—4 to 11 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; common fine and few medium roots; many (about 40 percent) distinct cracked coatings on sand grains; about 5 percent gravel; strongly acid; clear wavy boundary.

Bs2—11 to 15 inches; strong brown (7.5YR 4/6) sand; weak medium subangular blocky structure; very friable; common fine and few medium roots; common (about 20 percent) faint cracked coatings on sand grains; about 5 percent gravel; strongly acid; clear wavy boundary.

Bs3—15 to 29 inches; yellowish brown (10YR 5/6) sand; weak coarse subangular blocky structure; very friable; few fine and medium roots; few (about 10 percent) faint cracked coatings on sand grains; about 5 percent gravel; strongly acid; gradual wavy boundary.

BC—29 to 43 inches; yellowish brown (10YR 5/4) sand; single grain; loose; about 2 percent gravel; moderately acid; clear wavy boundary.

C—43 to 80 inches; brown (10YR 5/3) sand; single grain; loose; about 2 percent gravel; neutral.

The thickness of the solum ranges from 20 to 45 inches. The content of gravel ranges from 0 to 5 percent throughout the profile.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2.5 or 3 and chroma of 0 or 1. It is strongly acid or moderately acid. It is sand.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 or 2. It is very strongly acid or strongly acid.

The Bs1 horizon has hue of 5YR or 7.5YR and value and chroma of 3 or 4. It is very strongly acid to moderately acid.

The Bs2 and Bs3 horizons have hue of 5YR to 10YR, value of 4 or 5, and chroma of 4 to 6. They are strongly acid or moderately acid.

The BC horizon has hue of 10YR, value of 5 or 6, and chroma of 4 or 5. It is strongly acid or moderately acid.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is moderately acid to neutral.

Ruse Series

The Ruse series consists of shallow, poorly drained soils on bedrock benches. These soils formed in loamy deposits overlying limestone bedrock. Permeability is moderate in the soil material and very slow in the bedrock. Slopes range from 0 to 2 percent.

Taxonomic class: Loamy, mixed, active, frigid Lithic Endoaquolls

Typical pedon of Ruse loam, 980 feet north and 220 feet east of the southwest corner of sec. 1, T. 31 N., R.

8 E. USGS Alpena topographic quadrangle; lat. 45 degrees 6 minutes 28.7 seconds north and long. 83 degrees 24 minutes 40.3 seconds west, NAD 27:

A—0 to 8 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; many fine and medium roots; common fine dark yellowish brown (10YR 4/6) accumulations of iron; about 10 percent gravel; neutral; abrupt smooth boundary.

Bg—8 to 13 inches; dark grayish brown (10YR 4/2 flaggy sandy loam; moderate medium granular structure; friable; many fine roots; common faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds; about 20 percent limestone flagstones; strongly effervescent; slightly alkaline; abrupt smooth boundary

2R—13 to 17 inches; limestone bedrock.

The thickness of the solum ranges from 10 to 20 inches and corresponds to the depth to limestone bedrock. The content of gravel ranges from 5 to 15 percent throughout the profile. The content of flagstones ranges from 0 to 20 percent.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is neutral or slightly alkaline.

The Bg horizon has hue of 10YR to 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is neutral to moderately alkaline.

Slade Series

The Slade series consists of very deep, somewhat poorly drained soils on ground moraines. These soils formed in loamy glacial till. Permeability is moderate or moderately slow. Slopes range from 0 to 3 percent.

Taxonomic class: Fine-loamy, mixed, active, frigid Aquic Glossudalfs

Typical pedon of Slade loam, 0 to 3 percent slopes, 2,000 feet south and 2,200 feet east of the northwest corner of sec. 19, T. 30 N., R. 6 E. USGS Beaver Lake topographic quadrangle; lat. 44 degrees 58 minutes 57.67 seconds north and long. 83 degrees 45 minutes 32.43 seconds west, NAD 27:

A—0 to 5 inches; very dark gray (7.5YR 3/1) loam, gray (7.5YR 6/1) dry; moderate fine and medium granular structure; friable; many fine and few medium roots; slightly acid; abrupt wavy boundary.

E—5 to 7 inches; pinkish gray (7.5YR 6/2) fine sandy loam, white (10YR 8/1) dry; moderate fine and medium subangular blocky structure; friable; few fine roots; few fine distinct brownish yellow (10YR 6/6) accumulations of iron; slightly acid; abrupt wavy boundary.

B/E—7 to 9 inches; about 60 percent reddish brown (5YR 4/3) clay loam (Bt); surrounded by pinkish gray (7.5YR 6/2) fine sandy loam, white (10YR 8/1) dry (E); moderate medium subangular blocky structure; friable; common fine prominent red (2.5YR 5/8) accumulations of iron and few fine distinct brown (7.5YR 5/2) iron depletions; few fine roots; slightly acid; clear smooth boundary.

Bt1—9 to 23 inches; reddish brown (5YR 4/3) clay loam; moderate medium subangular blocky structure; friable; few fine roots; common distinct dark reddish gray (5YR 4/2) clay films on faces of peds; common fine prominent red (2.5YR 5/8) accumulations of iron and common fine distinct brown (7.5YR 5/2) iron depletions; about 5 percent gravel; neutral; clear smooth boundary.

Bt2—23 to 26 inches; brown (7.5YR 5/3) loam; moderate medium subangular blocky structure; friable; few fine roots; few distinct dark reddish brown (5YR 3/3) clay films on faces of peds; common fine prominent yellowish red (5YR 5/8) accumulations of iron and common medium distinct reddish gray (5YR 5/2) iron depletions; about 10 percent gravel; neutral; clear smooth boundary.

BC—26 to 60 inches; reddish brown (5YR 5/3) loam; moderate thick platy structure; very firm; common prominent pinkish gray (5YR 7/1) lime coatings between plates; common medium distinct strong brown (7.5YR 5/6) accumulations of iron and common fine faint pinkish gray (5YR 6/2) iron depletions; about 10 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

C—60 to 80 inches; brown (7.5YR 5/3) loam; moderate thick platiness inherited from the parent material; very firm; about 5 percent gravel; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 40 to 80 inches. The depth to carbonates ranges from 20 to 40 inches. Iron depletions occur within the upper 10 inches of the argillic horizon. The content of gravel ranges from 0 to 14 percent throughout the profile, and the content of cobbles ranges from 0 to 7 percent.

The A horizon has hue of 7.5YR, value of 2 or 3, and chroma of 1. It is moderately acid or slightly acid. It is loam. The Ap horizon in cultivated areas has hue of 10YR, value of 2 or 3, and chroma of 2.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2. It is moderately acid or slightly acid. It is fine sandy loam or loam.

The E part of the B/E horizon has colors and textures similar to those of the E horizon, and the Bt part has colors and textures similar to those of the Bt horizon. Reaction is moderately acid or slightly acid. Some pedons have an E/B horizon.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is neutral. It is clay loam or loam.

The BC horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is slightly alkaline or moderately alkaline. It is loam.

The C horizon has hue of 5YR or 7.5YR, value of 5, and chroma of 3 or 4. It is moderately alkaline. It is loam.

Spot Series

The Spot series consists of very deep, poorly drained soils on lake plains. These soils formed in sandy lacustrine deposits. They have an ortstein layer (fig. 7). Permeability is moderately rapid in the ortstein layer and rapid in the rest of the profile. Slopes range from 0 to 2 percent.

Taxonomic class: Sandy, mixed, frigid, ortstein Typic Duraquods

Typical pedon of Spot peat, on a 0 percent slope, 2,110 feet south and 660 feet west of the northeast corner of sec. 35, T. 31 N., R. 7 E. USGS Lake Winyah topographic quadrangle; lat. 45 degrees 2 minutes 29.84 seconds north and long. 83 degrees 32 minutes 6.64 seconds west, NAD 27:

Oi—0 to 3 inches; dark reddish brown (5YR 2.5/2) peat, dark reddish brown (5YR 2.5/2) dry; about 90 percent fiber broken face, about 80 percent rubbed; weak medium platy structure; friable; many fine roots; very strongly acid; abrupt wavy boundary.

Oa—3 to 6 inches; black (N 2.5/0) muck, dark gray (N 4/0) dry; about 50 percent fiber broken face, about 10 percent rubbed; weak medium granular structure; friable; many fine roots; very strongly acid; abrupt wavy boundary.

E1—6 to 10 inches; gray (10YR 6/1) sand, very pale brown (10YR 8/2) dry; single grain; loose; common fine roots; strongly acid; abrupt smooth boundary.

E2—10 to 13 inches; light brownish gray (10YR 6/2) sand, very pale brown (10YR 8/2) dry; single grain; loose; few fine roots; common medium prominent strong brown (7.5YR 5/8) accumulations of iron; strongly acid; abrupt smooth boundary.

Bs—13 to 15 inches; brown (7.5YR 4/4 and 5/4) sand; moderate medium subangular blocky structure; friable; common fine roots; strongly acid; abrupt smooth boundary.

Bhsm—15 to 21 inches; dark brown (7.5YR 3/2 and 3/4) sand; massive; firm, brittle; 100 percent of the horizon made up of moderately cemented ortstein; strongly acid; abrupt smooth boundary.

B´s—21 to 28 inches; brown (7.5YR 4/4) and (7.5YR 5/4) sand; weak medium subangular blocky structure; very friable; moderately acid; clear smooth boundary.

C—28 to 80 inches; brown (10YR 5/3) sand; single grain; loose; moderately acid.

The thickness of the solum ranges from 20 to 28 inches. The depth to ortstein typically is 15 inches. The thickness of the ortstein typically is 6 inches.

The Oi horizon has hue of 5YR and value and chroma of 2. It is very strongly acid. It is peat.

The Oa horizon is neutral in hue and has value of 2 and chroma of 0. It is very strongly acid. It is muck.

The E horizon has hue of 7.5YR or 10YR, value of 6, and chroma of 1 or 2. It is very strongly acid or strongly acid. It is sand.

The Bhsm horizon has hue of 7.5YR and value and chroma of 2 or 3. It is very strongly acid or strongly acid. It is sand.

The Bs and B´s horizons have hue of 7.5YR, value of 3 to 5, and chroma of 4 or 5. They are strongly acid or moderately acid. They are sand.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 or 3. It is moderately acid or slightly acid. It is sand.

Springport Series

The Springport series consists of very deep, poorly drained soils on lake plains, some of which are till floored. These soils formed in stratified silty and clayey lacustrine deposits. A till substratum phase is underlain by loamy glacial till. Permeability is very slow. Slopes range from 0 to 2 percent.

Taxonomic class: Fine, mixed, semiactive, frigid Typic Epiaquolls

Typical pedon of Springport silty clay loam, till substratum, on a 0 percent slope, 460 feet north and 120 feet west of the southeast corner of sec. 28, T. 30 N., R. 7 E. USGS Big Ravine topographic quadrangle; lat. 44 degrees 57 minutes 40.81 seconds north and long. 83 degrees 35 minutes 18.96 seconds west, NAD 27:

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; many fine roots throughout; few fine prominent yellowish brown (10YR 5/6) accumulations of iron; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bg—9 to 16 inches; greenish gray (5GY 6/1) silty clay loam; moderate medium subangular blocky structure; friable; few very fine roots; few very fine vesicular pores; common medium prominent yellowish brown (10YR 5/6) accumulations of iron; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Bw—16 to 23 inches; reddish brown (5YR 5/3) silty clay; moderate coarse prismatic structure parting to moderate medium angular blocky; firm; few very fine roots; common very fine vesicular pores; common medium prominent greenish gray (5GY 6/1) iron depletions and common medium prominent strong brown (7.5YR 5/6) accumulations of iron on faces of peds and penetrating the peds; about 1 percent pebbles; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C1—23 to 67 inches; reddish brown (5YR 4/3) silty clay; massive; firm; few fine prominent greenish gray (5GY 5/1) iron depletions and common medium prominent strong brown (7.5YR 5/6) accumulations of iron; violently effervescent; moderately alkaline; abrupt smooth boundary.

2C2—67 to 80 inches; reddish brown (5YR 5/3) loam; massive; firm; common medium prominent strong brown (7.5YR 5/6) accumulations of iron; about 5 percent pebbles; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 10 to 25 inches. Carbonates are in the Ap horizon and in all layers below that horizon. The depth to loamy glacial till ranges from 60 to more than 80 inches. The content of gravel is 0 to 2 percent in the clayey lacustrine material. In the loamy glacial till, the content of gravel ranges from 2 to 10 percent and the content of cobbles ranges from 0 to 5 percent.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The dry value is 4 or 5. This horizon is silty clay loam or clay loam.

The Bg horizon has hue of 5GY or 10YR, value of 5 or 6, and chroma of 1 or 2. It is silty clay loam or silty clay.

The Bw horizon has hue of 5YR, value of 5 or 6, and chroma of 3 or 4. It is silty clay or clay.

The C horizon has hue of 5YR, value of 4 to 6, and chroma of 3 or 4. It is silty clay or clay.

The 2C horizon has hue of 5YR, value of 5, and chroma of 3. It is loam or fine sandy loam.

Summerville Series

The Summerville series consists of shallow, well drained soils on karst plains, ground moraines, and glacial lake benches. These soils formed in loamy glacial till underlain by fractured limestone bedrock. Permeability is moderate in the loamy material and slow to rapid in the limestone bedrock. Slopes range from 0 to 12 percent.

Taxonomic class: Loamy, mixed, active, frigid Lithic Eutrudepts

Typical pedon of Summerville fine sandy loam, 0 to 6 percent slopes, 1,300 feet south and 1,200 feet east of the northwest corner of sec. 21, T. 32 N., R. 8 E. USGS Long Lake East topographic quadrangle; lat. 45 degrees 9 minutes 37.47 seconds north and long. 83 degrees 28 minutes 22.31 seconds west, NAD 27:

A—0 to 5 inches; dark brown (7.5YR 3/2) fine sandy loam, brown (7.5YR 5/2) dry; weak fine and medium granular structure; friable; few very fine and many fine and medium roots; slightly acid; clear smooth boundary.

Bw—5 to 16 inches; brown (7.5YR 4/4) fine sandy loam; moderate medium and coarse subangular blocky structure; friable; many fine and medium roots; few fine vesicular pores; common medium worm channels filled with dark brown (7.5YR 3/2) fine sandy loam; about 10 percent channers; neutral; abrupt smooth boundary.

R—16 to 18 inches; fractured karst limestone.

The thickness of the solum and the depth to bedrock range from 10 to 20 inches. The content of channers ranges from 0 to 14 percent throughout the profile, and the content of gravel ranges from 0 to 5 percent.

The A horizon has hue of 7.5YR, value of 3 or 4, and chroma of 2 or 3. It is fine sandy loam.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is fine sandy loam.

Some pedons have a C horizon. This horizon has hue of 10YR, value of 5, and chroma of 2. It is fine sandy loam.

Tacoda Series

The Tacoda series consists of very deep, somewhat poorly drained soils in glacial drainageways and on lake terraces. These soils formed in sandy outwash or lacustrine material and in clayey lacustrine deposits. Permeability is rapid in the sandy material and very slow in the clayey deposits. Slopes range from 0 to 4 percent.

Taxonomic class: Sandy, mixed, frigid Typic Epiaquods

Typical pedon of Tacoda sand, on a 1 percent slope, in an area of Tacoda-Wakeley complex, 0 to 4 percent slopes, 1,450 feet north and 70 feet west of the southeast corner of sec. 19, T. 31 N., R. 5 E. USGS Jewett Creek topographic quadrangle; lat. 45 degrees 3 minutes 48.34 seconds north and long. 83 degrees 51 minutes 35.56 seconds west, NAD 27:

A—0 to 3 inches; black (N 2.5/0) sand, very dark gray (N 3/0) dry; weak fine granular structure; very friable; many fine roots; extremely acid; abrupt smooth boundary.

E—3 to 14 inches; grayish brown (10YR 5/2) sand; light gray (10YR 7/2) dry; single grain; loose; common fine roots; extremely acid; abrupt irregular boundary.

Bs1—14 to 18 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; friable; many fine roots; layer of dark reddish brown (5YR 3/2), strongly cemented ortstein making up 37 percent of the horizon; common fine distinct strong brown (7.5YR 5/6) accumulations of iron; very strongly acid; clear irregular boundary.

Bs2—18 to 27 inches; strong brown (7.5YR 5/6) sand; weak medium subangular blocky structure; friable; common fine roots; distinct cracked coatings on about 30 percent of sand grains; common medium distinct yellowish brown (10YR 5/6) accumulations of iron; strongly acid; clear wavy boundary.

BC—27 to 36 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; common medium distinct yellowish brown (10YR 5/6) accumulations of iron; neutral; clear wavy boundary.

C—36 to 44 inches; pale brown (10YR 6/3) sand; single grain; loose; common medium prominent grayish brown (10YR 5/2) iron depletions; about 5 percent gravel; neutral; clear wavy boundary.

2C—44 to 80 inches; reddish brown (5YR 5/4) silty clay; massive; firm; few fine prominent yellowish red (7.5YR 5/6) accumulations of iron and few fine prominent greenish gray (5GY 6/1) iron depletions; strongly effervescent; moderately alkaline.

The thickness of the solum, the depth to clayey deposits, and the depth to carbonates range from 40 to 60 inches. The content of gravel ranges from 0 to 10 percent in the solum and from 0 to 2 percent in the clayey material.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is sand.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. The dry value is 7. This horizon is sand.

The Bs horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is sand.

The BC and C horizons have hue of 10YR, value of 5 or 6, and chroma of 4 or 5. They are sand.

The 2C horizon has hue of 5YR or 7.5YR, value of 5, and chroma of 4. It is silty clay or clay.

Tawas Series

The Tawas series consists of very deep, very poorly drained soils on lake plains, lake terraces, moraines, and outwash plains. These soils formed in organic soil material that is 16 to 50 inches deep over sandy lacustrine or outwash deposits. Permeability is moderately slow to moderately rapid in the organic material and rapid in the sandy deposits. Slopes range from 0 to 2 percent.

Taxonomic class: Sandy or sandy-skeletal, mixed, euic, frigid Terric Haplosaprists

Typical pedon of Tawas muck, on a 0 percent slope, in an area of Tawas-Au Gres complex, 0 to 4 percent slopes, 200 feet south and 1,940 feet east of the northwest corner of sec. 16, T. 30 N., R. 8 E. USGS Alpena topographic quadrangle; lat. 45 degrees 0 minutes 15.15 seconds north and long. 83 degrees 28 minutes 40.25 seconds west, NAD 27:

Oa1—0 to 3 inches; black (N 2.5/0) (broken face and rubbed) muck; about 20 percent fiber, 5 percent rubbed; weak thick platy structure parting to weak fine granular; friable; common fine roots; about 10 percent wood fragments; neutral; abrupt smooth boundary.

Oa2—3 to 26 inches; black (5YR 2.5/1) (broken face and rubbed) muck; about 10 percent fiber, 2 percent rubbed; massive; friable; about 15 percent wood fragments; neutral; abrupt smooth boundary.

Oa3—26 to 28 inches; very dark gray (N 3/0) (broken face) muck, black (N 2.5/0) rubbed; about 10 percent fiber, 2 percent rubbed; weak fine granular structure; friable; about 30 percent sand; about 5 percent wood fragments; neutral; abrupt smooth boundary.

Cg—28 to 80 inches; grayish brown (10YR 5/2) sand; single grain; loose; about 3 percent gravel; neutral.

The depth to sandy mineral layers is 18 to 28 inches.

The Oa horizon has hue of 5YR or 7.5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is slightly acid or neutral. It is muck.

The Cg horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. Reaction is neutral or slightly alkaline. The content of gravel ranges from 0 to 5 percent. This horizon is sand.

Thunderbay Series

The Thunderbay series consists of very deep, poorly drained soils on flood plains. These soils formed in loamy and sandy alluvial deposits. Permeability is rapid. Slopes range from 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, semiactive, frigid Fluvaquentic Endoaquolls

Typical pedon of Thunderbay very fine sandy loam, frequently flooded, on a 1 percent slope, 50 feet south and 2,400 feet west of the northeast corner of sec. 14, T. 30 N., R. 7 E. USGS Lake Winyah topographic quadrangle; lat. 45 degrees 0 minutes 15.28 seconds north and long. 83 degrees 33 minutes 18.66 seconds west, NAD 27:

A1—0 to 7 inches; black (10YR 2/1) (broken and crushed) very fine sandy loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; many fine and common medium roots; very slightly effervescent; slightly alkaline; abrupt smooth boundary.

A2—7 to 14 inches; black (10YR 2/1) (broken) very fine sandy loam, very dark grayish brown (10YR 3/2) crushed, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; many fine roots; many medium prominent strong brown (7.5YR 4/6) accumulations of iron; slightly alkaline; abrupt smooth boundary.

Cg1—14 to 19 inches; dark gray (5Y 4/1) loam; weak medium subangular blocky structure; friable; common fine roots; many medium prominent strong brown (7.5YR 4/6) accumulations of iron; about 5 percent of the horizon consists of thin strata of brown (10YR 5/3) sand; slightly alkaline; abrupt smooth boundary.

Cg2—19 to 24 inches; very dark gray (10YR 3/1) silt loam stratified with brown (10YR 5/3) sand; weak medium platy structure; friable; few fine roots; common fine prominent strong brown (7.5YR 4/6) accumulations of iron; slightly alkaline; abrupt smooth boundary.

Cg3—24 to 31 inches; grayish brown (10YR 5/2) sand; single grain; loose; few fine roots; common medium faint brown (10YR 5/3) and few medium prominent strong brown (7.5YR 4/6) accumulations of iron; moderately alkaline; abrupt smooth boundary.

Cg4—31 to 80 inches; greenish gray (5GY 5/1) sand; single grain; loose; few fine prominent strong brown (7.5YR 4/6) accumulations of iron; moderately alkaline.

The thickness of the mollic epipedon ranges from 10 to 21 inches. Depth to the sandy layers ranges from 20 to 50 inches. The content of gravel is 0 to 2 percent in the loamy layers and 0 to 10 percent in the sandy layers.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Prominent accumulations of iron are in the lower part of the mollic epipedon.

The Cg horizon has hue of 10YR, 5YR, 5GY or 5Y; value of 3 to 5; and chroma of 1 or 2. It is loamy sand, sand, silt loam, or loam.

Tonkey Series

The Tonkey series consists of very deep, poorly drained soils on lake plains and outwash plains and in glacial drainageways. These soils formed in loamy and silty lacustrine and outwash deposits. Permeability is moderate. Slopes range from 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, semiactive, nonacid, frigid Mollic Endoaquepts

Typical pedon of Tonkey silt loam, on a 0 percent slope, 1,190 feet north and 100 feet west of the southeast corner of sec. 20, T. 29 N., R. 8 E. USGS Ossineke topographic quadrangle; lat. 45 degrees 53 minutes 29.53 seconds north and long. 83 degrees 29 minutes 9.28 seconds west, NAD 27:

Ap—0 to 7 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; many fine roots; about 1 percent gravel; neutral; abrupt smooth boundary.

Bg1—7 to 15 inches; greenish gray (5GY 5/1), stratified sandy loam and sand; weak medium subangular blocky structure; friable; common fine roots; common medium prominent yellowish brown (10YR 5/6) accumulations of iron and common medium prominent dark gray (5Y 4/1) iron depletions; neutral; abrupt wavy boundary.

Bg2—15 to 22 inches; greenish gray (5G 5/1), stratified silt loam and sandy loam; weak medium angular blocky structure; friable; common fine roots; many fine tubular pores; common medium prominent yellowish brown (10YR 5/6) accumulations of iron; about 3 percent gravel;

slightly effervescent; slightly alkaline; abrupt wavy boundary.

Cg—22 to 45 inches; brown (7.5YR 5/2), stratified silt loam, sandy loam, and sand; massive; friable; many coarse prominent yellowish brown (10YR 5/6) accumulations of iron and many fine prominent greenish gray (5G 5/1) iron depletions; strongly effervescent; moderately alkaline; abrupt wavy boundary.

C—45 to 80 inches; brown (7.5YR 5/3), stratified silt loam, sandy loam, and sand; massive; friable; many coarse prominent yellowish brown (10YR 5/6) accumulations of iron and many fine prominent greenish gray (5G 5/1) iron depletions; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 18 to 25 inches. The depth to carbonates ranges from 15 to 20 inches. The content of gravel ranges from 0 to 5 percent throughout the profile.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The dry value is 5. This horizon is silt loam.

The Bg horizon has hue of 5GY or 5G, value of 5 or 6, and chroma of 1 or 2. It is dominantly silt loam or sandy loam but in some pedons has thin strata of sand.

The Cg and C horizons have hue of 7.5YR, value of 5 or 6, and chroma of 2 or 3. They are dominantly silt loam or sandy loam but in some pedons have strata of sand.

Udipsamments

These very deep, excessively drained to moderately well drained soils are on lake plains and outwash plains. They formed in sandy deposits. Permeability is rapid. Slopes range from 0 to 40 percent.

Taxonomic class: Mixed, frigid Udipsamments

These soils are in sandy areas that have been cut or filled. They have hue of 10YR, value of 5 or 6, and chroma of 4 to 6. They are sand, fine sand, or loamy sand.

Udorthents

These very deep, well drained soils are on lake plains and ground moraines. They formed in loamy glacial till or lacustrine deposits. Permeability is moderate or moderately slow. Slopes range from 0 to 12 percent.

Taxonomic class: Mixed, frigid Udorthents

These soils are in loamy areas that have been cut or filled. They have hue of 5YR, 7.5YR, or 10YR; value of 4 to 6; and chroma of 3 or 4. They are sandy loam, loam, silt loam, or clay loam.

Wakeley Series

The Wakeley series consists of very deep, very poorly drained soils on lake plains and lake terraces. These soils formed in sandy lacustrine deposits underlain by clayey lacustrine deposits. Permeability is rapid in the sandy material and very slow in the clayey deposits. Slopes range from 0 to 2 percent.

Taxonomic class: Sandy over clayey, mixed, semiactive, nonacid, frigid Aeric Epiaquents

Typical pedon of Wakeley mucky sand, on a 0 percent slope, in an area of Tacoda-Wakeley complex, 0 to 4 percent slopes, 1,250 feet north and 45 feet west of the southeast corner of sec. 19, T. 31 N., R. 5 E. USGS Jewett Creek topographic quadrangle; lat. 45 degrees 3 minutes 46.24 seconds north and long. 83 degrees 51 minutes 35.48 seconds west, NAD 27:

A—0 to 3 inches; black (N 2.5/0) mucky sand, very dark gray (N 3/0) dry; weak medium granular structure; friable; many fine roots; moderately acid; abrupt smooth boundary.

Cg—3 to 6 inches; gray (5Y 5/1) sand; single grain; loose; few very dark gray organic stains; few fine roots; moderately acid; abrupt wavy boundary.

C—6 to 16 inches; brown (10YR 5/3) sand; single grain; loose; common medium prominent gray (5Y 5/1) iron depletions; slightly acid; abrupt smooth boundary.

C´g—16 to 21 inches; grayish brown (2.5Y 5/2) loamy sand; single grain; loose; common medium distinct light olive brown (2.5Y 5/4) accumulations of iron; about 5 percent gravel; neutral; abrupt smooth boundary.

2C1—21 to 24 inches; reddish brown (5YR 5/3) silty clay; massive; firm; common fine roots; common medium prominent strong brown (7.5YR 5/6) accumulations of iron and many medium prominent greenish gray (5GY 6/1) iron depletions; strongly effervescent; moderately alkaline; clear smooth boundary.

2C2—24 to 80 inches; reddish brown (5YR 5/3) silty clay; massive; firm; few medium prominent strong brown (7.5YR 5/6) accumulations of iron and few fine prominent greenish gray (5GY 6/1) iron depletions; strongly effervescent; moderately alkaline.

The depth to clayey material and the depth to carbonates range from 20 to 35 inches. The content of gravel is 0 to 10 percent in the sandy material and 0 to 2 percent in the clayey material.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is mucky sand.

The Cg and C´g horizons have hue of 5YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. They are sand or loamy sand.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 or 4. It is sand.

The 2C horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is silty clay or clay.

Wheatley Series

The Wheatley series consists of very deep, very poorly drained soils on lake terraces and in glacial drainageways. These soils formed in sandy and gravelly lacustrine and glaciofluvial deposits. Permeability is rapid in the upper part of the profile and very rapid in the lower part. Slopes are 0 to 1 percent.

The Wheatley soils in Alpena County are taxadjuncts to the series because they have higher chroma colors in the upper 20 inches and do not have the dark mineral surface layer that is definitive for the series. They classify as mixed, frigid Aquic Udipsamments. These differences do not significantly affect the use and management of the soils.

Taxonomic class: Mixed, frigid Mollic Psammaquents

Typical pedon of Wheatley muck, 1,210 feet south and 900 feet east of the northwest corner of sec. 15, T. 25 N., R. 9 E. Alcona County, Michigan; USGS Greenbush topographic quadrangle; lat. 44 degrees 33 minutes 59.87 seconds north and long. 83 degrees 20 minutes 16.64 seconds west, NAD 27:

Oa—0 to 5 inches; black (N 2/0) muck; black (N 2/0) dry; weak fine granular structure; friable; about 20 percent light gray (N 7/0) sand; many fine roots; slightly acid; abrupt smooth boundary.

Cg—5 to 9 inches; gray (5Y 5/1) sand; single grain; loose; common medium prominent very dark gray (N 3/0) iron depletions; about 10 percent gravel; neutral; abrupt smooth boundary.

C—9 to 34 inches; brown (10YR 5/3) sand; weak medium subangular blocky structure; friable; few fine prominent yellowish brown (10YR 5/8) accumulations of iron; about 10 percent gravel; neutral; abrupt smooth boundary.

2Cg—34 to 80 inches; greenish gray (5GY 5/1) gravelly sand; single grain; nonsticky; about 30 percent gravel; violently effervescent; moderately alkaline.

The depth to carbonates ranges from 20 to 40 inches. The content of gravel ranges from 5 to 10 percent in the upper part of the profile and from 15 to 34 percent in the lower part.

The Oa horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

The C horizon has hue of 5Y to 10YR, value of 4 to 6, and chroma of 1 to 3. It is sand or loamy sand.

The 2Cg horizon has hue of 5GY to 10YR or is neutral in hue. It has value of 4 to 6 and chroma of 0 or 1. It is gravelly sand or gravelly loamy sand.

Zimmerman Series

The Zimmerman series consists of very deep, excessively drained soils on lake terraces and dissected lake plains. These soils formed in sandy lacustrine deposits. Permeability is rapid. Slopes range from 0 to 35 percent.

Taxonomic class: Mixed, frigid Lamellic Udipsamments

Typical pedon of Zimmerman loamy fine sand, on a 34 percent slope, 150 feet south and 920 feet west of the northeast corner of sec. 16, T. 29 N., R. 8 E. USGS Ossineke topographic quadrangle; lat. 44 degrees 54 minutes 59.45 seconds north and long. 83 degrees 28 minutes 8.41 seconds west, NAD 27:

A—0 to 1 inch; black (7.5YR 2.5/1) loamy fine sand, dark gray (7.5YR 4/1) dry; weak medium granular structure; very friable; many fine roots; moderately acid; abrupt smooth boundary.

E—1 to 3 inches; dark grayish brown (10YR 4/2) fine sand, light gray (10YR 7/1) dry; weak medium subangular blocky structure; very friable; many fine roots; moderately acid; abrupt smooth boundary.

Bw1—3 to 6 inches; dark yellowish brown (10YR 4/4) fine sand; weak medium subangular blocky structure; friable; many fine and few medium roots; about 2 percent gravel; moderately acid; clear wavy boundary.

Bw2—6 to 24 inches; yellowish brown (10YR 5/6) fine sand; weak medium subangular blocky structure; friable; many fine and common medium and coarse roots; slightly acid; clear wavy boundary.

E´—24 to 46 inches; pale brown (10YR 6/3) fine sand, very pale brown (10YR 7/3) dry; single grain; loose; few fine and medium roots; moderately acid; abrupt wavy boundary.

E and Bt—46 to 80 inches; pale brown (10YR 6/3) fine sand, very pale brown (10YR 7/3) dry (E); single grain; loose; thin lamellae of brown (7.5YR 4/4) loamy fine sand (Bt) ranging from $^1/_8$ to $^1/_4$ inch in thickness and accumulating to a total thickness of 2 inches; few fine roots; moderately acid.

The thickness of the solum and the depth to carbonates range from 60 to more than 80 inches. The content of gravel ranges from 0 to 5 percent throughout the solum.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. It is loamy fine sand.

The E horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. The dry value is 7. This horizon is fine sand or loamy fine sand.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is fine sand or loamy fine sand.

The E´ horizon and the E part of the E and Bt horizon have hue of 10YR, value of 5 or 6, and chroma of 2 or 3. They have a dry value of 7. They are fine sand or loamy fine sand.

The Bt part of the E and Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is loamy fine sand or fine sandy loam.

Formation of the Soils

This section relates the factors of soil formation to the soils in Alpena County and explains the processes of soil formation.

Factors of Soil Formation

Soil forms through the interaction of five major factors—the physical, chemical, and mineral composition of the parent material; 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; and the length of time that the processes of soil formation have acted on the parent material (Jenny, 1941).

Climate and plant and animal life are the active forces of soil formation. They slowly change the parent material into a natural body of soil that has genetically related layers, called horizons. The effects of climate and plant and animal life are conditioned by relief. The nature of the parent material also affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made about the effect of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. The parent material of the soils in Alpena County was deposited by glaciers or by meltwater from the glaciers. Some of this material was subsequently reworked by water or wind. The glaciers covered the county about 12,000 years ago. Parent material determines the chemical and mineralogical composition of the soil. Although the parent material is of common glacial origin, its properties vary greatly, sometimes within a small area, depending on how the material was deposited. The dominant parent materials in Alpena County were deposited as glacial till, outwash material, lake sediment, alluvium, and organic material (Burgis and Eschman, 1981).

Glacial till is material that was deposited directly by glaciers with a minimum of water action. It consists of a mixture of particles of different sizes. The small pebbles in glacial till have sharp corners, indicating that they have not been worn by water. The glacial till in Alpena County generally is calcareous sandy loam and loam. Hoist soils are an example of soils that formed in glacial till. Typically, they are loamy and have a moderately developed structure.

Outwash material was deposited by running water from melting glaciers. The size of the particles that make up outwash material depends on the speed of the water that carried them. When the water slowed down, the coarser particles were deposited. The finer particles, such as very fine sand, silt, and clay, were carried by slowly moving water. Outwash deposits generally consist of layers of particles of similar size, such as sand, coarse sand, and gravel. East Lake soils are an example of soils that formed in outwash material.

Lake sediment is material that settled from still or slowly moving, deep lake water and from shallow high-energy water near shorelines. Lake sediments are well sorted. The size of their particles depends on the speed of the water that suspended them. Au Gres soils are an example of sandy soils that formed in material deposited in sand bars on a shallow lake bottom. Springport soils are an example of fine textured soils that formed in material deposited on a deep lake bottom.

Alluvium has been deposited by the floodwater of present streams in recent time. The texture of this material depends on the speed of the water that deposited the material. Thunderbay soils are an example of alluvial soils.

Organic material is made up of plant remains. After the glaciers receded from the area, water was left standing in depressions on outwash plains, flood plains, and till plains. The grasses and sedges that grew around the edge of these depressions died. Because of the wetness, the remains of the plants did not decompose but accumulated around the edge of the depressions. Later, water-tolerant trees grew in the areas. As these trees died, their residue became part of the organic accumulation. Consequently, the depressions were eventually filled with organic material and developed into areas of muck. Lupton soils are an example of soils that formed in organic material.

Plant and Animal life

Green plants have been the principal organisms influencing the soils in Alpena County. Bacteria, fungi, earthworms, and humans also have been important. The chief contribution of plant and animal life is the addition of organic matter and nitrogen to the soil. The kind of organic matter on and in the soil depends on the kinds of plants that grew on the soil. The residue of these plants accumulates on the surface of the soil, decays, and eventually becomes organic matter. Plant roots provide channels for the downward movement of water through the soil and add organic matter to the soil as they decay. Bacteria in the soil help to break down the organic matter into a form that can be used by plants.

The vegetation in Alpena County was a mixture of coniferous and deciduous trees. Differences in natural soil drainage and in parent material affect the composition of forests. In general, the well drained upland soils, such as Klacking and McGinn soils, were covered with red oak and white pine. Grayling soils were covered with northern pin oak and jack pine. The very poorly drained soils were covered with northern whitecedar and black spruce. Deford and Kinross soils, which formed under wet conditions, contain a considerable amount of organic matter.

Climate

Climate is important in the formation of soils. It determines the kind of plant and animal life on and in the soil and the amount of water available for the weathering of minerals and the transportation of soil material. Through its influence on soil temperature, climate determines the rate of chemical reaction in the soil. The climatic influences generally affect areas larger than a county.

The climate in Alpena County is cool and humid. Presumably, it is similar to the climate under which the soils formed. The soils in the county differ from soils that formed in a dry, warm climate or from those that formed in a moist, hot climate. Climate is uniform throughout the county, but its effect is modified locally by the proximity to large lakes. Minor differences among the soils in Alpena County are partially the result of climatic differences.

Relief

Relief has had a marked influence on the formation of soils in Alpena County through its affect on natural drainage, erosion, plant cover, and soil temperature. Slopes range from 0 to 50 percent in the county. Natural drainage ranges from excessive to very poor. The excessively drained soils are on hilltops, and the very poorly drained soils are in depressions and on broad plains.

Relief influences the formation of soils by affecting runoff and drainage. Drainage, in turn, through its effect on aeration of the soil, determines the color of the soil. Runoff is most rapid on the steepest slopes. Water ponds temporarily in low areas. Water and air move freely through excessively drained and well drained soils but slowly through very poorly drained soils. In well aerated soils, the iron and aluminum compounds that give most soils their color are brightly colored and are oxidized. Poorly aerated soils are dull gray and mottled. Rubicon soils are example of excessively drained, well aerated soils; Deford soils are examples of poorly drained, poorly aerated soils. Both of these soils formed in sandy outwash and lacustrine material.

Time

Generally, a long time is required for the development of distinct soil horizons from parent material. The differences in the length of time that the parent material has been in place are commonly reflected in the degree of profile development in the soil. Some soils form rapidly; others form slowly.

The soils in Alpena County range from young to mature. The glacial deposits in which many of the soils formed have been exposed to soil-forming factors long enough for the development of distinct horizons. Some soils forming in recent alluvial sediment have not been in place long enough for the development of distinct horizons and are considered young. Ausable soils are an example. Klacking soils are an example of mature soils. They have been in place long enough for the leaching of lime.

Processes of Soil Formation

Several processes were involved in the development of soil horizons in Alpena County. These are the accumulation of organic matter, the leaching of lime (calcium carbonate) and other bases, the formation and translocation of clay minerals, and the reduction and transfer of iron. In most of the soils, two or more of these processes have been active in the development of horizons.

Organic matter accumulates at the surface and becomes part of the A horizon. If the soil is plowed, the A horizon is mixed into a plow layer, or Ap horizon. In the surface layer of the soils in Alpena County, the content of organic matter ranges from high to low. For example, it is high in Deford soils and low in Grayling soils.

The leaching of bases and the translocation of clay are among the more important processes of horizon differentiation. The leaching of carbonates and other bases has occurred in most of the soils in the county. Soil scientists generally agree that the leaching of bases in soils precedes the translocation of clay minerals. Many of the soils in Alpena County are moderately leached or strongly leached. For example, McGinn soils are leached of carbonates to a depth of 20 to 40 inches, whereas Rubicon soils are leached to a depth of more than 60 inches. This difference in the depth of leaching is a result of variations in time, relief, and parent material.

The translocation of clay minerals has contributed to horizon development in Alpena County. An eluviated, or leached, E horizon has a lower content of clay than the underlying illuviated B horizon and typically is lighter in color. The B horizon typically has an accumulation of clay and clay films in pores and on the faces of peds. Carbonates and soluble salts were probably leached to a considerable extent before the translocation of clay took place in the soils. Negwegon soils are an example of soils that have translocated clay in the form of clay films accumulated in the B horizon.

In some soils iron, aluminum, and humus have moved from the surface layer to the B horizon. The B horizon in such soils commonly is dark brown or dark reddish brown. Au Gres and Kinross soils are examples of soils in which translocated iron, aluminum, and humus have affected the B horizon.

Gleying, or the reduction and transfer of iron, is evident in somewhat poorly drained, poorly drained, and very poorly drained soils. A gray or dull color in the subsoil indicates the reduction and loss of iron. The very poorly drained Wakeley soils are an example of gleyed soils.

References

American Association of State Highway and Transportation Officials (AASHTO). 2000. Standard specifications for transportation materials and methods of sampling and testing. 20th edition, 2 volumes.

American Society for Testing and Materials (ASTM). 2001. Standard classification of soils for engineering purposes. ASTM Standard D 2487-00.

Burgis, W.A., and D.F. Eschman. 1981, Late-Wisconsinan history of northeastern lower Michigan. Department of Geological Sciences, University of Michigan.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. February 24, 1995. Hydric soils of the United States.

Hurt, G.W., P.M. Whited, and R.F. Pringle, editors. Version 4.0, 1998. Field indicators of hydric soils in the United States.

Jenny, Hans. 1941. Factors of soil formation.

Law, John W., and Delores A. Law. 1975. Home was Alpena.

Michigan Department of Agriculture. 1997. Michigan agricultural statistics 1996-97.

Michigan State University, Departments of Crop and Soil Sciences and Horticulture. 1992. Fertilizer recommendations for vegetables and field crops in Michigan. Extension Bulletin E-550A, E-550B.

Mokma, D.L. 1982. Soil management units and land use planning. Michigan State University Extension Bulletin E-1262.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Pregitzer, K.S., G.E. Host, and P.J. Greaney. 1987 An ecological classification of the state upland forests in northern lower Michigan. Department of Forestry, Michigan State University.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1996. Keys to soil taxonomy. 7th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. (http://nsscnt.nssc.nrcs.usda.gov/nfm/)

United States Department of Agriculture, Natural Resources Conservation Service. National list of common plant names. (Available in the State Office of the Natural Resources Conservation Service at East Lansing, Michigan)

United States Department of Agriculture, Natural Resources Conservation Service. 2002. National soil survey handbook, title 430-VI. (http://www.statlab.iastate.edu/soils/nssh/)

United States Department of Agriculture, Natural Resources Conservation Service. 1996. Soil survey laboratory methods manual. Soil Survey Investigations Report 42.

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

Voss, Edward G. 1972, 1985, 1996. Michigan flora, parts I, II, III. Cranbrook Institute of Science and University of Michigan Herbarium.

Wildermuth, Robert, J.W. Moon, L.R. Schoenmann, and J. O. Veach. 1924. Soil survey of Alpena County, Michigan. U.S. Department of Agriculture, Bureau of Chemistry and Soils.

Glossary

ABC soil. A soil having an A, a B, and a C horizon.

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

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.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

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

Bar. A ridgelike accumulation of sand, gravel, or other alluvial material that has formed in the channel, along the banks, or at the mouth of a stream where a decrease in velocity induces deposition.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

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.

Beach ridge. A low, essentially continuous mound of beach or beach-and-dune material heaped up by the action of waves and current on the backshore of a beach, beyond the present limit of storm waves or the reach of ordinary tides, and occurring singly or as one of a series of approximately parallel deposits. The ridges are roughly parallel to the shoreline and represent successive positions of an advancing shoreline.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

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.

Channel. The hollow bed where a natural body of surface water flows or may flow. The deepest or central part of the bed of a stream, containing the main current and occupied more or less continuously by water.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

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 soil. Silty clay, sandy clay, or clay.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from adjacent stands.

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.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

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.

Codominent trees. Trees with crowns that form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

Commerical forest. Forestland capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

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.

Congeliturbate. Soil material disturbed by frost action.

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.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

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.

Cropping system. Growing crops according to a planned system of rotation and management practices.

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.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

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.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer. A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

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.

Disintegration moraine A drift topography characterized by randomly oriented mounds and pits, generally developed in supraglacial drift by collapse and flow as the underlying stagnant ice melted. Slopes may be steep and unstable, and there are used and unused stream courses and lake depressions interspersed with moranic ridges. Consequently, there are rapid or abrupt changes between materials of differing lithology.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Dominent trees. Trees with crowns that form the general level of the forest canopy and that receive full light from above and from the sides.

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.

Drainageway. An area that is at a lower elevation than the surrounding areas, collects water, and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or not have distinctly incised channels at its upper reaches or throughout its course.

Draw. A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.

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.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

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.

End moraine A ridgelike accumulation that is being or was produced at the outer margin of an actively flowing glacier at any given time.

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.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

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.
Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.
Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.
Esker. A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.
Even aged. Refers to a stand of trees in which only small differences in age occur between individual trees. A range of 20 years is allowed.
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.
Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.
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 moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.
Fine textured soil. Sandy clay, silty clay, or clay.
Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.
First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.
Flat. A general term for a level or nearly level area or a small area of land marked by little or no relief.
Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.
Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.
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 type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.
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.
Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.
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.
Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.
Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.
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 moraine. An extensive, fairly even layer of till having an uneven or undulating surface; a deposit of rock and mineral debris dragged along, in, or beneath a glacier and emplaced by such processes as basal lodgment and release from downwasting stagnant ice by ablation.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

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-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

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.

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.

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.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

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. Methods of irrigation are:

Basin.-Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.-Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.-Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.-Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).-Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.-Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.-Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.-Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.-Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. An irregular, short ridge or hill of stratified glacial drift.

Kame terrace. A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Kettle. A steep-sided, bowl-shaped depression without surface drainage. It is in glacial drift deposits and is believed to have formed by the melting of a large, detached block of stagnant ice buried in the 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.

Lake plain (geology). A nearly level surface marking the floor of an extinct lake filled in by well sorted, coarse textured to fine textured, stratified sediments.

Lake terrace. A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level fell.

Lammela. A thin, discontinuous or continuous, generally horizontal layer of fine textured material that has been pedogenically concentrated within a coarser textured eluviated layer.

Landform. Any physical, recognizable form or feature on the earth's surface having a characteristic shape and produced by natural causes. It includes major forms, such as a plain, plateau, or mountain, and minor forms, such as a hill, valley, slope, esker, or dune.

Landscape. The distinct association of landforms, especially as modified by geologic forces, that can be seen in a single view.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

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.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^{1}/_{3}$- or $^{1}/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

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 soils. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Lobe. A tonguelike projection from the main mass of a continental glacier.

Low strength. The soil is not strong enough to support loads.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Marsh. Periodically wet or continually flooded areas that do not have a deeply submerged surface and are covered dominantly with sedges, cattails, rushes, or other hydrophytic plants.

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.

Mean annual increment (MAI). The average annual increase in volume of a tree during the entire life of the tree.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

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.)

Mucky peat. Organic soil material intermediate in degree of decomposition between the less decomposed peat and the more decomposed muck. (See Hemic 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.)

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.

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 mat. A zone of accumulation of organic matter, such as leaves, twigs, and grasses in various stages of decomposition, that lies above the mineral soil. Often described in forested regions and commonly called a duff layer.

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

Ortstein A hardened mass or layer in the soil in which the cementing material consists of illuviated compounds of iron and aluminum and organic matter.

Outwash Stratified detritus removed or washed out from a glacier by meltwater streams and deposited in front of or beyond the end moraine or margin of an active glacier. The coarser textured material is deposited nearer to the ice.

Outwash channel A long, narrow body of outwash confined within a valley beyond a glacier; it may or may not emerge from the valley and join an outwash plain.

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.

Outwash terrace. A valley train deposit extending along a valley downstream from an outwash plain or terminal moraine; a flat-topped bank of outwash with an abrupt outer face.

Overstory. The trees in the forest that form the upper crown cover.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

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.

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:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 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 Outwash with pits or kettles produced by the partial or complete burial of glacial ice by outwash and the subsequent thaw of the ice and collapse of the surficial materials.

Plain. An extensive lowland area that ranges from level to gently sloping or undulating. A plain has few or no prominent hills or valleys and typically occurs at low elevations relative to the surrounding areas. Where dissected, remnants of a plain can form the local uplands.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

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.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

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 native plant community. See Climax plant community.

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.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Ravine. A small stream channel that is narrow, steep sided, and commonly V shaped in cross section and is larger than a gully.

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

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

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.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

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.

Ridge. A long, narrow elevation of the land surface, generally sharp crested with steep sides and forming an extended upland between valleys.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

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 soils. Sands or loamy sands.

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.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scarp. An escarpment, cliff, or steep slope of some extent along the margin of a plateau, mesa, terrace, or bench. A scarp may be of any 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.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

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.

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.

Sinkhole. A depression in the landscape where limestone has been dissolved.

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.

Skid trails. Pathways along which logs are dragged to a common site for loading unto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

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, classes for simple slopes are as follows:

Level	0 to 1 percent
Nearly level	0 to 3 percent
Gently sloping	2 to 6 percent
Moderately sloping	6 to 12 percent
Strongly sloping	12 to 18 percent
Moderately steep	18 to 25 percent
Steep	25 to 35 percent
Very steep	35 percent and higher

Classes for complex slopes are as follows:

Nearly level	0 to 3 percent
Undulating	2 to 6 percent
Gently rolling	6 to 12 percent
Rolling	12 to 18 percent
Hilly	18 to 25 percent
Steep	25 to 35 percent
Very steep	35 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

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.

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 over periods of time.

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.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

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.

Stratified. Formed, arranged, or laid down in layers. The term refers to geologic deposits. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stream channel. See Channel.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and consists of the dissected remnants of an abandoned flood plain, streambed, or valley floor that where produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion 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).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where the amount of annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before winter grain is planted.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Swale. A slight depression, sometimes swampy, in the midst of generally level land or a shallow depression in an undulating ground moraine caused by uneven glacial deposition. Also, a long, narrow, generally shallow, troughlike depression between two beach ridges and aligned roughly parallel to the coastline.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

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.

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.

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.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Understory. The plants in a forest community that grow to a height of less than 5 feet.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Valley train. A long, narrow body of outwash confined within a valley beyond a glacier; it may or may not emerge from the valley and join an outwash plain.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Wave-built terrace. A gently sloping coastal feature at the seaward or lakeward edge of a wave-cut platform, constructed by sediment brought by rivers or drifted along the shore or across the platform and deposited in the deeper water beyond.

Wave-cut platform. A gently sloping surface produced by wave erosion, extending into the sea or lake from the base of the wave-cut cliff. It represents both the wave-cut bench and the abrasion platform.

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 1961-90 at Alpena, Michigan)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- 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-----	26.4	8.8	17.6	48	-20	0	1.67	0.89	2.35	5	21.9
February----	28.2	8.3	18.3	52	-22	1	1.37	.66	1.97	3	15.4
March-------	37.9	18.0	28.0	67	-13	19	2.12	1.31	2.85	5	14.2
April-------	51.6	30.1	40.8	83	10	119	2.26	1.59	2.87	6	4.7
May---------	64.8	39.2	52.0	90	23	378	2.74	1.63	3.73	6	.3
June--------	74.3	48.0	61.2	94	31	635	3.04	1.67	4.24	6	.0
July--------	80.0	54.0	67.0	97	38	837	2.92	1.44	4.19	5	.0
August------	76.7	52.6	64.6	93	35	764	3.40	2.23	4.46	6	.0
September---	68.3	45.7	57.0	88	27	510	3.11	1.64	4.41	6	.0
October-----	56.8	36.4	46.6	82	19	232	2.10	1.23	2.87	6	.6
November----	43.0	27.8	35.4	69	6	48	2.21	1.28	3.03	6	8.5
December----	30.9	16.5	23.7	57	-12	5	2.05	1.33	2.70	5	21.4
Yearly:											
Average---	53.2	32.1	42.7	---	---	---	---	---	---	---	---
Extreme---	102	-37	---	97	-24	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,548	28.97	25.45	32.20	65	87.0

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Alpena, Michigan)

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 10	May 25	June 13
2 years in 10 later than-----	May 5	May 20	June 7
5 years in 10 later than-----	April 26	May 11	May 27
First freezing temperature in fall:			
1 year in 10 earlier than---	October 11	September 21	September 8
2 years in 10 earlier than---	October 16	September 27	September 13
5 years in 10 earlier than---	October 25	October 8	September 22

Table 3.--Growing Season

(Recorded in the period 1961-90 at Alpena, Michigan)

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	159	126	94
8 years in 10	167	133	102
5 years in 10	181	148	117
2 years in 10	196	163	133
1 year in 10	203	171	141

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
11B	Eastport sand, 0 to 6 percent slopes	109	*
12B	Tawas-Au gres complex, 0 to 4 percent slopes	6,952	1.8
13	Tawas-Lupton mucks	81	*
14	Dawson-Loxley peats	1	*
16B	Graycalm sand, 0 to 6 percent slopes	621	0.2
16C	Graycalm sand, 6 to 12 percent slopes	1,066	0.3
16D	Graycalm sand, 12 to 18 percent slopes	272	*
16E	Graycalm sand, 18 to 35 percent slopes	1,264	0.3
17A	Croswell sand, 0 to 3 percent slopes	6,219	1.6
17B	Croswell sand, 0 to 6 percent slopes	79	*
18A	Au gres sand, 0 to 3 percent slopes	7,344	1.9
19	Leafriver muck	7	*
27A	Tacoda sand, 0 to 3 percent slopes	2,995	0.8
28B	East Lake sand, 0 to 6 percent slopes	1,368	0.4
28C	East Lake sand, 6 to 12 percent slopes	88	*
29A	Battlefield sand, 0 to 3 percent slopes	745	0.2
30	Wheatley muck	9	*
31B	Klacking loamy sand, 0 to 6 percent slopes	3,602	0.9
31C	Klacking loamy sand, 6 to 12 percent slopes	2,739	0.7
31D	Klacking loamy sand, 12 to 18 percent slopes	1,267	0.3
31E	Klacking loamy sand, 18 to 35 percent slopes	2,347	0.6
35	Kinross muck	831	0.2
36B	Annalake loamy very fine sand, 0 to 6 percent slopes	1,456	0.4
36C	Annalake loamy very fine sand, 6 to 12 percent slopes	227	*
37A	Richter loamy fine sand, 0 to 3 percent slopes	60	*
37B	Richter loamy fine sand, 0 to 6 percent slopes	5	*
38	Tonkey silt loam	7,475	1.9
41B	McGinn loamy sand, 0 to 6 percent slopes	1,688	0.4
41C	McGinn loamy sand, 6 to 12 percent slopes	2,152	0.6
41D	McGinn loamy sand, 12 to 18 percent slopes	926	0.2
41E	McGinn loamy sand, 18 to 35 percent slopes	338	*
42A	Killmaster sandy loam, 0 to 3 percent slopes	3,363	0.9
43	Wakeley mucky sand	2,359	0.6
44B	Ossineke fine sandy loam, 0 to 6 percent slopes	35,595	9.2
44C	Ossineke fine sandy loam, 6 to 12 percent slopes	4,232	1.1
45B	Hoist sandy loam, 0 to 6 percent slopes	6,257	1.6
45C	Hoist sandy loam, 6 to 12 percent slopes	799	0.2
46	Ensley mucky sandy loam	385	*
47D	Graycalm sand, 6 to 18 percent slopes	14	*
53B	Negwegon silt loam, 2 to 6 percent slopes	775	0.2
53C	Negwegon silt loam, 6 to 12 percent slopes	140	*
54A	Algonquin silt loam, 0 to 3 percent slopes	2,261	0.6
55	Springport clay loam, drained	1,914	0.5
57B	Kawkawlin loam, 1 to 4 percent slopes	91	*
59B	Algonquin-Springport complex, 0 to 6 percent slopes	2,875	0.7
62A	Allendale loamy sand, 0 to 3 percent slopes	77	*
63D	Bamfield fine sandy loam, 12 to 18 percent slopes	1,026	0.3
63E	Bamfield fine sandy loam, 18 to 35 percent slopes	1,540	0.4
68	Rondeau muck	147	*
69	Loxley peat	828	0.2
70	Lupton muck	15,936	4.1
71	Tawas muck	14,198	3.7
72	Dorval muck	35	*
74C2	Negwegon silty clay loam, 6 to 12 percent slopes, eroded	24	*
75B	Rubicon sand, 0 to 6 percent slopes	2,165	0.6
75D	Rubicon sand, 6 to 18 percent slopes	749	0.2
75E	Rubicon sand, 18 to 35 percent slopes	191	*
77	Rollaway muck, frequently flooded	1,822	0.5
78	Pits, borrow	925	0.2
82B	Udorthents, loamy, nearly level and undulating	22	*
82C	Udorthents, nearly level to gently rolling	775	0.2
83B	Udipsamments, nearly level and undulating	1,131	0.3

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
83F	Udipsamments, nearly level to very steep	56	*
84B	Zimmerman loamy fine sand, 0 to 6 percent slopes	709	0.2
84C	Zimmerman loamy fine sand, 6 to 12 percent slopes	133	*
84E	Zimmerman loamy fine sand, 18 to 35 percent slopes	314	*
85D	Zimmerman-annalake complex, 6 to 18 percent slopes	962	0.2
86	Histosols and aquents, ponded	3,339	0.9
87	Ausable muck, frequently flooded	2,225	0.6
90B	Chinwhisker sand, 0 to 4 percent slopes	2,583	0.7
92B	Klacking-mcginn loamy sands, 0 to 6 percent slopes	93	*
92C	Klacking-mcginn loamy sands, 6 to 12 percent slopes	375	*
93B	Tacoda-wakeley complex, 0 to 4 percent slopes	14,634	3.8
94F	Klacking-mcginn loamy sands, 8 to 50 percent slopes, dissected	2,302	0.6
97	Colonville very fine sandy loam, occasionally flooded	55	*
113	Angelica loam	6,277	1.6
116C	Mancelona sand, 6 to 12 percent slopes	9	*
127	Cathro muck	10,943	2.8
128	Dawson peat	253	*
145C	Rousseau fine sand, 6 to 12 percent slopes	2,340	0.6
145E	Rousseau fine sand, 18 to 35 percent slopes	617	0.2
159A	Finch sand, 0 to 3 percent slopes	594	0.2
166A	Slade loam, 0 to 3 percent slopes	15,246	4.0
182	Pits, quarry	1,955	0.5
300A	Hagensville fine sandy loam, 0 to 2 percent slopes	1,495	0.4
304A	Iosco loamy sand, 0 to 3 percent slopes	6,976	1.8
305B	Johnswood very flaggy loam, 1 to 6 percent slopes, stony	4,358	1.1
308B	Krakow flaggy fine sandy loam, 1 to 6 percent slopes	1,124	0.3
308C	Krakow flaggy fine sandy loam, 6 to 12 percent slopes	1,753	0.5
308D	Krakow flaggy fine sandy loam, 12 to 18 percent slopes	310	*
316	Ruse loam	3,103	0.8
350E	Blue Lake sand, 18 to 35 percent slopes	5	*
359C	Algonquin-Negwegon-Dorval complex, 0 to 12 percent slopes	183	*
361B	Allendale-Dorval-Blue Lake complex, 0 to 6 percent slopes	4	*
362D	Millersburg loamy sand, 6 to 18 percent slopes	1,072	0.3
362E	Millersburg loamy sand, 18 to 35 percent slopes	472	0.1
368A	Au Gres-Deford complex, 0 to 3 percent slopes	6,638	1.7
369	Deford muck	24,895	6.5
371	Springport silt loam	25	*
373B	Grayling sand, very deep water table, 0 to 6 percent slopes	1,166	0.3
374	Thunderbay very fine sandy loam, frequently flooded	4,321	1.1
376A	Urban land-Udipsamments, deep water table, complex, 0 to 3 percent slopes	3,942	1.0
380	Access denied	3,898	1.0
392	Caffey mucky sand	10	*
393B	Morganlake loamy sand, 0 to 6 percent slopes	14,180	3.7
393C	Morganlake loamy sand, 6 to 12 percent slopes	4,854	1.3
396F	Proper-Deford-Rousseau complex, 0 to 40 percent slopes	4,505	1.2
397	Spot peat	38	*
414B	Namur channery silt loam, 0 to 6 percent slopes	11,053	2.9
415A	Potagannissing silt loam, 0 to 3 percent slopes	4,370	1.1
416B	Negwegon silt loam, till substratum, 2 to 6 percent slopes	1,550	0.4
417B	Alpena gravelly sandy loam, 0 to 6 percent slopes	5,394	1.4
417C	Alpena gravelly sandy loam, 6 to 12 percent slopes	942	0.2
418E	Alpena gravelly sandy loam, esker, 18 to 35 percent slopes	340	*
419	Chippeny muck	5,665	1.5
420A	Otisco mucky sand, 0 to 3 percent slopes	8	*
424B	Morganlake-Ossineke, sandy substratum-Blue Lake complex, 0 to 6 percent slopes	47	*
424C	Morganlake-Ossineke, sandy substratum-Blue Lake complex, 6 to 12 percent slopes	3	*
426B	Coppler loamy sand, 0 to 6 percent slopes	1,502	0.4
426C	Coppler loamy sand, 6 to 12 percent slopes	999	0.3
426D	Coppler loamy sand, 12 to 18 percent slopes	524	0.1
451C	Annalake loamy fine sand, 6 to 12 percent slopes	3	*
477B	Algonquin, till substratum-Springport, till substratum, complex, 0 to 4 percent slopes	1,037	0.3
478	Springport silty clay loam, till substratum	663	0.2

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
479A	Algonquin silt loam, till substratum, 0 to 3 percent slopes	1,762	0.5
480B	Negwegon-Algonquin-Lupton complex, 0 to 6 percent slopes	3,387	0.9
481C	Negwegon-Lupton complex, 0 to 12 percent slopes	2,326	0.6
482B	Summerville fine sandy loam, 0 to 6 percent slopes	5,315	1.4
482C	Summerville fine sandy loam, 6 to 12 percent slopes	452	0.1
483A	Lachine loam, 0 to 3 percent slopes	2,027	0.5
484A	Elcajon loam, 0 to 3 percent slopes	975	0.3
485A	Bowers silt loam, 0 to 3 percent slopes	1,452	0.4
486B	Tonkey-Bowers silt loams, 0 to 4 percent slopes	3,830	1.0
487B	Slade-Angelica loams, 0 to 4 percent slopes	4,692	1.2
489F	Crowell-Proper fine sands, 3 to 40 percent slopes	1,014	0.3
	Water	11,368	3.0
	Total	385,025	100.0

* Less than 0.1 percent.

Table 5.--Land Capability and Yields per Acre of Crops

(Yields are those that can be expected under a high level of management. They are for nonirrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil.)

Map symbol and soil name	Land capability	Corn	Corn silage	Oats	Irish potatoes	Winter wheat
		Bu	*Tons*	*Bu*	*Cwt*	*Bu*
11B. Eastport	VIs	---	---	---	---	---
12B:		---	---	---	---	---
Tawas	VIw					
Au Gres	IVw					
13. Tawas-Lupton	VIw	---	---	---	---	---
14. Dawson-Loxley	VIIw	---	---	---	---	---
16B. Graycalm	IVs	---	---	---	---	---
16C. Graycalm	VIs	---	---	---	---	---
16D. Graycalm	VIs	---	---	---	---	---
16E. Graycalm	VIIs	---	---	---	---	---
17A. Croswell	IVs	50.0	9.0	50.0	---	25.0
17B. Croswell	IVs	50.0	9.0	50.0	---	25.0
18A. Au Gres	IVw	55.0	10.0	45.0	---	25.0
19. Leafriver	VIw	---	---	---	---	---
27A. Tacoda	IVw	---	10.0	65.0	---	---
28B. East Lake	IVs	50.0	9.0	40.0	250.0	---
28C. East Lake	VIs	---	---	---	---	---
29A. Battlefield	IVw	---	---	---	---	---
30. Wheatley	Vw	---	---	---	---	---
31B. Klacking	IIIs	---	11.0	60.0	---	---
31C. Klacking	IIIe	---	9.0	55.0	---	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn	Corn silage	Oats	Irish potatoes	Winter wheat
		Bu	*Tons*	*Bu*	*Cwt*	*Bu*
31D---------------------- Klacking	IVe	---	8.0	45.0	---	---
31E---------------------- Klacking	VIIe	---	---	---	---	---
35----------------------- Kinross	VIW	---	---	---	---	---
36B---------------------- Annalake	IIe	85.0	14.0	70.0	---	40.0
36C---------------------- Annalake	IIIe	80.0	13.0	65.0	---	38.0
37A---------------------- Richter	IIw	85.0	14.0	80.0	---	35.0
37B---------------------- Richter	IIe	80.0	13.0	80.0	---	35.0
38----------------------- Tonkey	Vw	---	---	---	---	---
41B---------------------- McGinn	IIIs	---	---	---	---	---
41C---------------------- McGinn	IIIe	---	---	---	---	---
41D---------------------- McGinn	IVe	---	---	---	---	---
41E---------------------- McGinn	VIe	---	---	---	---	---
42A---------------------- Killmaster	IIw	---	14.0	80.0	---	35.0
43----------------------- Wakeley	Vw	---	---	---	---	---
44B---------------------- Ossineke	IIIe	85.0	14.0	76.0	---	---
44C---------------------- Ossineke	IIIe	80.0	13.0	75.0	---	---
45B---------------------- Hoist	IIe	80.0	15.0	75.0	---	---
45C---------------------- Hoist	IIIe	80.0	15.0	75.0	---	---
46----------------------- Ensley	Vw	---	---	---	---	---
47D---------------------- Graycalm	VIs	---	---	---	---	---
53B---------------------- Negwegon	IIIe	75.0	12.0	70.0	---	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn	Corn silage	Oats	Irish potatoes	Winter wheat
		Bu	*Tons*	*Bu*	*Cwt*	*Bu*
53C---------------------- Negwegon	IIIe	68.0	10.0	65.0	---	---
54A---------------------- Algonquin	IIIw	80.0	13.0	75.0	---	---
55----------------------- Springport	IIIw	85.0	14.0	75.0	---	---
57B---------------------- Kawkawlin	IIe	85.0	16.0	80.0	---	42.0
59B----------------------		80.0	13.0	75.0	---	---
Algonquin---------------	IIIe					
Springport--------------	Vw					
62A---------------------- Allendale	IIIw	85.0	14.0	75.0	---	40.0
63D---------------------- Bamfield	IVe	---	---	---	---	---
63E---------------------- Bamfield	VIIe	---	---	---	---	---
68----------------------- Rondeau	VIw	---	---	---	---	---
69----------------------- Loxley	VIIw	---	---	---	---	---
70----------------------- Lupton	VIw	---	---	---	---	---
71----------------------- Tawas	VIw	---	---	---	---	---
72----------------------- Dorval	Vw	---	---	---	---	---
74C2--------------------- Negwegon	IIIe	68.0	10.0	65.0	---	---
75B---------------------- Rubicon	VIs	---	---	---	---	---
75D---------------------- Rubicon	VIIs	---	---	---	---	---
75E---------------------- Rubicon	VIIs	---	---	---	---	---
77----------------------- Rollaway	Vw	---	---	---	---	---
78: Pits, borrow.						
82B: Udorthents.						
82C: Udorthents.						

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn	Corn silage	Oats	Irish potatoes	Winter wheat
		Bu	*Tons*	*Bu*	*Cwt*	*Bu*
83B:						
Udipsamments.						
83F:						
Udipsamments.						
84B---------------------- Zimmerman	IVs	50.0	10.0	40.0	---	---
84C---------------------- Zimmerman	VIs	---	---	---	---	---
84E---------------------- Zimmerman	VIIs	---	---	---	---	---
85D----------------------		---	---	---	---	---
Zimmerman---------------	VIs					
Annalake----------------	IVe					
86:						
Histosols and Aquents.						
87----------------------- Ausable	VIIw	---	---	---	---	---
90B---------------------- Chinwhisker	IVs	---	---	---	---	---
92B---------------------- Klacking-McGinn	IIIs	---	11.0	60.0	---	---
92C---------------------- Klacking-McGinn	IIIe	---	---	---	---	---
93B----------------------		---	10.0	65.0	---	---
Tacoda------------------	IVw					
Wakeley-----------------	Vw					
94F---------------------- Klacking-McGinn	VIIe	---	8.0	45.0	---	---
97----------------------- Colonville	Vw	---	---	---	---	---
113---------------------- Angelica	Vw	100.0	17.0	90.0	---	---
116C--------------------- Mancelona	IIIe	50.0	9.0	45.0	---	22.0
127---------------------- Cathro	VIw	---	---	---	---	---
128---------------------- Dawson	VIIw	---	---	---	---	---
145C--------------------- Rousseau	IIIe	50.0	9.0	45.0	---	23.0
145E--------------------- Rousseau	VIIe	---	---	---	---	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn	Corn silage	Oats	Irish potatoes	Winter wheat
		Bu	*Tons*	*Bu*	*Cwt*	*Bu*
159A--------------------- Finch	IVw	45.0	9.0	40.0	---	22.0
166A--------------------- Slade	IIw	90.0	15.0	70.0	---	---
182: Pits, quarry.						
300A--------------------- Hagensville	IIw	80.0	15.0	75.0	290.0	35.0
304A--------------------- Iosco	IIIw	---	13.0	65.0	260.0	30.0
305B--------------------- Johnswood	VIs	---	---	---	---	---
308B--------------------- Krakow	IIIs	80.0	---	75.0	290.0	35.0
308C--------------------- Krakow	VIs	75.0	---	70.0	225.0	30.0
308D--------------------- Krakow	VIs	---	---	---	---	---
316---------------------- Ruse	VIIw	---	---	---	---	---
350E--------------------- Blue Lake	VIIe	---	---	---	---	---
359C---------------------		80.0	13.0	75.0	---	---
Algonquin	IIIw					
Negwegon----------------	IIIe					
Dorval------------------	Vw					
361B---------------------		85.0	14.0	75.0	---	40.0
Allendale---------------	IIIw					
Dorval------------------	Vw					
Blue Lake---------------	IIIs					
362D--------------------- Millersburg	IVe	---	---	---	---	---
362E--------------------- Millersburg	VIIe	---	---	---	---	---
368A---------------------		---	---	---	---	---
Au Gres-----------------	IVw					
Deford------------------	Vw					
369---------------------- Deford	Vw	---	---	---	---	---
371---------------------- Springport	Vw	---	---	---	---	---
373B--------------------- Grayling, very deep water table	VIs	---	---	---	---	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn	Corn silage	Oats	Irish potatoes	Winter wheat
		Bu	*Tons*	*Bu*	*Cwt*	*Bu*
374: Thunderbay	VIIw	---	---	---	---	---
376A: Urban land-Udipsamments, deep water table.						
380: Access denied.						
392: Caffey	Vw	---	---	---	---	---
393B: Morganlake	IIIs	75.0	12.0	70.0	---	35.0
393C: Morganlake	IIIe	65.0	12.0	65.0	---	30.0
396F:		50.0	9.0	50.0	---	25.0
Proper	IVs					
Deford	Vw					
Rousseau	VIe					
397: Spot	Vw	---	---	---	---	---
414B: Namur	VIs	---	6.0	45.0	---	---
415A: Potagannissing	VIIs	---	---	---	---	---
416B: Negwegon, till substratum	IIIe	75.0	12.0	70.0	---	---
417B: Alpena	VIs	---	---	---	---	---
417C: Alpena	VIs	---	---	---	---	---
418E: Alpena	VIIs	---	---	---	---	---
419: Chippeny	VIIw	---	---	---	---	---
420A: Otisco	IIIw	70.0	11.0	65.0	---	40.0
424B:		---	---	---	---	---
Morganlake	IIIs					
Ossineke, sandy substratum	IIIe					
Blue Lake	IIIs					
424C: Morganlake-Ossineke, sandy substratum-Blue Lake	IIIe	---	---	---	---	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn	Corn silage	Oats	Irish potatoes	Winter wheat
		Bu	Tons	Bu	Cwt	Bu
426B---Coppler	IIIs	65.0	11.0	55.0	---	24.0
426C---Coppler	IIIe	---	---	---	---	---
426D---Coppler	IVe	---	---	---	---	---
451C---Annalake	IIIe	80.0	13.0	65.0	---	38.0
477B---		80.0	13.0	75.0	---	---
Algonquin, till substratum---	IIIe					
Springport, till substratum---	Vw					
478---Springport, till substratum	Vw	85.0	14.0	75.0	---	---
479A---Algonquin, till substratum	IIIw	80.0	13.0	75.0	---	---
480B---		---	---	---	---	---
Negwegon---	IIIe					
Algonquin---	IIIw					
Lupton---	VIw					
481C---		68.0	10.0	65.0	---	---
Negwegon---	IIIe					
Lupton---	VIw					
482B---Summerville	IIIs	---	---	70.0	---	---
482C---Summerville	IVe	---	---	60.0	---	---
483A---Lachine	IIIw	---	---	---	---	---
484A---Elcajon	IIw	80.0	12.0	75.0	300.0	---
485A---Bowers	IIw	95.0	16.0	80.0	300.0	40.0
486B---		---	---	---	---	---
Tonkey---	Vw					
Bowers---	IIw					
487B---		90.0	15.0	70.0	---	---
Slade---	IIw					
Angelica---	Vw					
489F---		---	---	---	---	---
Crowell---	VIIs					
Proper---	IVs					

Table 6.--Yields per Acre of Hay and Pasture

(Yields are those that can be expected under a high level of management. They are for nonirrigated areas. Only the soils that are used for hay or pasture are listed. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil.)

Map symbol and soil name	Alfalfa hay	Bromegrass-alfalfa hay	Kentucky bluegrass	Red clover hay	Trefoil hay
	Tons	*Tons*	*AUM**	*Tons*	*Tons*
17A, 17B----------------- Croswell	2.5	---	2.3	---	---
18A--------------------- Au Gres	---	1.8	---	---	---
27A--------------------- Tacoda	3.0	---	---	---	---
28B--------------------- East Lake	2.5	1.8	---	---	---
28C--------------------- East Lake	2.3	1.6	---	---	---
31B--------------------- Klacking	3.0	---	---	---	---
31C--------------------- Klacking	2.8	---	---	---	---
31D--------------------- Klacking	2.0	---	---	---	---
36B--------------------- Annalake	---	3.5	2.9	---	---
36C--------------------- Annalake	---	3.3	2.7	---	---
37A, 37B----------------- Richter	3.5	---	---	---	---
44B--------------------- Ossineke	4.0	---	---	---	---
44C--------------------- Ossineke	3.5	---	---	---	---
45B, 45C----------------- Hoist	3.8	---	---	---	---
53B--------------------- Negwegon	3.5	---	---	---	---
53C--------------------- Negwegon	3.1	---	---	---	---
54A--------------------- Algonquin	3.5	---	---	2.5	2.3
55---------------------- Springport	3.5	---	---	2.5	2.3

See footnote at end of table.

Table 6.--Yields per Acre of Hay and Pasture--Continued

Map symbol and soil name	Alfalfa hay	Bromegrass-alfalfa hay	Kentucky bluegrass	Red clover hay	Trefoil hay
	Tons	*Tons*	*AUM**	*Tons*	*Tons*
57B---------------------- Kawkawlin	3.8	2.7	---	---	---
59B---------------------- Algonquin-Springport	3.5	---	---	2.5	2.3
62A---------------------- Allendale	3.5	2.5	---	---	---
63D, 63E----------------- Bamfield	3.0	---	---	---	---
74C2--------------------- Negwegon	3.1	---	---	---	---
75B---------------------- Rubicon	2.0	---	---	---	---
92B---------------------- Klacking-McGinn	3.0	---	---	---	---
93B---------------------- Tacoda-Wakeley	3.0	---	---	---	---
94F---------------------- Klacking-McGinn	2.0	---	---	---	---
113---------------------- Angelica	4.5	---	---	---	3.5
116C--------------------- Mancelona	2.2	---	---	---	---
145C--------------------- Rousseau	2.8	---	---	---	---
159A--------------------- Finch	---	2.0	---	---	---
166A--------------------- Slade	---	4.0	4.1	---	---
300A--------------------- Hagensville	---	3.5	---	---	---
304A--------------------- Iosco	---	3.0	4.0	---	---
308B--------------------- Krakow	---	3.5	---	---	---
308C--------------------- Krakow	---	3.2	---	---	---
359C--------------------- Algonquin-Negwegon-Dorval	3.5	---	---	2.5	2.3

See footnote at end of table.

Table 6.--Yields per Acre of Hay and Pasture--Continued

Map symbol and soil name	Alfalfa hay	Bromegrass-alfalfa hay	Kentucky bluegrass	Red clover hay	Trefoil hay
	Tons	*Tons*	*AUM**	*Ton*	*Tons*
361B--------------------- Allendale-Dorval-Blue Lake	3.5	2.5	---	---	---
362D--------------------- Millersburg	3.3	---	---	---	---
393B--------------------- Morganlake	3.5	---	---	---	---
393C--------------------- Morganlake	3.3	---	---	---	---
396F--------------------- Proper-Deford-Rousseau	2.5	---	2.3	---	---
414B--------------------- Namur	---	2.0	1.2	---	---
416B--------------------- Negwegon, till substratum	3.5	---	---	---	---
420A--------------------- Otisco	3.0	---	---	---	2.7
426B--------------------- Coppler	3.0	---	---	---	---
451C--------------------- Annalake	---	3.3	2.7	---	---
477B--------------------- Algonquin, till substratum-Springport, till substratum	3.5	---	---	2.5	2.3
478---------------------- Springport, till substratum	3.5	---	---	2.5	2.3
479A--------------------- Algonquin, till substratum	3.5	---	---	2.5	2.3
481C--------------------- Negwegon-Lupton	3.1	---	---	---	---
482B--------------------- Summerville	3.0	2.1	---	---	---
482C--------------------- Summerville	2.8	1.8	---	---	---
484A--------------------- Elcajon	---	4.0	3.7	---	---
485A--------------------- Bowers	4.0	3.5	---	---	---

See footnote at end of table.

Table 6.--Yields per Acre of Hay and Pasture--Continued

Map symbol and soil name	Alfalfa hay	Bromegrass-alfalfa hay	Kentucky bluegrass	Red clover hay	Trefoil hay
	Tons	*Tons*	*AUM**	*Tons*	*Tons*
487B: Slade-Angelica	---	4.0	4.1	---	---

* Animal-unit-month: The amount of forage required by one mature cow of about 1,000 pounds weight, with or without a calf, for 1 month.

Table 7.--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
36B	Annalake loamy very fine sand, 0 to 6 percent slopes
37A	Richter loamy fine sand, 0 to 3 percent slopes (where drained)
37B	Richter loamy fine sand, 0 to 6 percent slopes (where drained)
38	Tonkey silt loam (where drained)
41B	McGinn loamy sand, 0 to 6 percent slopes
42A	Killmaster sandy loam, 0 to 3 percent slopes (where drained)
44B	Ossineke fine sandy loam, 0 to 6 percent slopes
45B	Hoist sandy loam, 0 to 6 percent slopes
46	Ensley mucky sandy loam (where drained)
53B	Negwegon silt loam, 2 to 6 percent slopes
54A	Algonquin silt loam, 0 to 3 percent slopes (where drained)
55	Springport clay loam, drained (where drained)
57B	Kawkawlin loam, 1 to 4 percent slopes (where drained)
59B	Algonquin-Springport complex, 0 to 6 percent slopes (where drained)
97	Colonville very fine sandy loam, occasionally flooded (where drained)
113	Angelica loam (where drained)
166A	Slade loam, 0 to 3 percent slopes (where drained)
300A	Hagensville fine sandy loam, 0 to 2 percent slopes (where drained)
371	Springport silt loam (where drained)
416B	Negwegon silt loam, till substratum, 2 to 6 percent slopes
477B	Algonquin, till substratum-Springport, till substratum, complex, 0 to 4 percent slopes (where drained)
478	Springport silty clay loam, till substratum (where drained)
479A	Algonquin silt loam, till substratum, 0 to 3 percent slopes (where drained)
480B	Negwegon-Algonquin-Lupton complex, 0 to 6 percent slopes
485A	Bowers silt loam, 0 to 3 percent slopes
486B	Tonkey-Bowers silt loams, 0 to 4 percent slopes (where drained)
487B	Slade-Angelica loams, 0 to 4 percent slopes (where drained)

Table 8.--Forestland Management and Productivity

(Only the soils suitable for production of commercial trees are listed.)

Map symbol and soil name	Ordi-nation symbol	Management concerns: Erosion hazard	Management concerns: Equip-ment limita-tion	Management concerns: Seedling mortal-ity	Management concerns: Wind-throw hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume of wood fiber	Suggested trees to plant
11B:									
Eastport-------	5S	Slight	Moderate	Moderate	Slight	Eastern white pine--	---	---	Eastern white pine, jack pine, red pine.
						Jack pine-----------	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
						Red pine------------	47	72	
12B:									
Tawas----------	5W	Slight	Severe	Severe	Severe	Balsam fir----------	40	72	---
						Black ash-----------	---	---	
						Northern whitecedar	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
Au Gres--------	6W	Slight	Severe	Moderate	Severe	Balsam fir----------	---	---	Norway spruce, eastern white pine, red pine, white spruce.
						Bigtooth aspen------	---	---	
						Eastern hemlock-----	---	---	
						Eastern white pine--	---	---	
						Jack pine-----------	51	72	
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	70	86	
						Red maple-----------	65	43	
						Yellow birch--------	---	---	
13:									
Tawas----------	5W	Slight	Severe	Severe	Severe	Balsam fir----------	40	76	---
						Black ash-----------	---	---	
						Northern whitecedar	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
Lupton---------	2W	Slight	Severe	Severe	Severe	Balsam fir----------	46	86	---
						Black ash-----------	---	---	
						Black spruce--------	20	29	
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
						Tamarack------------	---	---	
						White spruce--------	---	---	
14:									
Dawson---------	2W	Slight	Severe	Severe	Severe	Black spruce--------	15	29	---
						Tamarack------------	---	---	
Loxley---------	2W	Slight	Severe	Severe	Severe	Balsam fir----------	---	---	---
						Black spruce--------	15	29	
						Tamarack------------	---	---	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume of wood fiber	Suggested trees to plant
16B, 16C, 16D, 16E:									
Graycalm	6S	Slight	Moderate	Moderate	Slight	Bigtooth aspen	70	86	Eastern white pine, red pine.
						Eastern white pine	---	---	
						Jack pine	56	86	
						Northern red oak	62	57	
						Paper birch	---	---	
						Quaking aspen	60	57	
						Red pine	61	100	
17A, 17B:									
Croswell	5S	Slight	Moderate	Moderate	Moderate	Bigtooth aspen	69	86	Eastern white pine, red pine, white spruce.
						Black cherry	---	---	
						Eastern white pine	---	---	
						Jack pine	53	72	
						Northern red oak	---	---	
						Paper birch	54	57	
						Quaking aspen	68	72	
						Red maple	---	---	
						Red pine	55	86	
18A:									
Au Gres	6W	Slight	Severe	Moderate	Severe	Balsam fir	---	---	Norway spruce, eastern white pine, red pine, white spruce.
						Bigtooth aspen	---	---	
						Eastern hemlock	---	---	
						Eastern white pine	---	---	
						Jack pine	51	72	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	70	86	
						Red maple	65	43	
						Yellow birch	---	---	
19:									
Leafriver	2W	Slight	Severe	Severe	Severe	Black spruce	---	---	---
						Northern whitecedar	---	---	
						Quaking aspen	45	29	
						Tamarack	---	---	
27A:									
Tacoda	4W	Slight	Severe	Moderate	Moderate	Balsam fir	---	---	Eastern white pine, white spruce.
						Eastern white pine	---	---	
						Paper birch	---	---	
						Quaking aspen	60	57	
						Red maple	---	---	
						White ash	---	---	
						White spruce	---	---	
28B, 28C:									
East Lake	2S	Slight	Moderate	Moderate	Slight	Jack pine	---	---	Eastern white pine, jack pine, red pine.
						Northern red oak	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Red maple	53	29	
						Red pine	55	86	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume of wood fiber	Suggested trees to plant
29A:									
Battlefield	5W	Slight	Severe	Moderate	Severe	Balsam fir	---	---	White spruce.
						Paper birch	---	---	
						Quaking aspen	68	72	
						Red maple	---	---	
						Sugar maple	---	---	
30:									
Wheatley	2W	Slight	Severe	Severe	Severe	Balsam fir	40	72	Norway spruce, eastern white pine, white spruce.
						Black spruce	15	29	
						Eastern hemlock	---	---	
						Northern whitecedar	15	43	
						Quaking aspen	45	29	
						Red maple	40	29	
31B, 31C, 31D, 31E:									
Klacking	6S	Slight	Slight	Slight	Slight	Bigtooth aspen	70	86	Eastern white pine, red pine.
						Black cherry	---	---	
						Jack pine	---	---	
						Northern pin oak	---	---	
						Northern red oak	60	57	
						Quaking aspen	---	---	
						Red maple	---	---	
						Red pine	---	---	
						White oak	57	43	
35:									
Kinross	2W	Slight	Severe	Severe	Severe	Balsam fir	---	---	---
						Black spruce	---	---	
						Eastern white pine	---	---	
						Jack pine	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	45	29	
						Red maple	---	---	
						Tamarack	---	---	
36B, 36C:									
Annalake	3	Slight	Moderate	Slight	Slight	American basswood	---	---	Eastern white pine, red pine, white spruce.
						Balsam fir	---	---	
						Eastern hemlock	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
						Sugar maple	61	43	
						Yellow birch	---	---	
37A, 37B:									
Richter	3W	Slight	Severe	Moderate	Severe	Balsam fir	---	---	Eastern white pine, northern whitecedar, white spruce.
						Black ash	---	---	
						Eastern hemlock	---	---	
						Paper birch	65	72	
						Quaking aspen	---	---	
						Red maple	65	43	
						Sugar maple	61	43	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume of wood fiber	Suggested trees to plant
38:									
Tonkey---------	5W	Slight	Severe	Severe	Severe	American basswood---	55	43	---
						American elm--------	---	---	
						Balsam fir----------	---	---	
						Northern whitecedar	---	---	
						Quaking aspen-------	61	72	
						Red maple-----------	---	---	
						Swamp white oak-----	---	---	
41B, 41C, 41D, 41E:									
McGinn--------	4S	Slight	Slight	Slight	Slight	Bigtooth aspen------	---	---	Red pine, white spruce.
						Northern red oak----	67	57	
						Red pine------------	---	---	
						White oak-----------	65	57	
42A:									
Killmaster-----	4W	Slight	Severe	Slight	Moderate	American basswood---	---	---	Eastern white pine, white ash, white spruce.
						Balsam fir----------	---	---	
						Bigtooth aspen------	60	57	
						Northern red oak----	---	---	
						Paper birch---------	---	---	
						Red maple-----------	---	---	
						White ash-----------	---	---	
						White spruce--------	---	---	
43:									
Wakeley--------	3W	Slight	Severe	Severe	Severe	Balsam fir----------	---	---	Northern whitecedar.
						Black spruce--------	---	---	
						Northern whitecedar	---	---	
						Quaking aspen-------	50	43	
44B, 44C:									
Ossineke-------	4	Slight	Moderate	Slight	Moderate	American basswood---	---	---	Norway spruce, eastern white pine, red pine, white spruce.
						Bigtooth aspen------	---	---	
						Eastern hemlock-----	---	---	
						Northern red oak----	65	57	
						Paper birch---------	---	---	
						Sugar maple---------	63	43	
						White ash-----------	---	---	
45B, 45C:									
Hoist----------	3	Slight	Moderate	Slight	Slight	American basswood---	---	---	Eastern white pine, red pine, white spruce.
						Balsam fir----------	---	---	
						Eastern white pine--	---	---	
						Northern red oak----	74	72	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Red pine------------	---	---	
						Sugar maple---------	66	43	
						White ash-----------	---	---	
46:									
Ensley---------	3W	Slight	Severe	Severe	Severe	Balsam fir----------	60	114	Green ash, white spruce.
						Black ash-----------	---	---	
						Red maple-----------	62	43	
						White ash-----------	---	---	
						White spruce--------	---	---	
						Yellow birch--------	---	---	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume of wood fiber	Suggested trees to plant
47D:									
Graycalm-------	6S	Slight	Moderate	Moderate	Slight	Bigtooth aspen------	70	86	Eastern white pine, red pine.
						Eastern white pine--	---	---	
						Jack pine----------	56	86	
						Northern red oak----	62	57	
						Paper birch---------	---	---	
						Quaking aspen-------	60	57	
						Red pine-----------	61	100	
53B, 53C:									
Negwegon-------	3C	Slight	Moderate	Slight	Moderate	American beech------	---	---	Eastern white pine, white spruce.
						Balsam fir----------	---	---	
						Bigtooth aspen------	---	---	
						Eastern hemlock-----	---	---	
						Northern red oak----	---	---	
						Sugar maple---------	62	43	
						White ash-----------	---	---	
54A:									
Algonquin------	6W	Slight	Severe	Moderate	Severe	Balsam fir----------	45	86	Eastern white pine, northern whitecedar, white spruce.
						Balsam poplar-------	---	---	
						Black ash-----------	---	---	
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
55:									
Springport-----	6W	Slight	Severe	Severe	Severe	Balsam fir----------	45	86	Eastern white pine, northern whitecedar, white spruce.
						Black ash-----------	---	---	
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
57B:									
Kawkawlin------	3W	Slight	Severe	Slight	Moderate	American basswood---	---	---	Norway spruce, eastern white pine, red pine, white spruce.
						Bigtooth aspen------	---	---	
						Northern red oak----	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
						Sugar maple---------	60	43	
						Swamp white oak-----	---	---	
						White ash-----------	---	---	
59B:									
Algonquin------	6W	Slight	Severe	Moderate	Severe	Balsam fir----------	45	86	Eastern white pine, northern whitecedar, white spruce.
						Balsam poplar-------	---	---	
						Black ash-----------	---	---	
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
Springport-----	6W	Slight	Severe	Severe	Severe	Balsam fir----------	45	86	Eastern white pine, northern whitecedar, white spruce.
						Black ash-----------	---	---	
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume of wood fiber	Suggested trees to plant
62A:									
Allendale	4W	Slight	Severe	Slight	Moderate	Balsam fir	---	---	Eastern white pine, white spruce.
						Eastern white pine	---	---	
						Paper birch	---	---	
						Quaking aspen	60	57	
						Red maple	---	---	
						White ash	---	---	
						White spruce	---	---	
63D, 63E:									
Bamfield	3R	Moderate	Moderate	Slight	Slight	American basswood	---	---	Norway spruce, eastern white pine, red pine, white spruce.
						American beech	---	---	
						Bigtooth aspen	---	---	
						Eastern hemlock	---	---	
						Northern red oak	---	---	
						Paper birch	---	---	
						Sugar maple	61	43	
						White ash	---	---	
68:									
Rondeau	---	Slight	Severe	Severe	Severe	Balsam poplar	---	---	---
						Northern whitecedar	---	---	---
69:									
Loxley	2W	Slight	Severe	Severe	Severe	Balsam fir	---	---	---
						Black spruce	15	29	
						Tamarack	---	---	
70:									
Lupton	2W	Slight	Severe	Severe	Severe	Balsam fir	46	86	---
						Black ash	---	---	
						Black spruce	20	29	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
						Tamarack	---	---	
						White spruce	---	---	
71:									
Tawas	5W	Slight	Severe	Severe	Severe	Balsam fir	40	72	---
						Black ash	---	---	
						Northern whitecedar	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
72:									
Dorval	2W	Slight	Severe	Severe	Severe	American elm	---	---	Northern whitecedar, white spruce.
						Northern whitecedar	---	---	
						Red maple	50	29	
						White ash	---	---	
74C2:									
Negwegon	3	Slight	Moderate	Slight	Moderate	American beech	---	---	Eastern white pine, white spruce.
						Balsam fir	---	---	
						Bigtooth aspen	---	---	
						Eastern hemlock	---	---	
						Northern red oak	---	---	
						Sugar maple	62	43	
						White ash	---	---	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume of wood fiber	Suggested trees to plant
75B, 75D, 75E:									
Rubicon--------	4R	Moderate	Moderate	Moderate	Slight	Bigtooth aspen------	66	72	Eastern white pine, jack pine, red pine.
						Eastern white pine--	45	72	
						Jack pine-----------	53	72	
						Northern red oak----	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	60	57	
						Red maple-----------	57	29	
						Red pine------------	53	86	
						White oak-----------	---	---	
77:									
Rollaway-------	3W	Slight	Severe	Severe	Severe	Balsam fir----------	40	72	---
						Black ash-----------	35	29	
						Black spruce--------	---	---	
						Northern whitecedar	30	43	
						Quaking aspen-------	40	29	
						Red maple-----------	---	---	
84B, 84C, 84E:									
Zimmerman------	8S	Slight	Moderate	Moderate	Slight	Jack pine-----------	65	100	Eastern white pine, jack pine, red pine, white spruce.
						Paper birch---------	---	---	
						Quaking aspen-------	70	86	
						Red maple-----------	---	---	
						Red pine------------	64	114	
85D:									
Zimmerman------	8S	Slight	Moderate	Moderate	Slight	Jack pine-----------	65	100	Eastern white pine, jack pine, red pine, white spruce.
						Paper birch---------	---	---	
						Quaking aspen-------	70	86	
						Red maple-----------	---	---	
						Red pine------------	64	114	
Annalake-------	3	Slight	Moderate	Slight	Slight	American basswood---	---	---	Eastern white pine, red pine, white spruce.
						Balsam fir----------	---	---	
						Eastern hemlock-----	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
						Sugar maple---------	61	43	
						Yellow birch--------	---	---	
87:									
Ausable--------	2W	Slight	Severe	Severe	Severe	Balsam poplar-------	---	---	---
						Black ash-----------	---	---	
						Northern whitecedar	15	29	
						Paper birch---------	---	---	
90B:									
Chinwhisker----	6S	Slight	Moderate	Moderate	Slight	Bigtooth aspen------	70	86	Eastern white pine, jack pine, white spruce.
						Jack pine-----------	56	86	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume of wood fiber	Suggested trees to plant
92B, 92C:									
Klacking	6S	Slight	Slight	Slight	Slight	Bigtooth aspen	70	86	Eastern white pine, red pine.
						Black cherry	---	---	
						Jack pine	---	---	
						Northern pin oak	---	---	
						Northern red oak	60	57	
						Quaking aspen	---	---	
						Red maple	---	---	
						Red pine	---	---	
						White oak	57	43	
McGinn	4S	Slight	Slight	Slight	Slight	Bigtooth aspen	---	---	Red pine, white spruce.
						Northern red oak	67	57	
						Red pine	---	---	
						White oak	65	57	
93B:									
Tacoda	4W	Slight	Severe	Moderate	Moderate	Balsam fir	---	---	Eastern white pine, white spruce.
						Eastern white pine	---	---	
						Paper birch	---	---	
						Quaking aspen	60	57	
						Red maple	---	---	
						White ash	---	---	
						White spruce	---	---	
Wakeley	3W	Slight	Severe	Severe	Severe	Balsam fir	---	---	Northern whitecedar.
						Black spruce	---	---	
						Northern whitecedar	---	---	
						Quaking aspen	50	43	
94F:									
Klacking	6S	Slight	Slight	Slight	Slight	Bigtooth aspen	70	86	Eastern white pine, red pine.
						Black cherry	---	---	
						Jack pine	---	---	
						Northern pin oak	---	---	
						Northern red oak	60	57	
						Quaking aspen	---	---	
						Red maple	---	---	
						Red pine	---	---	
						White oak	57	43	
McGinn	4S	Slight	Slight	Slight	Slight	Bigtooth aspen	---	---	Red pine, white spruce.
						Northern red oak	67	57	
						Red pine	---	---	
						White oak	65	57	
97:									
Colonville	3W	Slight	Severe	Slight	Moderate	American basswood	65	57	Norway spruce, eastern white pine, northern red oak, northern whitecedar, white spruce.
						Balsam fir	61	114	
						Northern whitecedar	45	72	
						Quaking aspen	---	---	
						Red maple	61	43	
						Swamp white oak	66	43	
						White ash	65	57	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume of wood fiber	Suggested trees to plant
113:									
Angelica-------	7W	Slight	Severe	Severe	Severe	Balsam fir----------	54	100	White spruce.
						Black ash-----------	---	---	
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	60	57	
						Yellow birch--------	---	---	
116C:									
Mancelona------	3S	Slight	Moderate	Moderate	Slight	Eastern white pine--	---	---	Eastern white pine, jack pine, red pine.
						Jack pine-----------	---	---	
						Northern red oak----	---	---	
						Red pine------------	---	---	
						Sugar maple---------	58	43	
						Yellow birch--------	---	---	
127:									
Cathro---------	5W	Slight	Severe	Severe	Severe	Balsam fir----------	40	72	White spruce.
						Black spruce--------	15	29	
						Northern whitecedar	15	29	
						Paper birch---------	---	---	
						Red maple-----------	40	29	
						Tamarack------------	35	29	
						White spruce--------	---	---	
128:									
Dawson---------	2W	Slight	Severe	Severe	Severe	Black spruce--------	15	29	---
						Tamarack------------	---	---	
145C, 145E:									
Rousseau-------	5S	Slight	Moderate	Moderate	Slight	Balsam fir----------	---	---	Jack pine, red pine.
						Bigtooth aspen------	66	72	
						Eastern hemlock-----	---	---	
						Jack pine-----------	62	86	
						Northern red oak----	---	---	
						Paper birch---------	65	72	
						Quaking aspen-------	65	72	
						Red maple-----------	60	43	
						Red pine------------	---	---	
						Yellow birch--------	---	---	
159A:									
Finch----------	4W	Slight	Severe	Moderate	Severe	Black spruce--------	38	43	Eastern white pine, red pine, white spruce.
						Eastern white pine--	53	100	
						Jack pine-----------	52	72	
						Northern red oak----	56	43	
						Paper birch---------	54	57	
						Quaking aspen-------	56	57	
						Red maple-----------	56	29	
166A:									
Slade----------	3W	Slight	Severe	Slight	Moderate	American basswood---	---	---	Black spruce, eastern white pine, white spruce.
						American elm--------	---	---	
						Bigtooth aspen------	---	---	
						Northern red oak----	64	57	
						Quaking aspen-------	---	---	
						Red maple-----------	65	43	
						Sugar maple---------	---	---	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume of wood fiber	Suggested trees to plant
300A:									
Hagensville----	3W	Slight	Severe	Moderate	Severe	Balsam fir----------	---	---	Norway spruce, eastern white pine, white spruce.
						Bigtooth aspen------	---	---	
						Black ash-----------	---	---	
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	65	43	
304A:									
Iosco----------	4W	Slight	Severe	Slight	Moderate	Balsam fir----------	55	114	Eastern white pine, red pine, white spruce.
						Northern red oak----	65	57	
						Paper birch---------	58	57	
						Quaking aspen-------	65	72	
						Red pine------------	---	---	
						Sugar maple---------	---	---	
						White ash-----------	---	---	
						Yellow birch--------	---	---	
305B:									
Johnswood------	3F	Slight	Moderate	Moderate	Severe	American basswood---	---	---	Norway spruce, eastern white pine, red pine, white spruce.
						American beech------	---	---	
						Balsam fir----------	---	---	
						Eastern hemlock-----	---	---	
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Sugar maple---------	65	43	
						White ash-----------	---	---	
308B, 308C, 308D:									
Krakow--------	3F	Slight	Moderate	Slight	Slight	American basswood---	---	---	Eastern white pine, red pine, white spruce.
						American beech------	---	---	
						Balsam fir----------	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Sugar maple---------	62	43	
						White ash-----------	---	---	
316:									
Ruse-----------	5W	Slight	Severe	Severe	Severe	Balsam fir----------	40	72	---
						Black spruce--------	---	---	
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						White ash-----------	---	---	
350E:									
Blue Lake------	3S	Slight	Moderate	Moderate	Slight	American basswood---	---	---	Eastern white pine, jack pine, red pine.
						American beech------	---	---	
						Bigtooth aspen------	---	---	
						Eastern hemlock-----	---	---	
						Eastern white pine--	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
						Sugar maple---------	64	43	
						Yellow birch--------	---	---	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume of wood fiber	Suggested trees to plant
359C:									
Algonquin------	6W	Slight	Severe	Moderate	Severe	Balsam fir----------	45	86	Eastern white pine, northern whitecedar, white spruce.
						Balsam poplar-------	---	---	
						Black ash-----------	---	---	
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
Negwegon-------	3C	Slight	Moderate	Slight	Moderate	American beech------	---	---	Eastern white pine, white spruce.
						Balsam fir----------	---	---	
						Bigtooth aspen------	---	---	
						Eastern hemlock-----	---	---	
						Northern red oak----	---	---	
						Sugar maple---------	62	43	
						White ash-----------	---	---	
Dorval---------	2W	Slight	Severe	Severe	Severe	American elm--------	---	---	Northern whitecedar, white spruce.
						Northern whitecedar	---	---	
						Red maple-----------	50	29	
						White ash-----------	---	---	
361B:									
Allendale------	4W	Slight	Severe	Slight	Moderate	Balsam fir----------	---	---	Eastern white pine, white spruce.
						Eastern white pine--	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	60	57	
						Red maple-----------	---	---	
						White ash-----------	---	---	
						White spruce--------	---	---	
Dorval---------	2W	Slight	Severe	Severe	Severe	American elm--------	---	---	Northern whitecedar, white spruce.
						Northern whitecedar	---	---	
						Red maple-----------	50	29	
						White ash-----------	---	---	
Blue Lake------	3S	Slight	Moderate	Moderate	Slight	American basswood---	---	---	Eastern white pine, jack pine, red pine.
						American beech------	---	---	
						Bigtooth aspen------	---	---	
						Eastern hemlock-----	---	---	
						Eastern white pine--	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
						Sugar maple---------	64	43	
						Yellow birch--------	---	---	
362D, 362E:									
Millersburg----	3A for 362D; 3R for 362E	Slight	Slight	Slight	Slight	Black cherry--------	---	---	Norway spruce, jack pine, red pine, white spruce.
						Eastern white pine--	---	---	
						Jack pine-----------	---	---	
						Northern red oak----	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
						Red pine------------	---	---	
						Sugar maple---------	65	43	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume of wood fiber	Suggested trees to plant
368A:									
Au Gres	6W	Slight	Severe	Moderate	Severe	Balsam fir	---	---	Norway spruce, eastern white pine, red pine, white spruce.
						Bigtooth aspen	---	---	
						Eastern hemlock	---	---	
						Eastern white pine	---	---	
						Jack pine	51	72	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	70	86	
						Red maple	65	43	
						Yellow birch	---	---	
Deford	4W	Slight	Severe	Severe	Severe	American basswood	---	---	Eastern white pine, white spruce.
						Balsam fir	---	---	
						Northern whitecedar	---	---	
						Quaking aspen	60	57	
						Red maple	64	43	
369:									
Deford	4W	Slight	Severe	Severe	Severe	American basswood	---	---	Eastern white pine, white spruce.
						Balsam fir	---	---	
						Northern whitecedar	---	---	
						Quaking aspen	60	57	
						Red maple	64	43	
371:									
Springport	6W	Slight	Severe	Severe	Severe	Balsam fir	45	86	Eastern white pine, northern whitecedar, white spruce.
						Balsam poplar	---	---	
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
373B:									
Grayling, very deep water table	4S	Slight	Moderate	Moderate	Slight	Jack pine	48	57	Jack pine, red pine.
						Northern pin oak	43	29	
374:									
Thunderbay	2W	Slight	Severe	Moderate	Severe	Black ash	---	---	---
						Red maple	40	29	
392:									
Caffey	2W	Slight	Severe	Severe	Severe	Balsam fir	---	---	---
						Bigtooth aspen	---	---	
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	40	29	
						Red maple	---	---	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume of wood fiber	Suggested trees to plant
393B, 393C:									
Morganlake	6S	Slight	Slight	Slight	Slight	American basswood	---	---	Eastern white pine, red pine, white spruce.
						Balsam fir	---	---	
						Bigtooth aspen	76	86	
						Black cherry	---	---	
						Northern red oak	63	57	
						Paper birch	---	---	
						Quaking aspen	74	86	
						Red pine	62	114	
						Sugar maple	---	---	
						Yellow birch	---	---	
396F:									
Proper	5W	Slight	Moderate	Moderate	Slight	Jack pine	---	---	Eastern white pine, red pine, white spruce.
						Quaking aspen	65	72	
						Red maple	---	---	
						Red pine	---	---	
Deford	4W	Slight	Severe	Severe	Severe	American basswood	---	---	Eastern white pine, white spruce.
						Balsam fir	---	---	
						Northern whitecedar	---	---	
						Quaking aspen	60	57	
						Red maple	64	43	
Rousseau	5S	Slight	Moderate	Moderate	Slight	Balsam fir	---	---	Jack pine, red pine.
						Bigtooth aspen	66	72	
						Eastern hemlock	---	---	
						Jack pine	62	86	
						Northern red oak	---	---	
						Paper birch	65	72	
						Quaking aspen	65	72	
						Red maple	60	43	
						Red pine	---	---	
						Yellow birch	---	---	
397:									
Spot	2W	Slight	Severe	Severe	Severe	Black spruce	---	---	---
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	39	29	
						Red maple	---	---	
						Tamarack	---	---	
414B:									
Namur	2D	Slight	Severe	Severe	Severe	Eastern white pine	38	72	Eastern white pine, red pine.
						Northern whitecedar	34	43	
						Sugar maple	49	29	
						White ash	56	29	
415A:									
Potagannissing	3W	Slight	Severe	Severe	Severe	Balsam fir	40	72	---
						Eastern white pine	---	---	
						Northern whitecedar	32	43	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Red pine	---	---	
						White spruce	---	---	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume of wood fiber	Suggested trees to plant
416B:									
Negwegon, till substratum----	3C	Slight	Moderate	Slight	Moderate	American beech------	---	---	Eastern white pine, white spruce.
						Balsam fir----------	---	---	
						Bigtooth aspen------	---	---	
						Eastern hemlock-----	---	---	
						Northern red oak----	---	---	
						Sugar maple---------	62	43	
						White ash-----------	---	---	
417B, 417C, 418E:									
Alpena--------	3F	Slight	Slight	Moderate	Slight	Balsam fir----------	---	---	Jack pine, red pine.
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Sugar maple---------	61	43	
						White spruce--------	---	---	
						Yellow birch--------	---	---	
419:									
Chippeny-------	4W	Slight	Severe	Severe	Severe	Balsam fir----------	35	57	---
						Black ash-----------	---	---	
						Black spruce--------	---	---	
						Eastern hemlock-----	---	---	
						Northern whitecedar	35	57	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
						Yellow birch--------	---	---	
420A:									
Otisco---------	---	Slight	Severe	Slight	Moderate	American elm--------	---	---	---
						Balsam fir----------	---	---	
						Bigtooth aspen------	65	72	
						Jack pine-----------	53	72	
						Quaking aspen-------	60	57	
						Red maple-----------	---	---	
						White spruce--------	---	---	
						Yellow birch--------	---	---	
424B, 424C:									
Morganlake-----	6S	Slight	Slight	Slight	Slight	American basswood---	---	---	Eastern white pine, red pine, white spruce.
						Balsam fir----------	---	---	
						Bigtooth aspen------	76	86	
						Black cherry--------	---	---	
						Northern red oak----	63	57	
						Paper birch---------	---	---	
						Quaking aspen-------	74	86	
						Red pine------------	62	114	
						Sugar maple---------	---	---	
						Yellow birch--------	---	---	
Ossineke, sandy substratum----	4	Slight	Moderate	Slight	Moderate	American basswood---	---	---	Norway spruce, eastern white pine, red pine, white spruce.
						Bigtooth aspen------	---	---	
						Eastern hemlock-----	---	---	
						Northern red oak----	65	57	
						Paper birch---------	---	---	
						Sugar maple---------	63	43	
						White ash-----------	---	---	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume of wood fiber	Suggested trees to plant
424B, 424C:									
Blue Lake	3S	Slight	Moderate	Moderate	Slight	American basswood	---	---	Eastern white pine, jack pine, red pine.
						American beech	---	---	
						Bigtooth aspen	---	---	
						Eastern hemlock	---	---	
						Eastern white pine	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
						Sugar maple	64	43	
						Yellow birch	---	---	
426B, 426C, 426D:									
Coppler	3A	Slight	Slight	Slight	Slight	Eastern white pine	---	---	Eastern white pine, red pine.
						Northern red oak	55	43	
						Paper birch	---	---	
						Quaking aspen	66	72	
						Red maple	---	---	
						Red pine	---	---	
451C:									
Annalake	3	Slight	Moderate	Slight	Slight	American basswood	---	---	Eastern white pine, red pine, white spruce.
						Balsam fir	---	---	
						Eastern hemlock	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
						Sugar maple	61	43	
						Yellow birch	---	---	
477B:									
Alginquin, till substratum	6W	Slight	Severe	Moderate	Severe	Balsam fir	45	86	Eastern white pine, northern whitecedar, white spruce.
						Balsam poplar	---	---	
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
Springport, till substratum	6W	Slight	Severe	Severe	Severe	Balsam fir	45	86	Eastern white pine, northern whitecedar, white spruce.
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
478:									
Springport, till substratum	6W	Slight	Severe	Severe	Severe	Balsam fir	45	86	Eastern white pine, northern whitecedar, white spruce.
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume of wood fiber	Suggested trees to plant
479A:									
Algonquin, till substratum	6W	Slight	Severe	Moderate	Severe	Balsam fir	45	86	Eastern white pine, northern whitecedar, white spruce.
						Balsam poplar	---	---	
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
480B:									
Negwegon	3C	Slight	Moderate	Slight	Moderate	American beech	---	---	Eastern white pine, white spruce.
						Balsam fir	---	---	
						Bigtooth aspen	---	---	
						Eastern hemlock	---	---	
						Northern red oak	---	---	
						Sugar maple	62	43	
						White ash	---	---	
Algonquin	6W	Slight	Severe	Moderate	Severe	Balsam fir	45	86	Eastern white pine, northern whitecedar, white spruce.
						Balsam poplar	---	---	
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
Lupton	2W	Slight	Severe	Severe	Severe	Balsam fir	46	86	---
						Black ash	---	---	
						Black spruce	20	29	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
						Tamarack	---	---	
						White spruce	---	---	
481C:									
Negwegon	3C	Slight	Moderate	Slight	Moderate	American beech	---	---	Eastern white pine, white spruce.
						Balsam fir	---	---	
						Bigtooth aspen	---	---	
						Eastern hemlock	---	---	
						Northern red oak	---	---	
						Sugar maple	62	43	
						White ash	---	---	
Lupton	2W	Slight	Severe	Severe	Severe	Balsam fir	46	86	---
						Black ash	---	---	
						Black spruce	20	29	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
						Tamarack	---	---	
						White spruce	---	---	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume of wood fiber	Suggested trees to plant
482B, 482C:									
Summerville----	2D	Slight	Moderate	Moderate	Severe	American beech------	---	---	Eastern white pine, northern whitecedar, white spruce.
						Balsam fir----------	---	---	
						Basswood-----------	---	---	
						Eastern white pine--	48	86	
						Northern whitecedar	---	---	
						Paper birch---------	53	57	
						Quaking aspen-------	---	---	
						Red pine------------	---	---	
						Sugar maple---------	57	29	
483A:									
Lachine--------	4W	Slight	Severe	Moderate	Severe	American basswood---	---	---	Eastern white pine, northern whitecedar.
						Bigtooth aspen------	---	---	
						Northern whitecedar	---	---	
						Paper birch---------	36	57	
						Quaking aspen-------	---	---	
						Red pine------------	---	---	
484A:									
Elcajon--------	4W	Slight	Severe	Slight	Moderate	American basswood---	---	---	Eastern white pine, white spruce.
						Balsam fir----------	---	---	
						Eastern white pine--	---	---	
						Sugar maple---------	61	43	
485A:									
Bowers---------	7W	Slight	Severe	Slight	Moderate	American basswood---	---	---	Norway spruce, eastern white pine, white spruce.
						Balsam fir----------	54	100	
						Northern red oak----	---	---	
						Quaking aspen-------	---	---	
						White ash-----------	---	---	
						Yellow birch--------	---	---	
486B:									
Tonkey---------	5W	Slight	Severe	Severe	Severe	American basswood---	55	43	---
						American elm--------	---	---	
						Balsam fir----------	---	---	
						Northern whitecedar	---	---	
						Quaking aspen-------	61	72	
						Red maple-----------	---	---	
						Swamp white oak-----	---	---	
Bowers---------	7W	Slight	Severe	Slight	Moderate	American basswood---	---	---	Norway spruce, eastern white pine, white spruce.
						Balsam fir----------	54	100	
						Northern red oak----	---	---	
						Quaking aspen-------	---	---	
						White ash-----------	---	---	
						Yellow birch--------	---	---	
487B:									
Slade----------	3W	Slight	Severe	Slight	Moderate	American basswood---	---	---	Black spruce, eastern white pine, white spruce.
						American elm--------	---	---	
						Bigtooth aspen------	---	---	
						Northern red oak----	64	57	
						Quaking aspen-------	---	---	
						Red maple-----------	65	43	
						Sugar maple---------	---	---	

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume of wood fiber	Suggested trees to plant
487B:									
Angelica	7W	Slight	Severe	Severe	Severe	Balsam fir	54	100	White spruce.
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	60	57	
						Yellow birch	---	---	
489F:									
Crowell	7R	Moderate	Moderate	Moderate	Slight	Bigtooth aspen	---	---	Red pine.
						Eastern white pine	---	---	
						Northern red oak	---	---	
						Red maple	---	---	
						Red pine	59	100	
Proper	5W	Slight	Moderate	Moderate	Slight	Jack pine	---	---	Eastern white pine, red pine, white spruce.
						Quaking aspen	65	72	
						Red maple	---	---	
						Red pine	---	---	

Table 9.--Equipment Limitations on Forestland

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that the soil was not rated.)

Map symbol and soil name	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid roads	Log landings	Haul roads		Logging areas and skid roads	Log landings	Haul roads
11B------------- Eastport	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
12B:							
Tawas----------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
Au Gres--------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
13:							
Tawas----------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
Lupton---------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
14:							
Dawson---------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
Loxley---------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
16B------------- Graycalm	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
16C, 16D*------- Graycalm	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Moderate: slope.	Slight.
16E------------- Graycalm	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
17A, 17B-------- Croswell	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
18A------------- Au Gres	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
19-------------- Leafriver	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
27A------------- Tacoda	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.

See footnotes at end of table.

Table 9.--Equipment Limitations on Forestland--Continued

Map symbol and soil name	Ratings for most limiting season(s): Logging areas and skid roads	Log landings	Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Log landings	Haul roads
28B------------- East Lake	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
28C------------- East Lake	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Moderate: slope.	Slight.
29A------------- Battlefield	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
30-------------- Wheatley	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
31B------------- Klacking	Slight--------	Slight--------	Slight--------	Year round-----	Slight--------	Slight--------	Slight.
31C, 31D**------ Klacking	Slight--------	Moderate: slope.	Slight--------	Year round-----	Slight--------	Moderate: slope.	Slight.
31E------------- Klacking	Moderate: slope.	Severe: slope.	Moderate: slope.	Year round-----	Moderate: slope.	Severe: slope.	Moderate: slope.
35-------------- Kinross	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
36B------------- Annalake	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Slight--------	Slight.
36C------------- Annalake	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Moderate: slope.	Slight.
37A, 37B-------- Richter	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
38-------------- Tonkey	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
41B------------- McGinn	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer,fall, winter.	Slight--------	Slight--------	Slight.
41C, 41D-------- McGinn	Moderate: low strength.	Moderate: slope.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Moderate: slope.	Slight.
41E------------- McGinn	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Summer, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
42A------------- Killmaster	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
43-------------- Wakeley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.

See footnotes at end of table.

Table 9.--Equipment Limitations on Forestland--Continued

Map symbol and soil name	Ratings for most limiting season(s): Logging areas and skid roads	Log landings	Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Log landings	Haul roads
44B------------- Ossineke	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Slight--------	Slight.
44C------------- Ossineke	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Moderate: slope.	Slight.
45B------------- Hoist	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Slight--------	Slight.
45C------------- Hoist	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Moderate: slope.	Slight.
46-------------- Ensley	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
47D*------------ Graycalm	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Moderate: slope.	Slight.
53B------------- Negwegon	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Slight--------	Slight.
53C------------- Negwegon	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Moderate: slope.	Slight.
54A------------- Algonquin	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
55-------------- Springport	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
57B------------- Kawkawlin	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
59B:							
Algonquin------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
Springport-----	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
62A------------- Allendale	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
63D------------- Bamfield	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Moderate: slope.	Slight.

See footnotes at end of table.

Table 9.--Equipment Limitations on Forestland--Continued

Map symbol and soil name	Ratings for most limiting season(s): Logging areas and skid roads	Log landings	Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Log landings	Haul roads
63E------------- Bamfield	Moderate: low strength, slope.	Severe: slope.	Moderate: low strength, slope.	Summer, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
68-------------- Rondeau	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
69-------------- Loxley	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
70-------------- Lupton	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
71-------------- Tawas	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
72-------------- Dorval	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
74C2------------ Negwegon	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Moderate: slope.	Slight.
75B------------- Rubicon	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall winter.	Slight--------	Slight--------	Slight.
75D*------------ Rubicon	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall winter.	Slight--------	Moderate: slope.	Slight.
75E------------- Rubicon	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
77-------------- Rollaway	Severe: wetness, low strength, flooding.	Severe: wetness, low strength, flooding.	Severe: wetness, low strength, flooding.	Winter---------	Slight--------	Slight--------	Slight.
84B------------- Zimmerman	Slight--------	Slight--------	Slight--------	Year round-----	Slight--------	Slight--------	Slight.
84C------------- Zimmerman	Slight--------	Moderate: slope.	Slight--------	Year round-----	Slight--------	Moderate: slope.	Slight.
84E------------- Zimmerman	Moderate: slope.	Severe: slope.	Moderate: slope.	Year round-----	Moderate: slope.	Moderate: slope.	Moderate: Slope
85D:							
Zimmerman**----	Slight---------	Moderate: slope.	Slight--------	Year round-----	Slight--------	Moderate: slope.	Slight.

See footnotes at end of table.

Table 9.--Equipment Limitations on Forestland--Continued

Map symbol and soil name	Ratings for most limiting season(s): Logging areas and skid roads	Ratings for most limiting season(s): Log landings	Ratings for most limiting season(s): Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Ratings for preferred operating season(s): Log landings	Ratings for preferred operating season(s): Haul roads
85D:							
Annalake	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Moderate: slope.	Slight.
87 Ausable	Severe: wetness, low strength, flooding.	Severe: wetness, low strength, flooding.	Severe: wetness, low strength, flooding.	Winter.	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
90B Chinwhisker	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
92B:							
Klacking	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
McGinn	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Spring, fall, winter.	Slight	Slight	Slight.
92C:							
Klacking	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope	Slight.
McGinn	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Spring, fall, winter	Slight	Moderate: slope	Slight.
93B:							
Tacoda	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
Wakeley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
94F:							
Klacking**	Severe: slope.	Severe: slope.	Severe: slope.	Spring, fall, winter.	Severe: slope.	Severe: slope.	Severe: slope.
McGinn**	Severe: slope.	Severe: slope.	Severe: slope.	Year round	Severe: slope.	Severe: slope.	Severe: slope.
97 Colonville	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
113 Angelica	Severe: low strength, wetness.	Severe: low strength, wetness.	Severe: low strength, wetness.	Summer, winter	Slight	Slight	Slight.
116C Mancelona	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight	Moderate: slope.	Slight.
127 Cathro	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.

See footnotes at end of table.

Table 9.--Equipment Limitations on Forestland--Continued

Map symbol and soil name	Ratings for most limiting season(s): Logging areas and skid roads	Log landings	Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Log landings	Haul roads
128------------- Dawson	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
145C------------ Rousseau	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall winter.	Slight--------	Moderate: slope.	Slight.
145E------------ Rousseau	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
159A------------ Finch	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
166A------------ Slade	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
300A------------ Hagensville	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe wetness, low strength.	Summer, fall, winter.	Slight--------	Slight--------	Slight.
304A------------ Iosco	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
305B------------ Johnswood	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall winter.	Slight--------	Slight--------	Slight.
308B------------ Krakow	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Slight--------	Slight.
308C, 308D*----- Krakow	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Moderate: slope.	Slight.
316------------- Ruse	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe wetness, low strength.	Summer, winter	Slight--------	Slight--------	Moderate: depth to rock.
350E------------ Blue Lake	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
359C:							
Algonquin------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
Negwegon-------	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Moderate: slope	Slight.
Dorval---------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.	Moderate: low strength.	Severe: low strength.	Moderate: low strength.

See footnotes at end of table.

Table 9.--Equipment Limitations on Forestland--Continued

Map symbol and soil name	Ratings for most limiting season(s): Logging areas and skid roads	Ratings for most limiting season(s): Log landings	Ratings for most limiting season(s): Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Ratings for preferred operating season(s): Log landings	Ratings for preferred operating season(s): Haul roads
361B:							
Allendale	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
Dorval	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
Blue Lake	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
362D: Millersburg	Moderate: low strength.	Moderate: low strength slope.	Moderate: low strength.	Summer, fall, winter.	Slight	Moderate: slope	Slight.
362E: Millersburg	Moderate: low strength, slope.	Severe: low strength slope.	Moderate: low strength, slope	Summer, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
368A:							
Au Gres	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
368A:							
Deford	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer.	Slight	Slight	Slight.
369: Deford	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer.	Slight	Slight	Slight.
371: Springport	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
373B: Grayling, very deep water table	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall winter.	Slight	Slight	Slight.
374: Thunderbay	Severe: wetness, low strength, flooding.	Severe: wetness, low strength, flooding.	Severe: wetness, low strength, flooding.	Summer, winter	Slight	Slight	Slight.
392: Caffey	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter	Slight	Slight	Slight.
393B: Morganlake	Slight	Slight	Slight	Year round.	Slight	Slight	Slight.
393C: Morganlake	Slight	Moderate: slope.	Slight	Year round.	Slight	Moderate: slope.	Slight.
396F:							
Proper	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall winter.	Slight	Slight	Slight.
Deford	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer.	Slight	Slight	Slight.

See footnotes at end of table.

Table 9.--Equipment Limitations on Forestland--Continued

Map symbol and soil name	Ratings for most limiting season(s): Logging areas and skid roads	Log landings	Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Log landings	Haul roads
396F:							
Rousseau	Severe: slope.	Severe: slope.	Severe: slope.	Spring, fall, winter.	Severe: slope.	Severe: slope.	Severe: slope.
397 Spot	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer.	Slight	Slight	Slight.
414B Namur	Moderate: low strength.	Moderate: low strength, depth to rock.	Severe: depth to rock.	Summer, fall, winter.	Slight	Moderate: depth to rock.	Severe: depth to rock
415A Potagannissing	Severe: wetness, low strength.	Severe: wetness, low strength.	Severve: wetness, low strength, depth to rock.	Summer, winter	Slight	Slight:	Severe: depth to rock.
416B Negwegon, till substratum	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
417B Alpena	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall winter.	Slight	Slight	Slight.
417C Alpena	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall winter.	Slight	Slight	Slight.
418E Alpena, esker	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
419 Chippeny	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength, depth to rock.
420A Otisco	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
424B:							
Morganlake	Slight	Slight	Slight	Year round.	Slight	Slight	Slight.
Ossineke, sandy substratum	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
Blue Lake	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
424C:							
Morganlake	Slight	Moderate: slope.	Slight	Year round.	Slight	Moderate: slope.	Slight.
Ossineke, sandy substratum	Moderate: low strength,	Moderate: low strength, slope.	Moderate: low strength,	Summer, fall, winter.	Slight	Moderate: slope.	Slight.

See footnotes at end of table.

Table 9.--Equipment Limitations on Forestland--Continued

Map symbol and soil name	Ratings for most limiting season(s): Logging areas and skid roads	Log landings	Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Log landings	Haul roads
424C:							
Blue Lake	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight	Moderate: slope.	Slight.
426B Coppler	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
426C, 426D Coppler	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.
451C Annalake	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Moderate: slope.	Slight.
477B:							
Algonquin, till substratum	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
Springport, till substratum	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
478 Springport, till substratum	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
479A Algonquin, till substratum	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
480B:							
Negwegon	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
Algonquin	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
Lupton	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
481C:							
Negwegon	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Moderate: slope.	Slight.
Lupton	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.

See footnotes at end of table.

Table 9.--Equipment Limitations on Forestland--Continued

Map symbol and soil name	Ratings for most limiting season(s): Logging areas and skid roads	Log landings	Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Log landings	Haul roads
482B------------ Summerville	Moderate: low strength.	Moderate: low strength	Severve: depth to rock.	Summer, fall, winter.	Slight--------	Slight--------	Severe: depth to rock.
482C------------ Summerville	Moderate: low strength.	Moderate: low strength, slope.	Severve: depth to rock.	Summer, fall, winter.	Slight--------	Moderate: depth to rock.	Severe: depth to rock.
483A------------ Lachine	Severe: wetness, low strength.	Severe: wetness, low strength.	Severve: wetness, low strength, depth to rock.	Summer, winter	Slight--------	Slight:	Severe: depth to rock.
484A------------ Elcajon	Severe: wetness, low strength.	Severe: wetness, low strength.	Severve: wetness, low strength.	Summer, winter	Slight--------	Slight:	Moderate: depth to rock.
485A------------ Bowers	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
486B:							
Tonkey---------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
Bowers---------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
487B:							
Slade----------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
Angelica-------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
489F:							
Crowell**------	Severe: slope, too sandy.	Severe: slope.	Severe: slope, too sandy.	Spring, fall, winter.	Severe: slope.	Severe: slope.	Severe: slope.
Proper---------	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall winter.	Slight--------	Slight--------	Slight.

* Some areas of the soil may be rated “Severe.”
** Some areas of the soil may be rated “Moderate.”

Table 10.--Plant Communities on Selected Soils

(Absence of an entry indicates that information was not available.)

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
11B--------------------	E. white pine-------3	E. white pine-------2		Brackenfern---------4	Huckleberry spp.-----3
Eastport sand	Paper birch---------3	Red maple-----------2		Running pine--------2	Wintergreen----------3
	Red maple-----------3				Bearberry------------2
	Northern red oak----2				Lowbush blueberry----2
	Quaking aspen				Canada mayflower-----2
					Wild sarsaparilla----2
					Starflower-----------2
					Grass spp.-----------2
12B:					
Tawas-----------------	N. whitecedar-------5		Speckled alder------2	Brackenfern---------1	Sedge spp.-----------5
	Black ash-----------4				Grass spp.-----------4
	Paper birch---------2				Goldthread-----------4
	Red maple-----------2				Sphagnum moss--------3
	Black spruce--------2				Goldenrod spp.-------3
					Bramble spp.---------2
					Horsetail spp.-------2
Au Gres---------------	E. white pine-------5	Red maple-----------4	Witchhazel----------2	Brackenfern---------5	Lowbush blueberry----5
	Red maple-----------4	Northern red oak----2			Wintergreen----------5
	Red pine------------4	Balsam fir----------2		Shining clubmoss----2	Largeleaf aster------4
	Jack pine-----------4	White spruce--------1			Canada mayflower-----4
	Quaking aspen-------3				Bunchberry-----------4
	Paper birch---------3				Wild strawberry------3
	Black spruce--------3				Sheep laurel---------3
	Balsam fir----------3				Starflower-----------3
	White spruce--------2				Violet spp.----------2
	Northern red oak----2				Yellow beadlily------2
					Bedstraw spp.--------2
					Canada blueberry-----2
					Bramble spp.---------2
					Cowwheat-------------2
					Gaywings-------------2
					Grass spp.-----------2
					Sphagnum moss--------2
					Pyrola spp.----------2
					Barren strawberry----1

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
13-------------------- Tawas-Lupton mucks	N. whitecedar-------5 Balsam fir----------3 Black spruce--------3 Paper birch---------2 Quaking aspen-------1 Balsam poplar-------1 Red maple-----------1	Balsam fir----------3 Northern red oak----2 Balsam poplar-------1 Black cherry--------1 Red maple-----------1 Black ash-----------1 American elm--------1 N. whitecedar-------1 Black spruce--------1	Alternateleaf dogwood-----------1 Redosier dogwood-----------1 Silky dogwood-------1 Speckled alder------1 American fly honeysuckle--------1	Oak fern-----------3 Cinnamon fern-------2 Sensitive fern------2 Shield fern---------2 Rattlesnake fern----1 Shining clubmoss----1	Dwarf enchanters nightshade---------4 Dewberry spp.--------3 Goldthread-----------3 Miterwort spp.-------3 Sphagnum moss--------3 Starflower-----------3 Canada mayflower-----3 Yellow beadlily------3 Bedstraw spp.--------2 Canada blueberry-----2 Jewelweed------------2 Labrador tea---------2 Sedge spp.-----------2 Sheep laurel---------2 Violet spp.----------2 Creeping wintergreen---------2 Huckleberry spp.-----2 Baneberry------------1 Lowbush blueberry----1 Poison ivy-----------1 Currant spp.---------1 Wild strawberry------1 Grass spp.-----------1 Horsetail spp.-------1
14-------------------- Dawson-Loxley peats	Black spruce--------3 Tamarack------------3 Jack pine-----------2 E. white pine-------1 Red pine------------1	Black spruce--------3 Jack pine-----------2 E. white pine-------1	Leatherleaf---------5 Swamp birch---------3 Speckled alder------2 Willow spp.---------1		Pale laurel----------5 Sphagnum moss--------4 Bog rosemary---------4 Cranberry SSP.-------4 Sedge spp.-----------4 Moss spp.------------3 Lowbush blueberry----3 Labrador tea---------3 Pitcherplant---------2 Yellow beadlily------1 Sundew spp.----------1
16B, 16C, 16E---------- Graycalm sand	Bigtooth aspen------4 Northern red oak----2 White ash-----------2 Red maple-----------2 Sugar maple---------2 Red pine------------1 E. white pine-------1		Witchhazel----------3		Grass spp.-----------2 Lowbush blueberry----2 Lichen spp.----------2

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
17A, 17B---------------	Red pine------------6		Serviceberry--------3	Brackenfern---------3	Grass spp.-----------6
Croswell sand	Red maple-----------4				Lowbush blueberry----5
	Bigtooth aspen------3				Canada mayflower-----5
	E. white pine-------3				Wintergreen---------
	Northern red oak----2				
18A--------------------	E. white pine-------5	Red maple-----------4	Witchhazel----------2	Brackenfern---------5	Lowbush blueberry----5
Au Gres sand	Red maple-----------4	Northern red oak----2			Wintergreen----------5
	Red pine------------4	Balsam fir----------2		Shining clubmoss----2	Largeleaf aster------4
	Jack pine-----------4	White spruce--------1			Canada mayflower-----4
	Quaking aspen-------3				Bunchberry-----------4
	Paper birch---------3				Sheep laurel---------3
	Black spruce--------3				Yellow beadlily------3
	Balsam fir----------3				Starflower-----------3
	White spruce--------2				Wild strawberry------3
	Northern red oak----2				Violet spp.----------2
					Bedstraw spp.--------2
					Canada blueberry-----2
					Bramble spp.---------2
					Cowwheat-------------2
					Gaywings-------------2
					Grass spp.-----------2
					Sphagnum moss--------2
					Pyrola spp.----------2
					Barren strawberry----1
19---------------------	N. whitecedar-------4	Red maple-----------3	Redosier dogwood----2	Cinnamon fern-------2	Goldthread-----------3
Leafriver muck	Black ash-----------4				Sedge spp.-----------3
	Red maple-----------3				Dewberry spp.--------3
	Paper birch---------3				Grass spp.-----------3
					Jewelweed------------2
27A--------------------	Red maple-----------3	Red maple-----------3	Serviceberry--------3	Brackenfern---------3	Pale laurel----------3
Tacoda sand	Quaking aspen-------3	Red pine------------3			Canada mayflower-----3
	Red pine------------2	Balsam fir----------2		Common clubmoss-----3	Starflower-----------3
	E. white pine-------2			Ground clubmoss-----2	Lowbush blueberry----3
	Balsam fir----------2				Bunchberry-----------3
	Paper birch---------2				Pyrola spp.----------2
					Wintergreen----------2
					Grass spp.-----------2

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
28B-------------------- East Lake sand	Red pine-----------5 Northern red oak----4 Jack pine----------3	Red maple----------3	Serviceberry--------3	Brackenfern---------6	Wintergreen----------5 Grass spp.-----------4 Canada mayflower-----4 Largeleaf aster------4 Lowbush blueberry----3 Wood betony----------2 Canada blueberry-----2
29A-------------------- Battlefield sand	Red maple----------3 Paper birch---------3 Balsam fir---------3 White ash----------2 Eastern hemlock-----1	Red maple----------3		Brackenfern---------4 Running pine--------2	Grass spp.-----------4 Wintergreen----------2 Canada mayflower-----2 Canada blueberry-----2
30--------------------- Wheatley muck	N. whitecedar-------4 Red maple----------3	Red maple----------3	Speckled alder------3 Redosier dogwood----3 Highbush cranberry--1	Cinnamon fern-------3	Sedge spp.-----------5 Labrador tea---------3 Goldthread-----------3 Dewberry spp.--------3
31B, 31C, 31D, 31E----- Klacking loamy sand	Bigtooth aspen------4 Northern red oak----4 E. white pine-------1 Red maple----------1	Red maple----------3 E. white pine-------1	Serviceberry--------2 Witchhazel----------2	Brackenfern---------6	Grass spp.-----------3 Wintergreen----------3 Largeleaf aster------3 Trailing arbutus-----2 Sweetfern------------2
35--------------------- Kinross muck	Quaking aspen-------2 Jack pine----------2 Red pine-----------2	Jack pine----------3 Quaking aspen-------2 Red maple----------2 Red pine-----------2 Jack pine----------2	Leatherleaf---------7 Speckled alder------4		Sphagnum moss--------7 Canada blueberry-----6 Wintergreen----------6 Sheep laurel---------3
36B, 36C--------------- Annalake loamy very fine sand	White oak----------5 Northern red oak----4 Red maple----------4 American beech------3 Paper birch---------3	Red maple----------3	Gray dogwood--------3	Brackenfern---------6	Grass spp.-----------7 Sweetfern------------5 Goldenrod spp.-------5 Yarrow---------------4
37A, 37B--------------- Richter loamy fine sand	E. white pine-------3 Paper birch---------3 Balsam fir---------2	Balsam fir---------4 E. white pine-------3 Red maple----------3	Gray dogwood--------2	Brackenfern---------3	Canada mayflower-----3 Gaywings-------------2 Grass spp.-----------2 Sedge spp.-----------1

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
38---------------------	N. whitecedar-------5	Black ash-----------3	Speckled alder------4		Goldthread-----------6
Tonkey silt loam	Black ash-----------3	N. whitecedar-------3			Sedge spp.-----------5
	White spruce--------1	Red maple-----------2			Bunchberry-----------4
					Horsetail spp.-------3
					Cattail spp.---------2
					Poison ivy-----------2
41B, 41C, 41D, 41E-----	Northern red oak----5	Northern red oak----4		Brackenfern---------4	Lowbush blueberry----3
McGinn loamy sand	Bigtooth aspen------2	White ash-----------2			Sweetfern------------1
	Red maple-----------2	Red maple-----------1		Groundpine----------2	
	E. white pine-------1				
42A--------------------	E. white pine-------3	Balsam fir----------4	Gray dogwood--------2	Brackenfern---------3	Canada mayflower-----3
Killmaster sandy loam	Paper birch---------3	E. white pine-------3			Gaywings-------------2
	Balsam fir----------2	Red maple-----------3			Grass spp.-----------2
					Sedge spp.-----------1
43---------------------	N. whitecedar-------3		Speckled alder------3		Sedge spp.-----------3
Wakeley mucky sand	Black ash-----------2				
	Black spruce--------1				
44B, 44C---------------	Northern red oak----4	White ash-----------4	Serviceberry--------3	Rattlesnake fern----2	Trout lily-----------5
Ossineke fine sandy loam	Sugar maple---------4	American basswood---3	Red elderberry------1		Grass spp.-----------4
	American basswood --3	Red maple-----------3	Witchhazel----------1	Ground cedar--------3	Dutchmans breeches---3
	American beech------3	Sugar maple---------3			Sedge spp.-----------3
	White ash-----------3	Northern red oak----2			Spring beauty--------3
	Bigtooth aspen------2	Hophornbeam---------2			Trillium spp.--------3
	Paper birch---------2				Downy yellow violet--3
	Red maple-----------2				Smooth yellow violet-------------3
	Hophornbeam---------2				White lettuce--------2
	Eastern hemlock-----1				Bedstraw-------------2
					Largeleaf aster------2
					Pyrola spp.----------2
					Sweet cicely---------2
					Canada mayflower-----2
					Gaywings-------------2
					Bellwort spp.--------1
					False Solomons seal----------------1
45B, 45C---------------	E. white pine-------3			Brackenfern--------4	
Hoist sandy loam	Red maple-----------3				
	Northern red oak----3				
	American beech------2				

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
46--------------------- Ensley mucky sandy loam	N. whitecedar-------4 Balsam fir---------3 Black spruce--------2		Speckled alder------2		Grass spp.-----------3
47D-------------------- Graycalm sand	Jack pine-----------6 Bigtooth aspen------4 Black oak-----------4 Quaking aspen-------3 Paper birch---------3 Black cherry--------3 Red maple-----------3 Red pine------------3 Northern red oak----2 White oak-----------1 E. white pine-------1	Jack pine-----------4 Quaking aspen-------3 Red maple-----------3 Paper birch---------2 Black cherry--------2 Sugar maple---------2 Northern red oak----2 Hophornbeam---------2 E. white pine-------2 Red pine------------2 Bigtooth aspen------1 White oak-----------1	Silky dogwood-------3 Mapleleaf viburnum-----------3 Serviceberry--------2 Witchhazel----------2 Northern bush honeysuckle--------1 Hawthorne spp.------1	Brackenfern---------4 Ground cedar--------1	Lowbush blueberry----3 Grass spp.-----------3 Blue cladonia--------3 False Solomons seal----------------3 Reindeer lichen------3 Huckleberry spp.-----2 Canada blueberry-----2 Gaywings-------------2 Largeleaf aster------2 Starflower-----------2 Sweetfern------------2 Wintergreen----------2 Wood anemone---------2 Canada mayflower-----1 Bramble spp.---------1 Cowwheat-------------1 Hairy Solomons seal----------------1 Indian pipe----------1 Moss spp.------------1 Rosy twistedstalk----1 Sedge spp.-----------1
53B, 53C--------------- Negwegon silt loam	E. white pine-------5 Sugar maple---------4				Grass spp.-----------5 Goldenrod spp.-------4 Violet spp.----------3
54A-------------------- Algonquin silt loam	Quaking aspen-------5 White spruce--------3 American basswood---1 White ash-----------1	White ash-----------4 American basswood---1 Quaking aspen-------1 Red maple-----------1 American elm--------1 White spruce--------1	Hawthorne spp.------1 Serviceberry--------1	Brackenfern---------3 Rattlesnake fern----1 Shield fern---------1	Grass spp.-----------6 Goldenrod spp.-------4 Dewberry spp.--------4 Bunchberry-----------3 Wood anemone---------3 Miterwort spp.-------3 Poison ivy-----------2 Bedstraw spp.--------2 Gaywings-------------2 Hepatica spp.--------2 Largeleaf aster------2 Violet spp.----------2 Wild sarsaparilla----2 Columbine------------1 Horsetail spp.-------1

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
57B---------------------	Quaking aspen-------5	White ash-----------4	Hawthorne spp.------1	Brackenfern---------3	Grass spp.-----------6
Kawkawlin loam	White spruce--------3	American basswood --1	Serviceberry--------1	Rattlesnake fern----1	Goldenrod spp.-------4
	American basswood---1	Quaking aspen-------1		Shield fern---------1	Dewberry spp.--------4
	White ash-----------1	Red maple-----------1			Bunchberry-----------3
		American elm--------1			Palmate-leaf coltsfoot---------- 3
		White spruce--------1			Wood anemone---------3
					Miterwort spp.-------3
					Bedstraw spp.--------2
					Gaywings-------------2
					Hepatica spp.--------2
					Largeleaf aster------2
					Violet spp.----------2
					Poison ivy-----------2
					Columbine------------1
					Horsetail spp.-------1
62A---------------------	White spruce--------4			Brackenfern--------4	Goldenrod spp.-------3
Allendale loamy sand	Balsam fir----------1				
63D, 63E----------------	American beech------3	American beech------3			
Bamfield fine sandy loam	Northern red oak----3				
	Red maple-----------3				
	Bigtooth aspen------2				
68----------------------	Balsam poplar-------5				Grass spp.-----------7
Rondeau muck	N. whitecedar-------4				Stinging nettle------6
					Goldenrod spp.-------6
69----------------------	Black spruce--------4		Leatherleaf--------4		Sphagnum moss--------6
Loxley peat	E. white pine-------3				Pale laurel----------4
	Tamarack------------3				Bog rosemary---------3
	Jack pine-----------2				Sedge spp.-----------2
	Paper birch---------1				
70----------------------	N. whitecedar-------5		Redosier dogwood----2	Cinnamon fern-------2	Grass spp.-----------4
Lupton muck	Black ash-----------3		Speckled alder------2		Sedge spp.-----------3
	Black spruce--------3				Sphagnum moss--------3
	Tamarack------------3				Miterwort spp.-------3
	Paper birch---------2				Starflower-----------2
	Balsam fir----------2				Goldthread-----------2
	Quaking aspen-------1				Bunchberry-----------2

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
71-------------------- Tawas muck	N. whitecedar-------5 Black ash-----------4 Paper birch---------2 Red maple-----------2 Black spruce--------2		Speckled alder------2		Sedge spp.-----------5 Grass spp.-----------4 Goldthread-----------4 Sphagnum moss--------3 Goldenrod spp.-------3 Bramble spp.---------2 Horsetail spp.-------2
72-------------------- Dorval muck	Black ash-----------3		Speckled alder------2		Sedge spp.-----------2
75B, 75D, 75E--------- Rubicon sand	Red pine------------6 Northern red oak----4 E. white pine-------3 Balsam fir----------2	Northern red oak----3 Red maple-----------3 Chokecherry---------2	Serviceberry--------2	Brackenfern---------6	Sweetfern------------4 Wintergreen----------4 Cowwheat-------------3 Bearberry------------3 Canada mayflower-----2 Grass spp.-----------2 Starflower---------- 2 Lowbush blueberry----2
77-------------------- Rollaway muck	Bigtooth aspen------1 Black spruce--------1		Speckled alder------3		Grass spp.-----------7 Bulrush spp.---------1 Cattail spp.---------1
84B, 84C, 84E--------- Zimmerman loamy fine sand	E. white pine-------4 American beech------3 Bigtooth aspen------3 Northern red oak----3 Red maple-----------3	American beech------2 Northern red oak----2 Red maple-----------2		Brackenfern---------3	Grass spp.-----------3 Lowbush blueberry----3 Cowwheat-------------2
85D------------------- Zimmerman-Annalake	E. white pine-------4 American beech------3 Bigtooth aspen------3 Northern red oak----3 Red maple-----------3	American beech------2 Northern red oak----2 Red maple-----------2		Brackenfern---------4	Grass spp.-----------3 Lowbush blueberry----3 Cowwheat-------------2
86*------------------- Histosols and Aquents, ponded.			Speckled alder------5		Cattail spp.---------5 Bulrush spp.---------5
87-------------------- Ausable muck	N. whitecedar-------4 Paper birch---------3 Black ash-----------3		Speckled alder------3		Sedge spp.-----------5 Horsetail spp.-------3

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
90B-------------------	Jack pine-----------5	Quaking aspen------5		Brackenfern---------5	Sweetfern-----------4
Chinwhisker sand	Quaking aspen-------4				Lowbush blueberry----4
	Northern red oak----4				
	Bigtooth aspen------4				
	White oak-----------3				
	Balsam fir----------2				
92B, 92C---------------	Northern red oak----4	Northern red oak----2	Serviceberry--------2	Brackenfern---------5	Grass spp.-----------3
Klacking-McGinn loamy	Bigtooth aspen------3	Red maple-----------2	Witchhazel----------2		Wintergreen----------3
sands	E. white pine-------1	E. white pine-------1		Groundpine----------2	Largeleaf aster----- 3
	Red maple-----------1	White ash-----------1			Lowbush blueberry----3
					Trailing arbutus-----2
					Sweetfern-----------2
93B:					
Tacoda---------------	Quaking aspen-------3	Red maple-----------3	Serviceberry--------3	Brackenfern---------3	Bunchberry-----------3
	Red maple-----------3	Red pine------------2			Canada mayflower-----3
	Red pine------------2	Balsam fir----------2		Common clubmoss-----3	Starflower-----------3
	E. white pine-------2			Ground cedar--------2	Lowbush blueberry----3
	Balsam fir----------2				Pyrola spp.----------2
	Paper birch---------2				Wintergreen----------2
					Grass spp.-----------2
Wakeley---------------	N. whitecedar-------3		Speckled alder------3		Sedge spp.-----------3
	Black ash-----------2				
	Black spruce--------1				
94F-------------------	Northern red oak----4	Northern red oak----2	Serviceberry--------2	Brackenfern---------5	Grass spp.-----------3
Klacking-McGinn loamy	Bigtooth aspen------3	Red maple-----------2	Witchhazel----------2		Wintergreen----------3
sands	E. white pine-------1	E. white pine-------1		Groundpine----------2	Largeleaf aster----- 3
	Red maple-----------1	White ash-----------1			Lowbush blueberry----3
					Trailing arbutus-----2
					Sweetfern-----------2
97--------------------	Silver maple--------5			Cinnamon fern-------6	Sedge spp.-----------5
Colonville very fine	N. whitecedar-------3				Columbine-----------3
sandy loam,					
occasionally flooded					
113-------------------	Red maple-----------4	Black ash-----------3	Speckled alder------3		Sedge spp.-----------5
Angelica loam	Balsam poplar-------3	Red maple-----------3	Willow spp.---------2		Horsetail spp.--------3
	Balsam fir----------3	N. whitecedar-------2			Jack-in-the-pulpit---2
	Black ash-----------3				
	N. whitecedar-------3				
	Quaking aspen-------2				

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
116C: Mancelona sand	Bigtooth aspen------5	Sugar maple---------4	Silky dogwood-------3	Brackenfern---------4	Trout lily-----------4
	Sugar maple---------4	Black cherry--------3	Mapleleaf viburnum-----------3	Shield fern---------2	Bramble spp.---------3
	American basswood---3	White oak-----------3	Hawthorne spp.------2		Grass spp.-----------3
	White ash-----------3	Chokecherry---------2	Serviceberry--------2		Largeleaf aster------3
	Quaking aspen-------3	Red maple-----------2	Striped maple-------2		Trillium spp.--------3
	Paper birch---------3	Northern red oak----2	Witchhazel----------2		Wintergreen----------3
	Red pine------------3	American basswood---1	Beaked hazelnut-----1		False Solomons seal----------------2
	Northern red oak----3	American beech------1			Hairy Solomons seal----------------2
	White oak-----------2	Bigtooth aspen------1			Hepatica spp.--------2
	Red maple-----------2				Moss spp.------------2
	Eastern hemlock-----1				Wild sarsaparilla----2
	American beech------1				Partridgeberry-------2
					Sedge spp.-----------2
					Sweetfern------------2
					Canada mayflower-----2
					Bedstraw spp.--------1
					Currant spp.---------1
					Sweet cicely---------1
					Pyrola spp.----------1
					Rosy twistedstalk----1
					White lettuce--------1
127: Cathro muck	Black ash-----------5	Black ash-----------2	Willow spp.---------5		Sedge spp.-----------7
	N. whitecedar-------5		Speckled alder------3		Grass spp.-----------6
	Paper birch---------4		Redosier dogwood----2		Goldenrod spp.-------6
	Quaking aspen-------3				Horsetail spp.-------3
	Balsam fir----------2				Sphagnum moss--------3
					White Canada violet--------------3
128: Dawson peat	Tamarack------------6	White pine----------1	Leatherleaf---------6		Sphagnum moss--------6
	E. white pine-------2				Sedge spp.-----------4
	Black spruce				Pale laurel----------3
					Blueberry spp.-------3
					Labrador tea---------3
145C, 145E: Rousseau fine sand	Red pine------------6	Red maple-----------2	Serviceberry--------2	Brackenfern---------6	Huckleberry spp.-----6
	E. white pine-------4	E. white pine-------2			Grass spp.-----------6
	Bigtooth aspen------3				Canada blueberry-----4
	Quaking aspen-------3				Pyrola spp.----------4
	Northern red oak----3				Wintergreen----------3
	Jack pine-----------3				Canada mayflower-----2
	Balsam fir----------3				Wild strawberry------2
	Red maple-----------3				Starflower-----------2

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
159A------------------	E. white pine-------5	Red maple-----------3	Serviceberry--------2	Brackenfern---------5	Canada blueberry-----3
Finch sand	Red maple-----------4	Balsam fir----------3	Honeysuckle spp.----1		Lowbush blueberry----3
	Red pine------------3	Red pine------------2			Sheep laurel---------3
	Quaking aspen-------2	E. white pine-------1			Bunchberry-----------3
	Paper birch---------2				Sphagnum moss--------3
	Jack pine-----------2				Canada mayflower-----3
	Tamarack------------2				Wintergreen----------3
	Black spruce--------1				Grass spp.-----------3
					Yarrow---------------2
					Pyrola spp.----------2
					Starflower-----------2
166A------------------	Quaking aspen-------3	Red maple-----------3	Witchhazel----------4		Bunchberry-----------4
Slade loam	Paper birch---------3	Black ash-----------2	Speckled alder------1		Wild strawberry------4
	White spruce--------2	White spruce--------2			Canada mayflower-----3
	Black ash-----------2				Grass spp.-----------3
	Red maple-----------1				Violet spp.----------2
300A------------------	Quaking aspen-------5	Red maple-----------3		Brackenfern---------4	Bunchberry-----------3
Hagensville fine sandy loam	Balsam fir----------2	Balsam fir----------1			Sedge spp.-----------3
	Paper birch---------2			Groundpine----------3	Grass spp.-----------2
	Red maple-----------2				
304A------------------	Quaking aspen-------5	E. white pine-------2	Speckled alder------3	Brackenfern---------6	Grass spp.-----------6
Iosco loamy sand	Red maple-----------4				Bramble spp.---------4
	Balsam fir----------4				Bunchberry-----------4
	E. white pine-------3				Cinquefoil spp.------3
	N. whitecedar-------3				Goldenrod spp.-------3
	Northern red oak----2				Aster spp.-----------3
					Canada blueberry-----2
					Sweetfern------------2
					Wild bergamot--------2
					Wintergreen----------2
					Canada mayflower-----2
					Hawkweed spp.--------1
305B------------------	Balsam fir----------4	Red maple-----------3	Dogwood spp.--------3	Brackenfern---------3	Grass spp.-----------2
Johnswood very flaggy loam	Sugar maple---------3	Balsam fir----------2	Buffaloberry--------2		Pyrola spp.----------2
	American basswood---3	Sugar maple---------2			Violet spp.----------2
	Bigtooth aspen------3				Gaywings-------------1
	Quaking aspen-------3				
	Paper birch---------2				
	E. white pine-------2				

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
308B, 308C, 308D------- Krakow flaggy fine sandy loam	Sugar maple---------4 Northern red oak----3 Paper birch---------3 White ash-----------3 American basswood---3 American beech------3 Balsam fir----------2	Red maple-----------3 White ash-----------3 Northern red oak----1	Dogwood spp.--------2 Witchhazel----------2 Buffaloberry--------1 Northern arrowwood--1	Brackenfern---------4 Ladyfern------------2	Canada mayflower-----4 Grass spp.-----------3 Violet spp.----------3 Solomons seal spp.---2 Baneberry spp.-------1
316------------------- Ruse loam	Quaking aspen-------5 N. whitecedar-------4 Black ash-----------3 Paper birch---------2 Balsam fir----------2 N. whitecedar-------2	Red maple-----------2 Balsam fir----------2	Speckled alder------3 Redosier dogwood---3	Brackenfern---------3	Sedge spp.-----------4 Wintergreen----------1
350E------------------ Blue Lake sand	Quaking aspen-------5 Sugar maple---------4 Paper birch---------4 American basswood---3 American beech------3 Red maple-----------3 Hophornbeam---------3 Northern red oak----2 White ash-----------1 Yellow birch--------1	Sugar maple---------3 Red maple-----------3 Hophornbeam---------3 White ash-----------2 Northern red oak----2 American beech------1 Quaking aspen-------1 Paper birch---------1 Black cherry--------1	Striped maple-------4 Serviceberry spp.---2 Rose spp.-----------2	Brackenfern---------4	Largeleaf aster------4 Wintergreen----------4 Canada blueberry-----3 Lowbush blueberry----3 Grass spp.-----------3 Bramble spp.---------3 Sedge spp.-----------3 Canada mayflower-----3 Blue cohosh----------2 Bearberry------------2 Bedstraw spp.--------2 Pyrola spp.----------2 Wild strawberry------2 Prince's pine--------1 False Solomons seal----------------1 Violet spp.----------1

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
359C:					
Algonquin-------------	Quaking aspen-------5	White ash-----------4	Hawthorne spp.------1	Brackenfern---------3	Grass spp.-----------6
	White spruce--------3	American basswood---1	Serviceberry--------1	Rattlesnake fern----1	Goldenrod spp.-------4
	American basswood---1	Quaking aspen-------1		Shield fern---------1	Dewberry spp.--------4
	White ash-----------1	Red maple-----------1			Bunchberry-----------3
		American elm--------1			Wood anemone---------3
		White spruce--------1			Miterwort spp.-------3
					Poison ivy-----------2
					Bedstraw spp.--------2
					Gaywings-------------2
					Hepatica spp.--------2
					Largeleaf aster------2
					Violet spp.----------2
					Wild sarsaparilla----2
					Columbine------------1
					Horsetail spp.-------1
Negwegon--------------	E. white pine-------5				Grass spp.-----------5
	Sugar maple---------4				Goldenrod spp.-------4
					Violet spp.----------3
Dorval----------------	Black ash-----------5	Black ash-----------2	Willow spp.---------5		Sedge spp.-----------7
	N. whitecedar-------5		Speckled alder------3		Grass spp.-----------6
	Paper birch---------4		Redosier dogwood----2		Goldenrod spp.-------6
	Quaking aspen-------3				Horsetail spp.-------3
	Balsam fir----------2				Sphagnum moss--------3
					White Canada violet--------------3
361B:					
Algonquin-------------	Quaking aspen-------5	White ash-----------4	Hawthorne spp.------1	Brackenfern---------3	Grass spp.-----------6
	White spruce--------3	American basswood---1	Serviceberry--------1	Rattlesnake fern----1	Goldenrod spp.-------4
	American basswood---1	Quaking aspen-------1		Shield fern---------1	Dewberry spp.--------4
	White ash-----------1	Red maple-----------1			Bunchberry-----------3
		American elm--------1			Wood anemone---------3
		White spruce--------1			Miterwort spp.-------3
					Poison ivy-----------2
					Bedstraw spp.--------2
					Gaywings-------------2
					Hepatica spp.--------2
					Largeleaf aster------2
					Violet spp.----------2
					Wild sarsaparilla----2
					Columbine------------1
					Horsetail spp.-------1

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
361B:					
Dorval----------------	Black ash----------5	Black ash----------2	Willow spp.---------5		Sedge spp.-----------7
	N. whitecedar-------5		Speckled alder------3		Grass spp.-----------6
	Paper birch---------4		Redosier dogwood----2		Goldenrod spp.-------6
	Quaking aspen-------3				Horsetail spp.-------3
	Balsam fir---------2				Sphagnum moss--------3
					White Canada violet-------------3
Blue Lake-------------	Quaking aspen-------5	Sugar maple---------3	Striped maple-------4	Brackenfern---------4	Largeleaf aster------4
	Sugar maple---------4	Red maple-----------3	Serviceberry spp.---2		Wintergreen----------4
	Paper birch---------4	Hophornbeam---------3	Rose spp.-----------2		Canada blueberry-----3
	American basswood---3	White ash-----------2			Lowbush blueberry----3
	American beech------3	Northern red oak----2			Grass spp.-----------3
	Red maple-----------3	American beech------1			Bramble spp.---------3
	Hophornbeam---------3	Quaking aspen-------1			Sedge spp.-----------3
	Northern red oak----2	Paper birch---------1			Canada mayflower-----3
	White ash-----------1	Black cherry--------1			Blue cohosh----------2
	Yellow birch--------1				Bearberry------------2
					Bedstraw spp.--------2
					Pyrola spp.----------2
					Wild strawberry------2
					Prince's pine--------1
					False Solomons seal----------------1
					Violet spp.----------1

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
362D, 362E-------------	Sugar maple---------4	Sugar maple---------4	Beaked hazelnut-----3	Brackenfern---------4	Trout lily-----------4
Millersburg loamy sand	American basswood---3	American beech------3	Mapleleaf	Ladyfern------------1	Squirrel corn--------3
	American beech------3	White ash-----------3	viburnum-----------2	Long beechfern------1	Lowbush blueberry----3
	Bigtooth aspen------3	Red maple-----------3	Serviceberry--------2	Rattlesnake fern----1	Grass spp.-----------3
	Northern red oak----3	American basswood 2	Striped maple-------2	Shield fern---------1	Dutchmans
	Jack pine-----------3	Bigtooth aspen------2	Witchhazel----------2		breeches------------3
	Quaking aspen-------2	Hophornbeam---------2	Sand cherry spp.----2	Running pine--------1	Sweet cicely---------3
	Paper birch---------2	Northern red oak----2	Red elderberry------1	Shining clubmoss----1	Wood anemone---------3
	Red maple-----------2	E. white pine-------2	Hawthorne spp.------1	Staghorn clubmoss---1	Canada mayflower-----3
	White oak-----------2	Quaking aspen-------1	American fly		Wood betony----------2
	White ash-----------2	Paper birch---------1	honeysuckle--------1		White lettuce--------2
	Hophornbeam---------1	Black cherry--------1	Silky dogwood-------1		Bedstraw spp.--------2
	E. white pine-------1	Chokecherry---------1			Canada blueberry-----2
	Red pine------------1	American elm--------1			Bramble spp.---------2
		Red pine------------1			Currant spp.---------2
					Jack-in-the-pulpit 2
					Largeleaf aster------2
					Canada white violet--2
					Downy yellow violet--2
					Moss spp.------------2
					Huckleberry spp.-----2
					Partridgeberry-------2
					Pyrola spp.----------2
					Sedge spp.-----------2
					Starflower-----------2
					Trailing arbutus-----2
					Violet spp.----------2
					Trillium spp.--------2
					Wild sarsaparilla----2
					Wintergreen----------2
					Prince's pine--------1
					Baneberry------------1
					Black snakeroot------1
					False Solomons
					seal----------------1
					Hairy Solomons
					seal----------------1
					Hawkweed spp.--------1
					Hepatica spp.--------1
					Indian cucumber
					root----------------1
					Rosy twistedstalk----1
					Wild strawberry------1

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
368A:					
Au Gres	E. white pine-------5	Red maple-----------4	Witchhazel----------2	Brackenfern---------5	Lowbush blueberry----5
	Red maple-----------4	Northern red oak----2			Wintergreen----------5
	Red pine------------4	Balsam fir----------2		Shining clubmoss----2	Largeleaf aster------4
	Jack pine-----------4	White spruce--------1			Canada mayflower-----4
	Quaking aspen-------3				Bunchberry-----------4
	Paper birch---------3				Sheep laurel---------3
	Black spruce--------3				Yellow beadlily------3
	Balsam fir----------3				Starflower-----------3
	White spruce--------2				Wild strawberry------3
	Northern red oak----2				Violet spp.----------2
					Bedstraw spp.--------2
					Canada blueberry-----2
					Bramble spp.---------2
					Cowwheat-------------2
					Gaywings-------------2
					Grass spp.-----------2
					Sphagnum moss--------2
					Pyrola spp.----------2
					Barren strawberry----1
Deford	Black ash-----------5	Black ash-----------3	Speckled alder------6	Cinnamon fern-------5	Sedge spp.-----------5
	Red maple-----------4	Balsam fir----------2	Redosier dogwood----3	Royal fern----------3	Goldthread-----------5
	N. whitecedar-------4		Highbush	Brackenfern---------2	Bunchberry-----------4
	Tamarack------------2		cranberry----------1	Ladyfern------------2	Poison ivy-----------3
	Black spruce--------2			Sensitive fern------1	Bramble spp.---------3
	Paper birch---------2				Dewberry spp.--------3
					Sweet coltsfoot------3
					Goldenrod spp.-------3
					Wild strawberry------2
					Bedstraw spp.--------2
					Buttercup spp.-------2
					Grass spp.-----------2
					Jewelweed------------2
					Marsh marigold-------2
					Mint spp.------------2
					Cattail spp.---------2
					Blue flag------------2
					Horsetail spp.-------2

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
369-------------------	Black ash-----------5	Black ash-----------3	Speckled alder------6	Cinnamon fern-------5	Sedge spp.-----------5
Deford muck	Red maple-----------4	Balsam fir----------2	Redosier dogwood----3	Royal fern----------3	Goldthread-----------5
	N. whitecedar-------4		Highbush	Brackenfern---------2	Bunchberry-----------4
	Tamarack------------2		cranberry----------1	Ladyfern------------2	Poison ivy-----------3
	Black spruce--------2			Sensitive fern------1	Bramble spp.---------3
	Paper birch---------2				Dewberry spp.--------3
					Sweet coltsfoot------3
					Goldenrod spp.-------3
					Wild strawberry------2
					Bedstraw spp.--------2
					Buttercup spp.-------2
					Grass spp.-----------2
					Jewelweed------------2
					Marsh marigold-------2
					Mint spp.------------2
					Cattail spp.---------2
					Blue flag------------2
					Horsetail spp.-------2
371-------------------	Red maple-----------4	Black ash-----------3	Virginia creeper----4	Shield fern---------2	Dewberry spp.--------4
Springport silt loam	N. whitecedar-------4	White ash-----------2	Alternateleaf	Ladyfern------------1	Poison ivy-----------4
	Black ash-----------3	Quaking aspen-------2	dogwood------------2		Virginia creeper-----4
	Quaking aspen-------3	American elm--------1	American fly		Currant spp.---------3
	Balsam poplar-------3	Balsam fir----------1	honeysuckle--------2		Wild sarsaparilla----3
	American basswood---2	N. whitecedar-------1			Horsetail spp.-------3
	Paper birch---------2				Jewelweed------------3
	American elm--------2				Sedge spp.-----------3
	Chokecherry---------1				Bedstraw spp.--------3
	White spruce--------1				Goldenrod spp.-------2
					Grass spp.-----------2
					Jack-in-the-pulpit --2
					Violet spp.----------2
					White lettuce--------1
					Baneberry------------1
					Black snakeroot------1
					False Solomons
					seal----------------1
					Avens spp.-----------1

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
373B------------------- Grayling sand, very deep water table	Jack pine-----------5 Bigtooth aspen------4 Black oak-----------3 Balsam fir----------2			Brackenfern---------1 Ground cedar--------3	Bearberry------------4 Lowbush blueberry----4 Huckleberry spp.-----4 Wintergreen----------3 Blue cladonia--------3 Canada blueberry-----3 Partridgeberry-------3 Reindeer lichen------3 Grass spp.-----------3 Canada mayflower-----2 Cowwheat-------------2 Sweetfern------------2
374------------------- Thunderbay very fine sandy loam	Black ash-----------4 Silver maple--------4	Silver maple--------4	Common prickly ash----------------3	Ostrich fern--------4 New York fern-------4 Sensitive fern------3	Grass spp.-----------5 Goldenrod spp.-------5 Stinging nettle------4 Sedge spp.-----------4 Smooth yellow violet--------------4 Blue flag------------4 Meadow rue spp.------2
392------------------- Caffey mucky sand	N. whitecedar-------4 Paper birch---------3 Black ash-----------3		Speckled alder------3		Sedge spp.-----------5 Horsetail spp.-------3
393B, 393C------------ Morganlake loamy sand	Northern red oak----5 American beech------4 Paper birch---------3 Red maple-----------3 Sugar maple---------3 Balsam fir----------3 E. white pine-------3 Quaking aspen-------2 White ash-----------2 Bigtooth aspen------2 Red pine------------1	Red maple-----------3 American beech------2 Quaking aspen-------2 Sugar maple---------2	Beaked hazelnut-----3 Gray dogwood--------3 Serviceberry--------1	Brackenfern---------4	Grass spp.-----------4 Canada blueberry-----3 Starflower-----------3 Sweetfern------------3 Gaywings-------------3 Wintergreen----------3 Lowbush blueberry----2 Wood betony----------2 Largeleaf aster------2 Bramble spp.---------2 Canada mayflower-----2 St. Johnswort spp.---1

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
396F:					
Proper----------------	Northern red oak----4	Red maple-----------3		Brackenfern---------6	Wintergreen----------5
	E. white pine-------4				Sheep laurel---------4
	Red pine------------4				Lowbush blueberry----3
	Bigtooth aspen------3				
	Quaking aspen-------3				
	Paper birch---------3				
	Jack pine-----------3				
	Red maple-----------3				
Deford----------------	Black ash-----------5	Black ash-----------3	Speckled alder------6	Cinnamon fern-------5	Sedge spp.-----------5
	Red maple-----------4	Balsam fir----------2	Redosier dogwood----3	Royal fern----------3	Goldthread-----------5
	N. whitecedar-------4		Highbush cranberry----------1	Brackenfern---------2	Bunchberry-----------4
	Tamarack------------2			Ladyfern------------2	Poison ivy-----------3
	Black spruce--------2			Sensitive fern------1	Bramble spp.---------3
					Dewberry spp.--------3
					Sweet coltsfoot------3
					Goldenrod spp.-------3
					Wild strawberry------2
					Bedstraw spp.--------2
					Buttercup spp.-------2
					Grass spp.-----------2
					Jewelweed------------2
					Marsh marigold-------2
					Mint spp.------------2
					Cattail spp.---------2
					Blue flag------------2
Rousseau--------------	Red pine------------6	Red maple-----------2	Serviceberry--------2	Brackenfern---------6	Huckleberry spp.-----6
	E. white pine-------4	E. white pine-------2			Grass spp.-----------6
	Bigtooth aspen------3				Canada blueberry-----4
	Quaking aspen-------3				Pyrola spp.----------4
	Northern red oak----3				Starflower-----------2
	Jack pine-----------3				Canada mayflower-----2
	Balsam fir----------3				Wild strawberry------2
	Red maple-----------3				
397------------------- Spot peat	E. white pine-------3		Leatherleaf---------7		Sphagnum moss--------7
	Red pine------------3				Wintergreen----------4
	Jack pine-----------3				Lowbush blueberry----3
	Black spruce--------2				Blue cladonia--------3

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
414B-------------------	Balsam fir----------4	Balsam fir----------2	Buffaloberry--------3		Poison ivy-----------3-
Namur channery silt	White spruce--------3		Mapleleaf viburnum 3		Largeleaf aster------3
loam	N. whitecedar-------3		Juniper spp.--------3		Canada mayflower-----3
	Bigtooth aspen------3		Northern arrowwood--2		Trout lily---------- 3
	Quaking aspen-------3		Dogwood spp.--------2		Barren strawberry----2
	Paper birch---------3		Gray dogwood--------2		Hepatica spp.--------2
	Sugar maple---------3		Hawthorne spp.------1		Rosy twistedstalk----2
	American basswood---2		Shrubby cinquefoil--1		Trillium spp.--------2
415A-------------------	N. whitecedar-------3		Redosier dogwood----2		Grass spp.-----------7
Potagannissing silt	E. white pine-------2				Wild carrot----------4
loam	Paper birch---------2				Sedge spp.-----------2
					Dwarf lake iris------2
416B-------------------	E. white pine-------5				Grass spp.-----------5
Negwegon silt loam,	Sugar maple---------4				Goldenrod spp.-------4
till substratum					Violet spp.----------3
417B, 417C-------------	Quaking aspen-------4	Balsam fir----------3	Juniper-------------3	Brackenfern---------2	Gaywings-------------3
Alpena gravelly sandy	N. whitecedar-------4	White ash-----------2	Serviceberry--------2		Grass spp.-----------3
loam	E. white pine-------3				Canada mayflower-----2
	Red pine------------3				Wild sarsaparilla----2
	Balsam fir----------3				Twinflower-----------2
	Eastern hemlock-----3				Violet spp.----------2
	Northern red oak----2				Dwarf lake iris------1
	Sugar maple---------2				
418E-------------------	Bigtooth aspen------4	White ash-----------4	Buffaloberry--------3	Brackenfern--------6	Bramble spp.---------3
Alpena gravelly sandy	Paper birch---------3	Black cherry--------3	Striped maple-------3		Grass spp.-----------3
loam, esker	Black cherry--------3	Red maple-----------3	Mapleleaf viburnum--2		Wild strawberry------3
	Balsam fir----------3	Paper birch---------2			Columbine------------2
419--------------------	N. whitecedar-------6	N. whitecedar-------2	Speckled alder------4	Sensitive fern------2	Horsetail spp.-------7
Chippeny muck	Tamarack------------3		Alternateleaf	Oak fern------------2	Sedge spp.-----------5
	Paper birch---------3		dogwood------------3		Grass spp.-----------3
	Black ash-----------3		Dogwood spp.--------2		Sphagnum moss--------3

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
420A------------------	Quaking aspen-------4	Balsam fir----------3	Northern bush	Brackenfern---------5	Goldenrod spp.-------4
Otisco mucky sand	Red maple-----------3	Red maple-----------3	honeysuckle--------3	Sensitive fern------2	Largeleaf aster------4
	White spruce--------3	White ash-----------2	Silky dogwood-------2	Shield fern---------2	Bunchberry-----------3
	Balsam fir----------2	American basswood 1	Speckled alder------2	Interrupted fern----1	Dewberry spp.--------3
	Paper birch---------2	American beech------1	Redosier dogwood----1	Rattlesnake fern----1	Grass spp.-----------3
	Bigtooth aspen------1	Quaking aspen-------1	Mapleleaf		Yellow beadlily------3
	Balsam poplar-------1	Black cherry--------1	viburmum-----------1	Running pine--------2	Sweet coltsfoot------3
	N. whitecedar-------1	Black oak-----------1	Alternateleaf	Shining clubmoss----2	Starflower-----------3
		Northern red oak----1	dogwood------------1	Groundpine----------2	Buttercup spp.-------3
		White spruce--------1	American fly		Gaywings-------------2
		Paper birch---------1	honeysuckle--------1		Horsetail spp.-------2
		White oak-----------1	Serviceberry spp.---1		PyrolaS spp.---------2
		Sugar maple	Striped maple-------1		Starflower-----------2
					Wild sarsaparilla----2
					Bedstraw spp.--------2
					Bramble spp.---------1
					Indian cucumber
					root----------------1
					Canada mayflower-----1
					Black snakeroot------1
					Goldthread-----------1
424B, 424C-------------	Sugar maple---------4	Sugar maple---------4	Silky dogwood-------1	Shield fern---------2	Sweet cicely---------5
Morganlake-Ossineke-	American basswood---4	American beech------3		Rattlesnake fern----1	Trout lily-----------4
Blue Lake	American beech------3	White ash-----------3			Violet spp.----------3
	Northern red oak----3	Quaking aspen-------2			Downy yellow violet--3
	White ash-----------2	Hophornbeam---------2			Canada mayflower-----3
	Quaking aspen-------2	American basswood---1			Wild leek------------3
	Yellow birch--------2	Black cherry--------1			Solomons seal--------1
	Eastern hemlock-----2				Moss spp.------------2
	Paper birch---------1				Trillium spp.--------2
	Hophornbeam---------1				Dutchmans breeches---2
					Bellwort spp.--------1
					Sedge spp.-----------1
					Baneberry------------1
					Bedstraw spp.--------1
					Currant spp.---------1
					Jack-in-the-pulpit --1
426B, 426C, 426D-------	Bigtooth aspen------3	Red maple-----------3	Serviceberry--------1	Brackenfern--------4	Grass spp.-----------4
Coppler loamy sand	Northern red oak----3	Bigtooth aspen------2	Witchhazel----------1		Sweetfern------------3
	Red maple-----------3	Northern red oak----2			Lowbush blueberry----3
	Black cherry--------3			Groundpine----------3	Canada blueberry-----3
	White ash-----------2				Stinging nettle------1
	Quaking aspen-------2				

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
451C------------------	White oak----------5	Red maple----------3	Gray dogwood--------3	Brackenfern---------6	Grass spp.----------7
Annalake loamy fine sand	Northern red oak----4				Sweetfern-----------5
	Red maple----------4				Goldenrod spp.-------5
	American beech------3				Yarrow--------------4
	Paper birch---------3				
477B:					
Algonquin------------	Quaking aspen-------5	White ash----------4	Hawthorne spp.------1	Brackenfern---------3	Grass spp.----------6
	White spruce--------3	American basswood---1	Serviceberry--------1	Rattlesnake fern----1	Goldenrod spp.-------4
	American basswood---1	Quaking aspen-------1		Shield fern---------1	Dewberry spp.--------4
	White ash----------1	Red maple----------1			Bunchberry----------3
		American elm--------1			Wood anemone---------3
		White spruce--------1			Miterwort spp.-------3
					Poison ivy----------2
					Bedstraw spp.--------2
					Gaywings------------2
					Hepatica spp.--------2
					Largeleaf aster------2
					Violet spp.----------2
					Wild sarsaparilla----2
					Columbine-----------1
					Horsetail spp.-------1
Springport-----------	Red maple----------4	Black ash----------3	American fly honeysuckle--------2	Shield fern---------2	Poison ivy----------4
	N. whitecedar-------4	Quaking aspen-------2	Alternateleaf dogwood-----------2	Ladyfern-----------1	Bedstraw spp.--------3
	Black ash----------3	N. whitecedar-------1			Sedge spp.----------3
	Quaking aspen-------3	American elm--------1			Currant spp.---------3
	Balsam poplar-------3	Balsam fir---------1			Horsetail spp.-------3
	Paper birch---------2				Jewelweed-----------3
	White spruce--------1				Violet spp.----------2
					Jack-in-the-pulpit --2
					Grass spp.----------2
					Goldenrod spp.-------2
					Baneberry-----------1
					False Solomons seal----------------1
					Avens spp.----------1

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
478-------------------- Springport silty clay loam, till substratum	Red maple-----------4 N. whitecedar-------4 Black ash-----------3 Quaking aspen-------3 Balsam poplar-------3 Paper birch---------2 White spruce--------1	Black ash-----------3 Quaking aspen-------2 N. whitecedar-------1 American elm--------1 Balsam fir----------1	American fly honeysuckle--------2 Alternateleaf dogwood-----------2	Shield fern---------2 Ladyfern------------1	Poison ivy-----------4 Bedstraw spp.--------3 Sedge spp.-----------3 Currant spp.---------3 Horsetail spp.-------3 Jewelweed------------3 Violet spp.----------2 Jack-in-the-pulpit --2 Grass spp.-----------2 Goldenrod spp.-------2 Baneberry------------1 False Solomons seal----------------1 Avens spp.-----------1
479A------------------- Algonquin silt loam, till surstratum	Quaking aspen-------5 White spruce--------3 American basswood---1 White ash-----------1	White ash-----------4 American basswood---1 Quaking aspen-------1 Red maple-----------1 American elm--------1 White spruce--------1	Hawthorne spp.------1 Serviceberry--------1	Brackenfern---------3 Rattlesnake fern----1 Shield fern---------1	Grass spp.-----------6 Goldenrod spp.-------4 Dewberry spp.--------4 Bunchberry-----------3 Wood anemone---------3 Miterwort spp.-------3 Poison ivy-----------2 Bedstraw spp.--------2 Gaywings-------------2 Hepatica spp.--------2 Largeleaf aster------2 Violet spp.----------2 Wild sarsaparilla----2 Columbine------------1 Horsetail spp.-------1
480B:					
Negwegon--------------	E. white pine-------5 Sugar maple---------4				Grass spp.-----------5 Goldenrod spp.-------4 Violet spp.----------3

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
480B:					
Algonquin-------------	Quaking aspen-------5	White ash-----------4	Hawthorne spp.------1	Brackenfern---------3	Grass spp.-----------6
	White spruce--------3	American basswood---1	Serviceberry--------1	Rattlesnake fern----1	Goldenrod spp.-------4
	American basswood---1	Quaking aspen-------1		Shield fern---------1	Dewberry spp.--------4
	White ash-----------1	Red maple-----------1			Bunchberry-----------3
		American elm--------1			Wood anemone---------3
		White spruce--------1			Miterwort spp.-------3
					Poison ivy-----------2
					Bedstraw spp.--------2
					Gaywings-------------2
					Hepatica spp.--------2
					Largeleaf aster------2
					Violet spp.----------2
					Wild sarsaparilla----2
					Columbine------------1
					Horsetail spp.-------1
Lupton----------------	N. whitecedar-------5		Redosier dogwood----2	Cinnamon fern-------2	Grass spp.-----------4
	Black ash-----------3		Speckled alder------2		Sedge spp.-----------3
	Black spruce--------3				Sphagnum moss--------3
	Tamarack------------3				Miterwort spp.-------3
	Paper birch---------2				Starflower-----------2
	Balsam fir----------2				Goldthread-----------2
	Quaking aspen-------1				Bunchberry-----------2
481C:					
Negwegon--------------	E. white pine-------5				Grass spp.-----------5
	Sugar maple---------4				Goldenrod spp.-------4
					Violet spp.----------3
Lupton----------------	N. whitecedar-------5		Redosier dogwood----2	Cinnamon fern-------2	Grass spp.-----------4
	Black ash-----------3		Speckled alder------2		Sedge spp.-----------3
	Black spruce--------3				Sphagnum moss--------3
	Tamarack------------3				Miterwort spp.-------3
	Paper birch---------2				Starflower-----------2
	Balsam fir----------2				Goldthread-----------2
	Quaking aspen-------1				Bunchberry-----------2
482B, 482C------------- Summerville very fine sandy loam	Quaking aspen-------4		Willow spp.---------4	Brackenfern---------4	Sedge spp.-----------3
	Paper birch---------3		Buffaloberry--------3	Maindenhair fern----2	Grass spp.-----------3
	Sugar maple---------2		Northern arrowwood--3		Violet spp.----------2
	Balsam fir----------2				
	E. white pine-------2				
	N. whitecedar-------2				

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
483A------------------	Quaking aspen-------4	Red maple-----------3	Willow spp.---------3	Brackenfern---------4	Sedge spp.-----------4
Lachine loam	Balsam fir----------2		Shrubby cinquefoil--3		Grass spp.-----------3
	American basswood---2				
	Paper birch---------2				
	N. whitecedar-------1				
484A------------------	Quaking aspen-------4	Red maple-----------3	Willow spp.---------2	Brackenfern---------3	Sedge spp.-----------4
Elcajon loam	E. white pine-------3		Shrubby cinquefoil--3		Grass spp.-----------3
	Sugar maple---------2				Violet spp.----------3
	American basswood---2				
	Paper birch---------2				
	Red maple-----------1				
485A------------------	Quaking aspen-------4	Red maple-----------3	Mapleleaf	Brackenfern---------2	Sedge spp.-----------4
Bowers silt loam	Balsam poplar-------3		viburnum-----------3		
	E. white pine-------3				
	Balsam fir----------3				
	Red maple-----------1				
486B:					
Tonkey silt loam------	N. whitecedar-------5	Black ash-----------3	Speckled alder------4		Goldthread-----------6
	Black ash-----------3	N. whitecedar-------3			Sedge spp.-----------5
	White spruce--------1	Red maple-----------2			Bunchberry-----------4
					Horsetail spp.-------3
					Cattail spp.---------2
					Poison ivy-----------2
Bowers silt loam------	Quaking aspen-------4	Red maple-----------3	Mapleleaf	Brackenfern---------2	Sedge spp.-----------4
	Balsam poplar-------3		viburnum-----------3		
	E. white pine-------3				
	Balsam fir----------3				
	Red maple-----------1				
487B:					
Slade-----------------	Quaking aspen-------3	Red maple-----------3	Witchhazel----------4		Bunchberry-----------4
	Paper birch---------3	Black ash-----------2	Speckled alder------1		Wild strawberry------4
	White spruce--------2	White spruce--------2			Canada mayflower-----3
	Black ash-----------2				Grass spp.-----------3
	Red maple-----------1				Violet spp.----------2
Angelica--------------	Red maple-----------4	Black ash-----------3	Speckled alder------3		Sedge spp.-----------5
	Balsam poplar-------3	Red maple-----------3	Willow spp.---------2		Horsetail spp.-------3
	Balsam fir----------3	N. whitecedar-------2			Jack-in-the-pulpit---2
	Black ash-----------3				
	N. whitecedar-------3				
	Quaking aspen-------2				

Table 10.--Plant Communities on Selected Soils--Continued

Map symbol and soil name	Extent of major and minor trees	Extent of seedlings	Extent of shrubs	Extent of ferns and clubmoss	Extent of ground plants
489F------------------- Crowell-Proper fine sands	Bigtooth aspen------4	Red maple-----------3	Serviceberry--------2	Brackenfern---------6	Huckleberry spp.-----4
	E. white pine-------4				Wintergreen----------4
	Red pine------------4				Lowbush blueberry----3
	Northern red oak----4				Canada mayflower-----3
	Quaking aspen-------3				Sheep laurel---------3
	Balsam fir----------3				Bedstraw spp.--------2
	Paper birch---------3				Starflower-----------2
	Jack pine-----------3				Wild sarsaparilla----2
	Red maple-----------3				Cowwheat------------ 1

* This map unit is dominated by shrubs in some areas.

Table 11.--Windbreaks and Environmental Plantings

(Absence of an entry indicates that trees generally do not grow to the given height on the soil.)

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
11B:					
Eastport.					
12B:					
Tawas	Common ninebark, redosier dogwood, silky dogwood.	Nannyberry, southern arrowwood, black spruce.	Northern white-cedar, green ash.	---	---
Au Gres	Common ninebark	American cranberrybush, Amur maple, nannyberry.	White spruce	Manchurian crabapple, Norway spruce, jack pine, eastern white pine, green ash.	Imperial Carolina poplar.
13:					
Tawas	Common ninebark, redosier dogwood, silky dogwood.	Nannyberry, southern arrowwood, black spruce.	Northern white-cedar, green ash.	---	---
Lupton.					
14:					
Dawson.					
Loxley	Common ninebark, gray dogwood, silky dogwood.	American cranberrybush, common lilac, nannyberry.	Northern white-cedar.	Siberian crabapple, Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
16B, 16C, 16D, 16E:					
Graycalm	Siberian peashrub	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
17A, 17B:					
Croswell	Siberian peashrub, manyflower cotoneaster.	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
18A:					
Au Gres	Common ninebark	American cranberrybush, Amur maple, nannyberry.	White spruce	Manchurian crabapple, Norway spruce, jack pine, eastern white pine, green ash.	Imperial Carolina poplar.
19:					
Leafriver.					

Table 11.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
27A:					
Tacoda	Silky dogwood	American cranberrybush, common lilac, nannyberry.	Eastern redcedar, white spruce.	Norway spruce, Siberian crabapple, eastern white pine, jack pine, green ash.	Imperial Carolina poplar.
28B, 28C:					
East Lake	Siberian peashrub, manyflower cotoneaster.	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
29A:					
Battlefield	Common ninebark, silky dogwood.	American cranberrybush, common lilac, Amur maple, nannyberry, northern white-cedar.	White spruce	Norway spruce, Siberian crabapple, eastern white pine, green ash.	---
30:					
Wheatley.					
31B, 31C, 31D, 31E:					
Klacking	Roselow sargent crabapple, common ninebark.	Common lilac, Amur maple, nannyberry.	Siberian crabapple, eastern redcedar, white spruce.	Norway spruce, eastern white pine, red pine.	Imperial Carolina poplar.
35:					
Kinross.					
36B, 36C:					
Annalake	American cranberrybush, Siberian peashrub, silky dogwood.	Common lilac, nannyberry, southern arrowwood.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, red pine.	Carolina poplar.
37A, 37B:					
Richter	Common ninebark, silky dogwood.	American cranberrybush, common lilac, Amur maple, nannyberry, northern white-cedar.	White spruce	Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
38:					
Tonkey	Common ninebark, redosier dogwood, silky dogwood.	American cranberrybush, northern white-cedar, southern arrowwood.	White spruce	Manchurian crabapple, Norway spruce, eastern white pine, green ash, red maple.	---
41B, 41C, 41D, 41E:					
McGinn.					

Table 11.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
42A:					
Killmaster	Roselow sargent crabapple, redosier dogwood, silky dogwood.	American cranberrybush, common lilac, northern white-cedar.	White spruce	Norway spruce, eastern white pine, red maple, white ash.	Imperial Carolina poplar.
43:					
Wakeley.					
44B, 44C:					
Ossineke	Roselow sargent crabapple, Siberian peashrub.	American cranberrybush, common lilac, northern white-cedar.	Blue spruce, white spruce, Austrian pine.	Manchurian crabapple, Norway spruce, green ash.	Imperial Carolina poplar.
45B, 45C:					
Hoist	Roselow sargent crabapple.	Common lilac, Amur maple, common ninebark, southern arrowwood.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, green ash, red pine.	Imperial Carolina poplar.
46:					
Ensley	Roselow sargent crabapple, common ninebark, silky dogwood.	American cranberrybush, nannyberry, southern arrowwood.	Northern white-cedar, white spruce.	Norway spruce, eastern white pine, green ash, red maple.	---
47D:					
Graycalm	Siberian peashrub	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
53B, 53C:					
Negwegon	Roselow sargent crabapple, Siberian peashrub, silky dogwood.	Common lilac, Amur maple, nannyberry.	White spruce	Manchurian crabapple, Norway spruce, green ash, red pine, eastern white pine.	---
54A:					
Algonquin	Roselow sargent crabapple, Siberian peashrub, silky dogwood.	American cranberrybush, common lilac, Amur maple.	Blue spruce, white spruce.	Manchurian crabapple, Norway spruce, green ash, eastern white pine.	---
55:					
Springport	Peking cotoneaster, Roselow sargent crabapple, silky dogwood.	American cranberrybush, common lilac, Amur maple.	White spruce, Manchurian crabapple, Norway spruce, eastern white pine, red pine.	Green ash	---

Table 11.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
57B:					
Kawkawlin	Roselow sargent crabapple, common ninebark, silky dogwood.	American cranberrybush, common lilac, Amur maple, nannyberry, northern white-cedar.	White spruce, Norway spruce, eastern white pine, red pine.	---	---
59B:					
Algonquin	Roselow sargent crabapple, Siberian peashrub, silky dogwood.	American cranberrybush, common lilac, Amur maple.	Blue spruce, white spruce.	Manchurian crabapple, Norway spruce, green ash, eastern white pine.	---
Springport	Peking cotoneaster, Roselow sargent crabapple, silky dogwood.	American cranberrybush, common lilac, Amur maple.	White spruce, Manchurian crabapple, Norway spruce, eastern white pine, red pine.	Green ash	---
62A:					
Allendale	Roselow sargent crabapple.	American cranberrybush, common lilac, nannyberry, northern white-cedar.	Blue spruce, white spruce.	Manchurian crabapple, Norway spruce, eastern white pine, red maple.	---
63D, 63E:					
Bamfield	Roselow sargent crabapple, Siberian peashrub.	American cranberrybush, common lilac, northern white-cedar.	Blue spruce, white spruce, Austrian pine.	Manchurian crabapple, Norway spruce, green ash.	Imperial Carolina poplar.
68:					
Rondeau	---	Common ninebark, gray dogwood, nannyberry, medium purple willow, northern whitecedar.	Amur maple, black spruce, white spruce.	Black ash	Laurel willow, eastern cottonwood.
69:					
Loxley	Common ninebark, gray dogwood, silky dogwood.	American cranberrybush, common lilac, nannyberry.	Northern white-cedar.	Siberian crabapple, Norway spruce, eastern white pine, green ash.	Carolina poplar.
70:					
Lupton.					
71:					
Tawas	Common ninebark, redosier dogwood, silky dogwood.	Nannyberry, southern arrowwood, black spruce.	Northern white-cedar, green ash.	---	---

Table 11.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
72:					
Dorval.					
74C2:					
Negwegon	Roselow sargent crabapple, Siberian peashrub, silky dogwood.	Common lilac, Amur maple, nannyberry.	White spruce	Manchurian crabapple, Norway spruce, green ash, red pine, eastern white pine.	---
75B, 75D, 75E:					
Rubicon	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, red pine, eastern white pine.	---	---
77:					
Rollaway.					
78:					
Pits, borrow.					
82B, 82C:					
Udorthents.					
83B, 83F:					
Udipsamments.					
84B, 84C, 84E:					
Zimmerman	Manyflower cotoneaster.	Amur maple, Siberian peashrub, common lilac, silky dogwood, Siberian crabapple, eastern redcedar.	---	Eastern white pine, jack pine, red pine.	---
85D:					
Zimmerman	Manyflower cotoneaster.	Amur maple, Siberian peashrub, common lilac, silky dogwood, Siberian crabapple, eastern redcedar.	---	Eastern white pine, jack pine, red pine.	---
Annalake	American cranberrybush, Siberian peashrub, silky dogwood.	Common lilac, nannyberry, southern arrowwood.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, red pine.	Carolina poplar.
86:					
Aquents.					
Histosols.					

Table 11.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
87:					
Ausable.					
90B:					
Chinwhisker.					
92B, 92C:					
Klacking----------	Roselow sargent crabapple, common ninebark.	Common lilac, Amur maple, nannyberry.	Siberian crabapple, eastern redcedar, white spruce.	Norway spruce, eastern white pine, red pine.	Imperial Carolina poplar.
McGinn.					
93B:					
Tacoda------------	Silky dogwood-----	American cranberrybush, common lilac, nannyberry.	Eastern redcedar, white spruce.	Norway spruce, Siberian crabapple, eastern white pine, jack pine, green ash.	Imperial Carolina poplar.
Wakeley.					
94F:					
Klacking----------	Roselow sargent crabapple, common ninebark.	Common lilac, Amur maple, nannyberry.	Siberian crabapple, eastern redcedar, white spruce.	Norway spruce, eastern white pine, red pine.	Imperial Carolina poplar.
McGinn.					
97:					
Colonville--------	Siberian peashrub, staghorn sumac.	Washington hawthorn, Norway spruce, nannyberry, silver buffaloberry.	Blue spruce, common lilac.	Green ash--------	Imperial Carolina poplar.
113:					
Angelica----------	Siberian peashrub, redosier dogwood, silky dogwood.	American cranberrybush, common lilac, nannyberry, northern white-cedar.	Black Hills spruce, white spruce.	Eastern white pine, green ash, red maple.	---
116C:					
Mancelona---------	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern white-cedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	Imperial Carolina poplar.
127:					
Cathro.					
128:					
Dawson.					

Table 11.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
145C, 145E:					
Rousseau	Vanhoutte spirea, manyflower cotoneaster.	Silky dogwood, Siberian crabapple.	Eastern redcedar, white spruce.	Norway spruce, jack pine, red pine, eastern white pine.	Imperial Carolina poplar.
159A:					
Finch	Common ninebark, silky dogwood.	American cranberrybush, Amur maple, nannyberry, northern white-cedar.	---	Norway spruce, Siberian crabapple, jack pine, white spruce, eastern white pine, green ash.	---
166A:					
Slade	Nannyberry, redosier dogwood.	American cranberrybush, common lilac, silky dogwood, northern white-cedar.	White spruce	Eastern white pine, green ash, red maple, silver maple, white ash.	---
182:					
Pits, quarry.					
300A:					
Hagensville	Common ninebark, redosier dogwood.	American cranberrybush, common lilac, nannyberry, northern white-cedar.	White spruce	Norway spruce, eastern white pine, green ash.	---
304A:					
Iosco	Silky dogwood	American cranberrybush, common lilac, redosier dogwood, nannyberry.	Northern white-cedar, white spruce.	Norway spruce, Siberian crabapple, red pine, eastern white pine, green ash.	---
305B:					
Johnswood.					
308B, 308C, 308D:					
Krakow	Silky dogwood	American cranberrybush, common lilac, Amur maple, nannyberry, northern white-cedar, southern arrowwood.	White spruce	Norway spruce, green ash, red pine, eastern white pine.	---
316:					
Ruse.					

Table 11.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
350E:					
Blue Lake	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Austrian pine, jack pine, red pine, eastern white pine.	---	---
359C:					
Algonquin	Roselow sargent crabapple, Siberian peashrub, silky dogwood.	American cranberrybush, common lilac, Amur maple.	Blue spruce, white spruce.	Manchurian crabapple, Norway spruce, green ash, eastern white pine.	---
Negwegon	Roselow sargent crabapple, Siberian peashrub, silky dogwood.	Common lilac, Amur maple, nannyberry.	White spruce	Manchurian crabapple, Norway spruce, green ash, red pine, eastern white pine.	---
Dorval.					
361B:					
Allendale	Roselow sargent crabapple.	American cranberrybush, common lilac, nannyberry, northern white-cedar.	Blue spruce, white spruce.	Manchurian crabapple, Norway spruce, eastern white pine, red maple.	---
Dorval.					
Blue Lake	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Austrian pine, jack pine, red pine, eastern white pine.	---	---
362D, 362E:					
Millersburg	---	Siberian peashrub, common lilac, nannyberry, southern arrowwood.	Siberian crabapple, eastern redcedar, white spruce.	Austrian pine, Norway spruce, red pine, eastern white pine.	Imperial Carolina poplar.
368A:					
Au Gres	Common ninebark	American cranberrybush, Amur maple, nannyberry.	White spruce	Manchurian crabapple, Norway spruce, jack pine, eastern white pine, green ash.	Imperial Carolina poplar.

Table 11.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
368A: Deford.					
369: Deford.					
371: Springport.					
373B: Grayling, very deep water table.					
374: Thunderbay.					
376A: Urban land.					
Udipsamments, deep water table.					
380: Access denied.					
392: Caffey.					
393B, 393C: Morganlake	American cranberrybush.	Common lilac, eastern redcedar, nannyberry, northern white-cedar.	Manchurian crabapple, Black Hills spruce, white spruce, Norway spruce.	Eastern white pine, green ash.	Imperial Carolina poplar.
396F: Proper.					
Deford.					
Rousseau	Vanhoutte spirea, manyflower cotoneaster.	Silky dogwood, Siberian crabapple.	Eastern redcedar, white spruce.	Norway spruce, jack pine, red pine, eastern white pine.	Imperial Carolina poplar.
397: Spot.					
414B: Namur.					
415A: Potagannissing.					
416B: Negwegon, till substratum	Roselow sargent crabapple, Siberian peashrub, silky dogwood.	Common lilac, Amur maple, nannyberry.	White spruce	Manchurian crabapple, Norway spruce, green ash, red pine, eastern white pine.	---

Table 11.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
417B, 417C, 418E:					
Alpena.					
419:					
Chippeny.					
420A:					
Otisco	Roselow sargent crabapple, common ninebark, silky dogwood.	American cranberrybush, nannyberry, southern arrowwood.	Northern white-cedar, white spruce.	Manchurian crabapple, Norway spruce, eastern white pine, green ash.	---
424B, 424C:					
Morganlake	American cranberrybush.	Common lilac, eastern redcedar, nannyberry, northern white-cedar.	Manchurian crabapple, Black Hills spruce, white spruce, Norway spruce.	Eastern white pine, green ash.	Imperial Carolina poplar.
Ossineke, sandy substratum	---	---	---	Roselow sargent crabapple, Siberian peashrub, American cranberrybush, common lilac.	Northern white-cedar, blue spruce, white spruce, Austrian pine, Manchurian crabapple, Norway spruce, white ash, imperial Carolina poplar.
Blue Lake	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Austrian pine, jack pine, red pine, eastern white pine.	---	---
426B, 426C, 426D:					
Coppler	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern white-cedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	Imperial Carolina poplar.
451C:					
Annalake	American cranberrybush, Siberian peashrub, silky dogwood.	Common lilac, nannyberry, southern arrowwood.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, red pine.	Carolina poplar.
477B:					
Algonquin, till substratum	Roselow sargent crabapple, Siberian peashrub, silky dogwood.	American cranberrybush, common lilac, Amur maple.	Blue spruce, white spruce.	Manchurian crabapple, Norway spruce, green ash, eastern white pine.	---

Table 11.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
477B:					
Springport, till substratum	Peking cotoneaster, Roselow sargent crabapple, silky dogwood.	American cranberrybush, common lilac, Amur maple.	White spruce, Manchurian crabapple, Norway spruce, eastern white pine, red pine.	Green ash	---
478:					
Springport, till substratum	Peking cotoneaster, Roselow sargent crabapple, silky dogwood.	American cranberrybush, common lilac, Amur maple.	White spruce, Manchurian crabapple, Norway spruce, eastern white pine, red pine.	Green ash	---
479A:					
Algonquin, till substratum	Roselow sargent crabapple, Siberian peashrub, silky dogwood.	American cranberrybush, common lilac, Amur maple.	Blue spruce, white spruce.	Manchurian crabapple, Norway spruce, green ash, eastern white pine.	---
480B:					
Negwegon	Roselow sargent crabapple, Siberian peashrub, silky dogwood.	Common lilac, Amur maple, nannyberry.	White spruce	Manchurian crabapple, Norway spruce, green ash, red pine, eastern white pine.	---
Algonquin	Roselow sargent crabapple, Siberian peashrub, silky dogwood.	American cranberrybush, common lilac, Amur maple.	Blue spruce, white spruce.	Manchurian crabapple, Norway spruce, green ash, eastern white pine.	---
Lupton.					
481C:					
Negwegon	Roselow sargent crabapple, Siberian peashrub, silky dogwood.	Common lilac, Amur maple, nannyberry.	White spruce	Manchurian crabapple, Norway spruce, green ash, red pine, eastern white pine.	---
Lupton.					
482B, 482C:					
Summerville.					
483A:					
Lachine.					

Table 11.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
484A:					
Elcajon	---	---	---	Common ninebark, nannyberry, redosier dogwood, American cranberrybush, common lilac, silky dogwood.	Northern white-cedar, white spruce, eastern white pine, red maple, silver maple, white ash.
485A:					
Bowers	Common ninebark	American cranberrybush, common lilac, nannyberry, northern white-cedar.	White spruce	Manchurian crabapple, Norway spruce, red pine, eastern white pine, green ash.	---
486B:					
Tonkey	Common ninebark, redosier dogwood, silky dogwood.	American cranberrybush, northern white-cedar, southern arrowwood.	White spruce	Manchurian crabapple, Norway spruce, eastern white pine, green ash, red maple.	---
Bowers	Common ninebark	American cranberrybush, common lilac, nannyberry, northern white-cedar.	White spruce	Manchurian crabapple, Norway spruce, red pine, eastern white pine, green ash.	---
487B:					
Slade	Nannyberry, redosier dogwood.	American cranberrybush, common lilac, silky dogwood, northern white-cedar.	White spruce	Eastern white pine, green ash, red maple, silver maple, white ash.	---
Angelica	Siberian peashrub, redosier dogwood, silky dogwood.	American cranberrybush, common lilac, nannyberry, northern white-cedar.	Black Hills spruce, white spruce.	Eastern white pine, green ash, red maple.	---
489F:					
Crowell.					
Proper.					

Table 12.--Recreational Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
11B:					
Eastport	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
12B:					
Tawas	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
Au Gres	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: wetness.
13:					
Tawas	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
Lupton	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
14:					
Dawson	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
Loxley	Severe: excess humus, ponding, too acid.	Severe: excess humus, ponding, too acid.	Severe: excess humus, ponding, too acid.	Severe: excess humus, ponding.	Severe: excess humus, ponding, too acid.
16B:					
Graycalm	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
16C:					
Graycalm	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
16D:					
Graycalm	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
16E:					
Graycalm	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
17A:					
Croswell	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
17B:					
Croswell	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
18A:					
Au Gres	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: wetness.
19:					
Leafriver	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
27A:					
Tacoda	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: wetness.
28B:					
East Lake	Severe: too sandy.	Severe: too sandy.	Moderate: slope, small stones.	Severe: too sandy.	Moderate: droughty, large stones.
28C:					
East Lake	Severe: too sandy.	Severe: too sandy.	Moderate: slope, small stones.	Severe: too sandy.	Moderate: droughty, large stones.
29A:					
Battlefield	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: wetness.
30:					
Wheatley	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
31B:					
Klacking	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
31C:					
Klacking	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
31D:					
Klacking	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
31E:					
Klacking	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
35:					
Kinross	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
36B:					
Annalake	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
36C:					
Annalake	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
37A:					
Richter	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
37B:					
Richter	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
38:					
Tonkey	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
41B:					
McGinn	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
41C:					
McGinn	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
41D:					
McGinn	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
41E:					
McGinn	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
42A:					
Killmaster	Severe: wetness.	Moderate: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: droughty, large stones, wetness.
43:					
Wakeley	Severe: percs slowly, ponding.	Severe: percs slowly, ponding, too sandy.	Severe: percs slowly, ponding, too sandy.	Severe: ponding, too sandy.	Severe: ponding.
44B:					
Ossineke	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
44C:					
Ossineke-----------	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
45B:					
Hoist--------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: large stones, slope.
45C:					
Hoist--------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: large stones, slope.
46:					
Ensley-------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
47D:					
Graycalm-----------	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
53B:					
Negwegon-----------	Severe: wetness.	Moderate: percs slowly, wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
53C:					
Negwegon-----------	Severe: wetness.	Moderate: percs slowly, wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
54A:					
Algonquin----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
55:					
Springport---------	Severe: percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding.
57B:					
Kawkawlin----------	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
59B:					
Algonquin----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Springport---------	Severe: percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding.
62A:					
Allendale----------	Severe: percs slowly, wetness.	Severe: percs slowly, wetness.	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.
63D:					
Bamfield-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
63E:					
Bamfield	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
68:					
Rondeau	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
69:					
Loxley	Severe: excess humus, ponding, too acid.	Severe: excess humus, ponding, too acid.	Severe: excess humus, ponding, too acid.	Severe: excess humus, ponding.	Severe: excess humus, ponding, too acid.
70:					
Lupton	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
71:					
Tawas	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
72:					
Dorval	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
74C2:					
Negwegon	Severe: wetness.	Moderate: percs slowly, slope, wetness.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: slope, wetness.
75B:					
Rubicon	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: droughty, slope.
75D:					
Rubicon	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: droughty, slope.
75E:					
Rubicon	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: droughty, slope.
77:					
Rollaway	Severe: excess humus, flooding, ponding.	Severe: excess humus, ponding.	Severe: excess humus, flooding, ponding.	Severe: excess humus, ponding.	Severe: excess humus, flooding, ponding.
78:					
Pits, borrow.					

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
82B:					
Udorthents	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
82C:					
Udorthents	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
83B:					
Udipsamments	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
83F:					
Udipsamments	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: slope.
84B:					
Zimmerman	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
84C:					
Zimmerman	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
84E:					
Zimmerman	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
85D:					
Zimmerman	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
Annalake	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
86:					
Histosols	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
87:					
Ausable	Severe: excess humus, flooding, ponding.	Severe: excess humus, ponding.	Severe: excess humus, flooding, ponding.	Severe: excess humus, ponding.	Severe: excess humus, flooding, ponding.
90B:					
Chinwhisker	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
92B:					
Klacking	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
McGinn	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
92C:					
Klacking	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
McGinn	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
93B:					
Tacoda	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: wetness.
Wakeley	Severe: percs slowly, ponding.	Severe: percs slowly, ponding, too sandy.	Severe: percs slowly, ponding, too sandy.	Severe: ponding, too sandy.	Severe: ponding.
94F:					
Klacking	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
McGinn	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
97:					
Colonville	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.
113:					
Angelica	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
116C:					
Mancelona	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, large stones, slope.
127:					
Cathro	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
128:					
Dawson	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
145C:					
Rousseau	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope.
145E:					
Rousseau	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope.
159A:					
Finch	Severe: cemented pan, too sandy, wetness.	Severe: cemented pan, too sandy, wetness.	Severe: cemented pan, too sandy, wetness.	Severe: too sandy, wetness.	Severe: cemented pan, droughty, wetness.
166A:					
Slade	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: large stones, wetness.
182:					
Pits, quarry	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.
300A:					
Hagensville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
304A:					
Iosco	Severe: wetness.	Moderate: too sandy, wetness.	Severe: wetness.	Moderate: too sandy, wetness.	Moderate: droughty, wetness.
305B:					
Johnswood	Severe: large stones, wetness.	Severe: large stones.	Severe: large stones, wetness.	Severe: large stones.	Severe: droughty, large stones.
308B:					
Krakow	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: large stones, slope.	Severe: large stones, slope.
308C:					
Krakow	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: large stones, slope.	Severe: large stones, slope.
308D:					
Krakow	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: large stones, slope.	Severe: large stones, slope.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
316:					
Ruse	Severe: depth to rock, ponding.	Severe: depth to rock, ponding.	Severe: depth to rock, ponding.	Severe: ponding.	Severe: depth to rock, ponding.
350E:					
Blue Lake	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
359C:					
Algonquin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Negwegon	Severe: wetness.	Moderate: percs slowly, wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
Dorval	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
361B:					
Allendale	Severe: percs slowly, wetness.	Severe: percs slowly, wetness.	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.
Dorval	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
Blue Lake	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
362D:					
Millersburg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, large stones, slope.
362E:					
Millersburg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, large stones, slope.
368A:					
Au Gres	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: wetness.
Deford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
369:					
Deford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
371:					
Springport	Severe: percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding.
373B:					
Grayling	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
374:					
Thunderbay	Severe: flooding, wetness.	Severe: wetness.	Severe: flooding, wetness.	Severe: wetness.	Severe: flooding, wetness.
376A:					
Urban land	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
380:					
Access denied.					
392:					
Caffey	Severe: ponding.	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: ponding.
393B:					
Morganlake	Severe: too acid.	Severe: too acid.	Severe: too acid.	Moderate: too sandy.	Severe: too acid.
393C:					
Morganlake	Severe: too acid.	Severe: too acid.	Severe: too acid.	Moderate: too sandy.	Severe: too acid.
396F:					
Proper	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Deford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
Rousseau	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope.
397:					
Spot	Severe: cemented pan, excess humus, ponding.	Severe: cemented pan, excess humus, ponding.	Severe: cemented pan, excess humus, ponding.	Severe: excess humus, ponding.	Severe: cemented pan, excess humus, ponding.
414B:					
Namur	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, small stones.	Slight	Severe: depth to rock.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
415A:					
Potagannissing-----	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: wetness.	Severe: depth to rock, wetness.
416B:					
Negwegon-----------	Severe: wetness.	Moderate: percs slowly, wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
417B:					
Alpena-------------	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight----------	Severe: droughty.
417C:					
Alpena-------------	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight----------	Severe: droughty.
418E:					
Alpena-------------	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight----------	Severe: droughty.
419:					
Chippeny-----------	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
420A:					
Otisco-------------	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: wetness.
424B:					
Morganlake---------	Severe: too acid.	Severe: too acid.	Severe: too acid.	Moderate: too sandy.	Severe: too acid.
Ossineke-----------	Moderate: slope, wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
Blue Lake----------	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
424C:					
Morganlake---------	Severe: too acid.	Severe: too acid.	Severe: too acid.	Moderate: too sandy.	Severe: too acid.
Ossineke-----------	Moderate: slope, wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
Blue Lake----------	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
426B:					
Coppler------------	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: slope, too sandy.	Moderate: droughty, large stones, slope.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
426C:					
Coppler	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: slope, too sandy.	Moderate: droughty, large stones, slope.
426D:					
Coppler	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: slope, too sandy.	Moderate: droughty, large stones, slope.
451C:					
Annalake	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
477B:					
Algonquin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Springport	Severe: percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding.
478:					
Springport	Severe: percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding.
479A:					
Algonquin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
480B:					
Negwegon	Severe: wetness.	Moderate: percs slowly, wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
Algonquin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Lupton	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
481C:					
Negwegon	Severe: wetness.	Moderate: percs slowly, wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
Lupton	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
482B:					
Summerville	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Severe: depth to rock.
482C:					
Summerville	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Slight	Severe: depth to rock.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
483A:					
Lachine	Severe: depth to rock, wetness.	Severe: depth to rock.	Severe: depth to rock, wetness.	Moderate: wetness.	Severe: depth to rock.
484A:					
Elcajon	Moderate: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: depth to rock, wetness.
485A:					
Bowers	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
486B:					
Tonkey	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Bowers	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
487B:					
Slade	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: large stones, wetness.
Angelica	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
489F:					
Crowell	Severe: cemented pan, slope, too sandy.	Severe: slope, too acid, too sandy.	Severe: cemented pan, slope, too sandy.	Severe: too sandy.	Severe: cemented pan, slope, too acid.
Proper	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.

Table 13.--Wildlife Habitat

(Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	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
11B:										
Eastport--------	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
12B:										
Tawas-----------	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
Au Gres---------	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor
13:										
Tawas-----------	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
Lupton----------	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
14:										
Dawson----------	Very poor	Poor	Poor	Poor	Poor	Poor	Good	Poor	Poor	Fair
Loxley----------	Very poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
16B:										
Graycalm--------	Poor	Poor	Fair	Good	Good	Very poor	Very poor	Poor	Good	Very poor
16C:										
Graycalm--------	Poor	Poor	Fair	Good	Good	Very poor	Very poor	Poor	Good	Very poor
16D:										
Graycalm--------	Poor	Poor	Fair	Good	Good	Very poor	Very poor	Poor	Good	Very poor
16E:										
Graycalm--------	Poor	Poor	Fair	Good	Good	Very poor	Very poor	Poor	Good	Very poor
17A:										
Croswell--------	Poor	Poor	Fair	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor
17B:										
Croswell--------	Poor	Poor	Fair	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor
18A:										
Au Gres---------	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor
19:										
Leafriver-------	Very poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
27A:										
Tacoda----------	Poor	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor
28B:										
East Lake-------	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	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
28C: East Lake	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
29A: Battlefield	Fair	Fair	Good	Fair	Fair	Fair	Poor	Fair	Fair	Poor
30: Wheatley	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good
31B: Klacking	Fair	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Fair	Very poor
31C: Klacking	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
31D: Klacking	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
31E: Klacking	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
35: Kinross	Very poor	Poor	Poor	Fair	Fair	Good	Good	Very poor	Fair	Good
36B: Annalake	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
36C: Annalake	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
37A: Richter	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
37B: Richter	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor
38: Tonkey	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good
41B: McGinn	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
41C: McGinn	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
41D: McGinn	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	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
41E:										
McGinn	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
42A:										
Killmaster	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
43:										
Wakeley	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good
44B:										
Ossineke	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
44C:										
Ossineke	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
45B:										
Hoist	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
45C:										
Hoist	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
46:										
Ensley	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good
47D:										
Graycalm	Poor	Poor	Fair	Good	Good	Very poor	Very poor	Poor	Good	Very poor
53B:										
Negwegon	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
53C:										
Negwegon	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
54A:										
Algonquin	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair
55:										
Springport	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good
57B:										
Kawkawlin	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
59B:										
Algonquin	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair
Springport	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good
62A:										
Allendale	Fair	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor
63D:										
Bamfield	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Good	Very poor

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	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
63E:										
Bamfield	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Good	Very poor
68:										
Rondeau	Poor	Poor	Poor	Very poor	Very poor	Good	Good	Poor	Very poor	Good
69:										
Loxley	Very poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
70:										
Lupton	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
71:										
Tawas	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
72:										
Dorval	Very poor	Very poor	Very poor	Poor	Poor	Good	Good	Very poor	Poor	Good
74C2:										
Negwegon	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
75B:										
Rubicon	Poor	Poor	Fair	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor
75D:										
Rubicon	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
75E:										
Rubicon	Very poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
77:										
Rollaway	Very poor	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good
78:										
Pits, borrow.										
82B:										
Udorthents.										
82C:										
Udorthents.										
83B:										
Udipsamments.										
83F:										
Udipsamments.										
84B:										
Zimmerman	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	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
84C:										
Zimmerman-------	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor
84E:										
Zimmerman-------	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor
85D:										
Zimmerman-------	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor
Annalake--------	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
86:										
Histosols.										
Aquents.										
87:										
Ausable---------	Very poor	Poor	Poor	Poor	Poor	Fair	Good	Poor	Poor	Fair
90B:										
Chinwhisker-----	Poor	Poor	Fair	Good	Good	Very poor	Very poor	Poor	Good	Very poor
92B:										
Klacking--------	Fair	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Fair	Very poor
McGinn----------	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
92C:										
Klacking--------	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
McGinn----------	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
93B:										
Tacoda----------	Poor	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor
Wakeley---------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good
94F:										
Klacking--------	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
McGinn----------	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
97:										
Colonville------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
113:										
Angelica--------	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life
116C:										
Mancelona-------	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
127:										
Cathro----------	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
128:										
Dawson----------	Very poor	Poor	Poor	Poor	Poor	Poor	Good	Poor	Poor	Fair
145C:										
Rousseau--------	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
145E:										
Rousseau--------	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
159A:										
Finch-----------	Poor	Poor	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor
166A:										
Slade-----------	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
182:										
Pits, quarry----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
300A:										
Hagensville-----	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
304A:										
Iosco-----------	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair
305B:										
Johnswood-------	Poor	Fair	Fair	Good	Good	Poor	Very poor	Fair	Good	Very poor
308B:										
Krakow----------	Fair	Fair	Good	Good	Good	Poor	Very poor	Fair	Good	Very poor
308C:										
Krakow----------	Poor	Poor	Fair	Good	Good	Very poor	Very poor	Poor	Good	Very poor
308D:										
Krakow----------	Poor	Poor	Fair	Good	Good	Very poor	Very poor	Poor	Good	Very poor
316:										
Ruse------------	Poor	Poor	Fair	Poor	Fair	Good	Poor	Poor	Fair	Fair
350E:										
Blue Lake-------	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	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
359C:										
Algonquin-------	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair
Negwegon--------	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
Dorval----------	Very poor	Very poor	Very poor	Poor	Poor	Good	Good	Very poor	Poor	Good
361B:										
Allendale-------	Fair	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor
Dorval----------	Very poor	Very poor	Very poor	Poor	Poor	Good	Good	Very poor	Poor	Good
Blue Lake-------	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
362D:										
Millersburg-----	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
362E:										
Millersburg-----	Very poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
368A:										
Au Gres---------	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor
Deford----------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good
369:										
Deford----------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good
371:										
Springport------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good
373B:										
Grayling--------	Poor	Poor	Fair	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor
374:										
Thunderbay------	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good
376A:										
Urban land.										
Udipsamments.										
380:										
Access denied.										
392:										
Caffey----------	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good
393B:										
Morganlake------	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	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
393C:										
Morganlake------	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
396F:										
Proper----------	Poor	Poor	Fair	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor
Deford----------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good
Rousseau--------	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
397:										
Spot------------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good
414B:										
Namur-----------	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor	Very poor
415A:										
Potagannissing--	Very poor	Very poor	Poor	Very poor	Very poor	Fair	Very poor	Poor	Very poor	Very poor
416B:										
Negwegon--------	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
417B:										
Alpena----------	Poor	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
417C:										
Alpena----------	Poor	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
418E:										
Alpena----------	Poor	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
419:										
Chippeny--------	Very poor	Poor	Poor	Poor	Poor	Good	Fair	Poor	Poor	Fair
420A:										
Otisco----------	Fair	Good	Good	Fair	Good	Fair	Very poor	Good	Fair	Very poor
424B:										
Morganlake------	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
Ossineke--------	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
Blue Lake-------	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Open- land wild- life	Wood- land wild- life	Wetland wild- life
424C:										
Morganlake	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
Ossineke	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
Blue Lake	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
426B:										
Coppler	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
426C:										
Coppler	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
426D:										
Coppler	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
451C:										
Annalake	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor
477B:										
Algonquin	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair
Springport	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good
478:										
Springport	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good
479A:										
Algonquin	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair
480B:										
Negwegon	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
Algonquin	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair
Lupton	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
481C:										
Negwegon	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
Lupton	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
482B:										
Summerville	Fair	Fair	Fair	Good	Good	Poor	Very poor	Fair	Good	Very poor
482C:										
Summerville	Poor	Fair	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor
483A:										
Lachine	Poor	Poor	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Poor

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	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
484A:										
Elcajon	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Fair
485A:										
Bowers	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair
486B:										
Tonkey	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good
Bowers	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair
487B:										
Slade	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
Angelica	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good
489F:										
Crowell	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
Proper	Poor	Poor	Fair	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor

Table 14.--Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
11B:						
Eastport	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
12B:						
Tawas	Severe: cutbanks cave, excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
Au Gres	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
13:						
Tawas	Severe: cutbanks cave, excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
Lupton	Severe: excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
14:						
Dawson	Severe: excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
Loxley	Severe: excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding, too acid.
16B:						
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
16C:						
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
16D:						
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
16E:						
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
17A:						
Croswell	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
17B:						
Croswell	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.
18A:						
Au Gres	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
19:						
Leafriver	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: excess humus, ponding.
27A:						
Tacoda	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
28B:						
East Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, large stones.
28C:						
East Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, large stones.
29A:						
Battlefield	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
30:						
Wheatley	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
31B:						
Klacking	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
31C:						
Klacking	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
31D:						
Klacking	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
31E:						
Klacking	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
35:						
Kinross	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
36B:						
Annalake	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope, wetness.	Severe: slope.	Moderate: frost action, slope.	Moderate: droughty, slope.
36C:						
Annalake	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope, wetness.	Severe: slope.	Moderate: frost action, slope.	Moderate: droughty, slope.
37A:						
Richter	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
37B:						
Richter	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
38:						
Tonkey	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
41B:						
McGinn	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones.
41C:						
McGinn	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones.
41D:						
McGinn	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones.
41E:						
McGinn	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones.
42A:						
Killmaster	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: droughty, large stones, wetness.
43:						
Wakeley	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding.	Severe: ponding.	Severe: ponding.
44B:						
Ossineke	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, wetness.	Moderate: low strength, shrink-swell, wetness.	Moderate: wetness.
44C:						
Ossineke	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, wetness.	Moderate: low strength, shrink-swell, wetness.	Moderate: wetness.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
45B:						
Hoist	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope, wetness.	Severe: slope.	Moderate: frost action, slope.	Moderate: large stones, slope.
45C:						
Hoist	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope, wetness.	Severe: slope.	Moderate: frost action, slope.	Moderate: large stones, slope.
46:						
Ensley	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
47D:						
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
53B:						
Negwegon	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell.	Moderate: wetness.
53C:						
Negwegon	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell.	Moderate: wetness.
54A:						
Algonquin	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell, wetness.	Severe: wetness.
55:						
Springport	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
57B:						
Kawkawlin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
59B:						
Algonquin	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell, wetness.	Severe: wetness.
Springport	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
62A:						
Allendale	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
63D:						
Bamfield-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
63E:						
Bamfield-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
68:						
Rondeau------------	Severe: excess humus, ponding.	Severe: ponding, subsides.	Severe: ponding, subsides.	Severe: ponding, subsides.	Severe: ponding, subsides.	Severe: excess humus, ponding.
69:						
Loxley-------------	Severe: excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding, too acid.
70:						
Lupton-------------	Severe: excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
71:						
Tawas--------------	Severe: cutbanks cave, excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
72:						
Dorval-------------	Severe: excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: ponding, shrink-swell, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
74C2:						
Negwegon-----------	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, slope, wetness.	Severe: low strength, shrink-swell.	Moderate: slope, wetness.
75B:						
Rubicon------------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
75D:						
Rubicon------------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
75E:						
Rubicon------------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
77:						
Rollaway	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, frost action, ponding.	Severe: excess humus, flooding, ponding.
78:						
Pits, borrow.						
82B:						
Udorthents	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
82C:						
Udorthents	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
83B:						
Udipsamments	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
83F:						
Udipsamments	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
84B:						
Zimmerman	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
84C:						
Zimmerman	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
84E:						
Zimmerman	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
85D:						
Zimmerman	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
Annalake	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope, wetness.	Severe: slope.	Moderate: frost action, slope.	Moderate: droughty, slope.
86:						
Histosols	Severe: excess humus, ponding.	Severe: low strength, ponding.	Severe: ponding.	Severe: low strength, ponding.	Severe: frost action, ponding.	Severe: excess humus, ponding.
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
87:						
Ausable	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: excess humus, flooding, ponding.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
90B:						
Chinwhisker	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.
92B:						
Klacking	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
McGinn	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones.
92C:						
Klacking	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
McGinn	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones.
93B:						
Tacoda	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Wakeley	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding.	Severe: ponding.	Severe: ponding.
94F:						
Klacking	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
McGinn	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones.
97:						
Colonville	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	---
113:						
Angelica	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
116C:						
Mancelona	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, large stones, slope.
127:						
Cathro	Severe: excess humus, ponding.	Severe: ponding, subsides.	Severe: ponding, subsides.	Severe: ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
128:						
Dawson	Severe: excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
145C:						
Rousseau-----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
145E:						
Rousseau-----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
159A:						
Finch--------------	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: cemented pan, wetness.	Severe: wetness.	Severe: wetness.	Severe: cemented pan, droughty, wetness.
166A:						
Slade--------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: large stones, wetness.
182:						
Pits, quarry-------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.
300A:						
Hagensville--------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
304A:						
Iosco--------------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: droughty, wetness.
305B:						
Johnswood----------	Severe: large stones, wetness.	Severe: large stones, wetness.	Severe: large stones, wetness.	Severe: large stones, wetness.	Severe: large stones.	Severe: droughty, large stones.
308B:						
Krakow-------------	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.
308C:						
Krakow-------------	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.
308D:						
Krakow-------------	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.
316:						
Ruse---------------	Severe: depth to rock, ponding.	Severe: depth to rock, ponding.	Severe: depth to rock, ponding.	Severe: depth to rock, ponding.	Severe: depth to rock, frost action, ponding.	Severe: depth to rock, ponding.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
350E:						
Blue Lake	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
359C:						
Algonquin	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell, wetness.	Severe: wetness.
Negwegon	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell.	Moderate: wetness.
Dorval	Severe: excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: ponding, shrink-swell, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
361B:						
Allendale	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Dorval	Severe: excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: ponding, shrink-swell, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
Blue Lake	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope,
362D:						
Millersburg	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: frost action, slope.	Moderate: droughty, large stones, slope.
362E:						
Millersburg	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: frost action, slope.	Moderate: droughty, large stones, slope.
368A:						
Au Gres	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Deford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
369:						
Deford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
371:						
Springport	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
373B:						
Grayling	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
374:						
Thunderbay	Severe: too sandy, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.
376A:						
Urban land	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
Udipsamments	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty.
380:						
Access denied.						
392:						
Caffey	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
393B:						
Morganlake	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid.
393C:						
Morganlake	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid.
396F:						
Proper	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Severe: droughty.
Deford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
Rousseau	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
397:						
Spot	Severe: cemented pan, cutbanks cave, ponding.	Severe: ponding.	Severe: cemented pan, ponding.	Severe: ponding.	Severe: ponding.	Severe: cemented pan, excess humus, ponding.
414B:						
Namur	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
415A:						
Potagannissing-----	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, frost action, wetness.	Severe: depth to rock, wetness.
416B:						
Negwegon-----------	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell.	Moderate: wetness.
417B:						
Alpena-------------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: droughty.
417C:						
Alpena-------------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: droughty.
418E:						
Alpena-------------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: droughty.
419:						
Chippeny-----------	Severe: cutbanks cave, depth to rock, ponding.	Severe: low strength, ponding, subsides.	Severe: depth to rock, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
420A:						
Otisco-------------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
424B:						
Morganlake---------	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid.
Ossineke-----------	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, slope, wetness.	Moderate: low strength, shrink-swell, wetness.	Moderate: wetness.
Blue Lake----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
424C:						
Morganlake---------	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid.
Ossineke-----------	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, slope, wetness.	Moderate: low strength, shrink-swell, wetness.	Moderate: wetness.
Blue Lake----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
426B:						
Coppler	Severe: cutbanks cave, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, large stones, slope.
426C:						
Coppler	Severe: cutbanks cave, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, large stones, slope.
426D:						
Coppler	Severe: cutbanks cave, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, large stones, slope.
451C:						
Annalake	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope, wetness.	Severe: slope.	Moderate: frost action, slope.	Moderate: droughty, slope.
477B:						
Algonquin	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell, wetness.	Severe: wetness.
Springport	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
478:						
Springport	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
479A:						
Algonquin	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell, wetness.	Severe: wetness.
480B:						
Negwegon	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell.	Moderate: wetness.
Algonquin	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell, wetness.	Severe: wetness.
Lupton	Severe: excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
481C:						
Negwegon	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell.	Moderate: wetness.
Lupton	Severe: excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
482B:						
Summerville	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
482C:						
Summerville	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.
483A:						
Lachine	Severe: depth to rock, wetness.	Severe: wetness.	Severe: depth to rock, wetness.	Severe: wetness.	Severe: frost action.	Severe: depth to rock.
484A:						
Elcajon	Severe: depth to rock, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: depth to rock, wetness.
485A:						
Bowers	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
486B:						
Tonkey	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
Bowers	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
487B:						
Slade	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: large stones, wetness.
Angelica	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
489F:						
Crowell	Severe: cemented pan, cutbanks cave, slope.	Severe: slope.	Severe: cemented pan, slope.	Severe: slope.	Severe: slope.	Severe: cemented pan, slope, too acid.
Proper	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Severe: droughty.

Table 15.--Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
11B:					
Eastport	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
12B:					
Tawas	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: ponding, seepage, too sandy.
Au Gres	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
13:					
Tawas	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: ponding, seepage, too sandy.
Lupton	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage.	Poor: excess humus, ponding.
14:					
Dawson	Severe: ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding, seepage.	Poor: excess humus, ponding.
Loxley	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage.	Poor: excess humus, ponding, too acid.
16B:					
Graycalm	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
16C:					
Graycalm	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
16D:					
Graycalm	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
16E:					
Graycalm	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
17A:					
Croswell	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
17B:					
Croswell	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy,	Severe: seepage, wetness.	Poor: seepage, too sandy.
18A:					
Au Gres	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
19:					
Leafriver	Severe: ponding, poor filter.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: ponding, seepage, too sandy.
27A:					
Tacoda	Severe: percs slowly, poor filter, wetness.	Severe: seepage.	Severe: too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
28B:					
East Lake	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
28C:					
East Lake	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
29A:					
Battlefield	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, small stones, too sandy.
30:					
Wheatley	Severe: ponding, poor filter.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: seepage, small stones, too sandy.
31B:					
Klacking	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
31C:					
Klacking	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
31D:					
Klacking	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
31E:					
Klacking	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
35:					
Kinross	Severe: ponding, poor filter.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: ponding, seepage, too sandy.
36B:					
Annalake	Severe: wetness.	Severe: slope, wetness.	Severe: too sandy.	Moderate: slope, wetness.	Poor: too sandy.
36C:					
Annalake	Severe: wetness.	Severe: slope, wetness.	Severe: too sandy.	Moderate: slope, wetness.	Poor: too sandy.
37A:					
Richter	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
37B:					
Richter	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
38:					
Tonkey	Severe: ponding, poor filter.	Severe: ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: ponding, seepage, too sandy.
41B:					
McGinn	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Good.
41C:					
McGinn	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Good.
41D:					
McGinn	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Good.
41E:					
McGinn	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Good.
42A:					
Killmaster	Severe: percs slowly, wetness.	Severe: seepage.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
43:					
Wakeley	Severe: percs slowly, ponding, poor filter.	Severe: ponding, seepage.	Severe: ponding, too clayey.	Severe: ponding, seepage.	Poor: hard to pack, ponding, too clayey.
44B:					
Ossineke	Severe: percs slowly, wetness.	Moderate: seepage, slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
44C:					
Ossineke	Severe: percs slowly, wetness.	Moderate: seepage, slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
45B:					
Hoist	Severe: percs slowly, wetness.	Severe: seepage, slope.	Moderate: slope, wetness.	Severe: seepage.	Fair: slope, wetness.
45C:					
Hoist	Severe: percs slowly, wetness.	Severe: seepage, slope.	Moderate: slope, wetness.	Severe: seepage.	Fair: slope, wetness.
46:					
Ensley	Severe: ponding.	Severe: ponding, seepage.	Severe: ponding, seepage.	Severe: ponding, seepage.	Poor: ponding.
47D:					
Graycalm	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
53B:					
Negwegon	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.
53C:					
Negwegon	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.
54A:					
Algonquin	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.
55:					
Springport	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: hard to pack, ponding, too clayey.
57B:					
Kawkawlin	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
59B:					
Algonquin	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.
Springport	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: hard to pack, ponding, too clayey.
62A:					
Allendale	Severe: percs slowly, poor filter, wetness.	Severe: seepage.	Severe: too clayey, wetness.	Severe: seepage, wetness.	Poor: hard to pack, too clayey, wetness.
63D:					
Bamfield	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
63E:					
Bamfield	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
68:					
Rondeau	Severe: ponding, subsides.	Severe: excess humus, seepage.	Severe: excess humus, ponding.	Severe: ponding, seepage.	Poor: excess humus, ponding.
69:					
Loxley	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage.	Poor: excess humus, ponding, too acid.
70:					
Lupton	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage.	Poor: excess humus, ponding.
71:					
Tawas	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: ponding, seepage, too sandy.
72:					
Dorval	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: ponding, too clayey.	Severe: ponding, seepage.	Poor: hard to pack, ponding, too clayey.
74C2:					
Negwegon	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
75B:					
Rubicon-----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, slope, too sandy.
75D:					
Rubicon-----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, slope, too sandy.
75E:					
Rubicon-----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, slope, too sandy.
77:					
Rollaway----------	Severe: flooding, percs slowly, ponding.	Severe: excess humus, flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
78:					
Pits, borrow.					
82B:					
Udorthents---------	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
82C:					
Udorthents---------	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
83B:					
Udipsamments-------	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
83F:					
Udipsamments-------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, slope, too sandy.
84B:					
Zimmerman----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
84C:					
Zimmerman----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
84E:					
Zimmerman----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
85D:					
Zimmerman	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Annalake	Severe: wetness.	Severe: slope, wetness.	Severe: too sandy.	Moderate: slope, wetness.	Poor: too sandy.
86:					
Histosols	Severe: ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: ponding.	Poor: excess humus, ponding.
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
87:					
Ausable	Severe: flooding, ponding, poor filter.	Severe: excess humus, flooding, seepage.	Severe: flooding, ponding, seepage.	Severe: flooding, ponding, seepage.	Poor: ponding, seepage, too sandy.
90B:					
Chinwhisker	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
92B:					
Klacking	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
McGinn	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Good.
92C:					
Klacking	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
McGinn	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Good.
93B:					
Tacoda	Severe: percs slowly, poor filter, wetness.	Severe: seepage.	Severe: too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Wakeley	Severe: percs slowly, ponding, poor filter.	Severe: ponding, seepage.	Severe: ponding, too clayey.	Severe: ponding, seepage.	Poor: hard to pack, ponding, too clayey.
94F:					
Klacking	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
McGinn	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Good.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
97:					
Colonville---------	Severe: flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: too sandy, wetness.
113:					
Angelica-----------	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, small stones.
116C:					
Mancelona----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
127:					
Cathro-------------	Severe: percs slowly, ponding.	Severe: excess humus, ponding, seepage.	Severe: ponding.	Severe: ponding, seepage.	Poor: ponding.
128:					
Dawson-------------	Severe: ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding, seepage.	Poor: excess humus, ponding.
145C:					
Rousseau-----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
145E:					
Rousseau-----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
159A:					
Finch--------------	Severe: cemented pan, poor filter, wetness.	Severe: cemented pan, seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
166A:					
Slade--------------	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
182:					
Pits, quarry-------	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.
300A:					
Hagensville--------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
304A:					
Iosco--------------	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
305B:					
Johnswood	Severe: large stones, percs slowly, wetness.	Severe: large stones.	Severe: large stones, wetness.	Severe: wetness.	Poor: large stones, wetness.
308B:					
Krakow	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: slope.	Poor: large stones, slope.
308C:					
Krakow	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: slope.	Poor: large stones, slope.
308D:					
Krakow	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: slope.	Poor: large stones, slope.
316:					
Ruse	Severe: depth to rock, ponding.	Severe: depth to rock, ponding, seepage.	Severe: depth to rock, ponding, seepage.	Severe: depth to rock, ponding.	Poor: depth to rock, large stones, ponding.
350E:					
Blue Lake	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
359C:					
Algonquin	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.
Negwegon	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.
Dorval	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: ponding, too clayey.	Severe: ponding, seepage.	Poor: hard to pack, ponding, too clayey.
361B:					
Allendale	Severe: percs slowly, poor filter, wetness.	Severe: seepage.	Severe: too clayey, wetness.	Severe: seepage, wetness.	Poor: hard to pack, too clayey, wetness.
Dorval	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: ponding, too clayey.	Severe: ponding, seepage.	Poor: hard to pack, ponding, too clayey.
Blue Lake	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
362D:					
Millersburg	Moderate: percs slowly, slope.	Severe: seepage, slope.	Moderate: slope.	Severe: seepage.	Poor: thin layer.
362E:					
Millersburg	Moderate: percs slowly, slope.	Severe: seepage, slope.	Moderate: slope.	Severe: seepage.	Poor: thin layer.
368A:					
Au Gres	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Deford	Severe: ponding, poor filter.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: ponding, seepage, too sandy.
369:					
Deford	Severe: ponding, poor filter.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: ponding, seepage, too sandy.
371:					
Springport	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: hard to pack, ponding, too clayey.
373B:					
Grayling	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
374:					
Thunderbay	Severe: flooding, poor filter, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, poor filter, seepage.	Severe: flooding, seepage, wetness.	Severe: too sandy, wetness.
376A:					
Urban land	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
Udipsamments	Severe: poor filter, wetness.	Severe: seepage.	Severe: seepage, too sandy, wetness.	Severe: seepage.	Poor: seepage, too sandy.
380:					
Access denied.					
392:					
Caffey	Severe: percs slowly, ponding.	Severe: ponding, seepage.	Severe: ponding.	Severe: ponding, seepage.	Poor: ponding.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
393B:					
Morganlake	Severe: percs slowly, poor filter, wetness.	Severe: seepage, wetness.	Severe: too acid.	Severe: seepage.	Fair: too clayey, wetness.
393C:					
Morganlake	Severe: percs slowly, poor filter, wetness.	Severe: seepage, wetness.	Severe: too acid.	Severe: seepage.	Fair: too clayey, wetness.
396F:					
Proper	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Deford	Severe: ponding, poor filter.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: ponding, seepage, too sandy.
Rousseau	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
397:					
Spot	Severe: cemented pan, ponding, poor filter.	Severe: cemented pan, excess humus, seepage.	Severe: ponding, seepage, too sandy.	Severe: cemented pan, ponding, seepage.	Poor: cemented pan, seepage, too sandy.
414B:					
Namur	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
415A:					
Potagannissing	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.
416B:					
Negwegon	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.
417B:					
Alpena	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
417C:					
Alpena	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
418E:					
Alpena	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
419:					
Chippeny	Severe: depth to rock, percs slowly, ponding.	Severe: depth to rock, excess humus, ponding.	Severe: depth to rock, excess humus, ponding.	Severe: depth to rock, ponding.	Poor: depth to rock, excess humus, ponding.
420A:					
Otisco	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
424B:					
Morganlake	Severe: percs slowly, poor filter, wetness.	Severe: seepage, wetness.	Severe: too acid.	Severe: seepage.	Fair: too clayey, wetness.
Ossineke	Severe: wetness.	Severe: wetness.	Severe: seepage, wetness.	Moderate: slope, wetness.	Fair: slope, wetness.
Blue Lake	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
424C:					
Morganlake	Severe: percs slowly, poor filter, wetness.	Severe: seepage, wetness.	Severe: too acid.	Severe: seepage.	Fair: too clayey, wetness.
Ossineke	Severe: wetness.	Severe: wetness.	Severe: seepage, wetness.	Moderate: slope, wetness.	Fair: slope, wetness.
Blue Lake	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
426B:					
Coppler	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, small stones, too sandy.
426C:					
Coppler	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, small stones, too sandy.
426D:					
Coppler	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, small stones, too sandy.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
451C:					
Annalake	Severe: wetness.	Severe: slope, wetness.	Severe: too sandy.	Moderate: slope, wetness.	Poor: too sandy.
477B:					
Algonquin	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.
Springport	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: hard to pack, ponding, too clayey.
478:					
Springport	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: hard to pack, ponding, too clayey.
479A:					
Algonquin	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.
480B:					
Negwegon	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.
Algonquin	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.
Lupton	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage.	Poor: excess humus, ponding.
481C:					
Negwegon	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.
Lupton	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage.	Poor: excess humus, ponding.
482B:					
Summerville	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
482C:					
Summerville	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
483A:					
Lachine	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, thin layer, wetness.
484A:					
Elcajon	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, thin layer, wetness.
485A:					
Bowers	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
486B:					
Tonkey	Severe: ponding, poor filter.	Severe: ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: ponding, seepage, too sandy.
Bowers	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
487B:					
Slade	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Angelica	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, small stones.
489F:					
Crowell	Severe: cemented pan, poor filter, slope.	Severe: cemented pan, seepage, slope.	Severe: seepage, slope, too sandy.	Severe: cemented pan, seepage, slope.	Poor: cemented pan, seepage, too sandy.
Proper	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.

Table 16.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
11B:				
Eastport	Good	Probable	Improbable: too sandy.	Poor: too sandy.
12B:				
Tawas	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Au Gres	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
13:				
Tawas	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Lupton	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
14:				
Dawson	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
Loxley	Poor: low strength, wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, too acid, wetness.
16B:				
Graycalm	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
16C:				
Graycalm	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
16D:				
Graycalm	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
16E:				
Graycalm	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
17A:				
Croswell	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
17B:				
Croswell	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
18A:				
Au Gres	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
19:				
Leafriver	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
27A:				
Tacoda	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
28B:				
East Lake	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
28C:				
East Lake	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
29A:				
Battlefield	Poor: wetness.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
30:				
Wheatley	Poor: wetness.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
31B:				
Klacking	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
31C:				
Klacking	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
31D:				
Klacking	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
31E:				
Klacking	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
35:				
Kinross	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
36B:				
Annalake	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones, thin layer.
36C:				
Annalake	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones, thin layer.
37A:				
Richter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
37B:				
Richter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
38:				
Tonkey	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
41B:				
McGinn	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too sandy.
41C:				
McGinn	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too sandy.
41D:				
McGinn	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too sandy.
41E:				
McGinn	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too sandy.
42A:				
Killmaster	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, too sandy.
43:				
Wakeley	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
44B:				
Ossineke	Fair: shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too clayey.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
44C:				
Ossineke	Fair: shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too clayey.
45B:				
Hoist	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
45C:				
Hoist	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
46:				
Ensley	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
47D:				
Graycalm	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
53B:				
Negwegon	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
53C:				
Negwegon	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
54A:				
Algonquin	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
55:				
Springport	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
57B:				
Kawkawlin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
59B:				
Algonquin	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Springport	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
62A:				
Allendale	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
63D:				
Bamfield	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
63E:				
Bamfield	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
68:				
Rondeau	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
69:				
Loxley	Poor: low strength, wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, too acid, wetness.
70:				
Lupton	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
71:				
Tawas	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
72:				
Dorval	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
74C2:				
Negwegon	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
75B:				
Rubicon	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
75D:				
Rubicon	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
75E:				
Rubicon	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
77:				
Rollaway	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
78:				
Pits, borrow.				
82B:				
Udorthents	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
82C:				
Udorthents	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
83B:				
Udipsamments	Good	Probable	Improbable: too sandy.	Fair: small stones, too sandy.
83F:				
Udipsamments	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
84B:				
Zimmerman	Good	Probable	Improbable: too sandy.	Poor: too sandy.
84C:				
Zimmerman	Good	Probable	Improbable: too sandy.	Poor: too sandy.
84E:				
Zimmerman	Good	Probable	Improbable: too sandy.	Poor: too sandy.
85D:				
Zimmerman	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Annalake	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones, thin layer.
86:				
Histosols	Poor: low strength, wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Aquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
87:				
Ausable	Poor: wetness.	Probable	Improbable: too sandy.	Poor: small stones, too sandy, wetness.
90B:				
Chinwhisker	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
92B:				
Klacking	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
McGinn	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too sandy.
92C:				
Klacking	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
McGinn	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too sandy.
93B:				
Tacoda	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Wakeley	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
94F:				
Klacking	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
McGinn	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too sandy.
97:				
Colonville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
113:				
Angelica	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, wetness.
116C:				
Mancelona	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
127:				
Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
128:				
Dawson	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
145C:				
Rousseau	Good	Probable	Improbable: too sandy.	Poor: too sandy.
145E:				
Rousseau	Good	Probable	Improbable: too sandy.	Poor: too sandy.
159A:				
Finch	Poor: wetness.	Probable	Improbable: too sandy.	Poor: area reclaim, cemented pan, too sandy.
166A:				
Slade	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
182:				
Pits, quarry	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
300A:				
Hagensville	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
304A:				
Iosco	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, too sandy.
305B:				
Johnswood	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
308B:				
Krakow	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
308C:				
Krakow	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
308D:				
Krakow	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
316:				
Ruse	Poor: depth to rock, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, wetness.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
350E:				
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
359C:				
Algonquin	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Negwegon	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Dorval	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
361B:				
Allendale	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
Dorval	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
362D:				
Millersburg	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
362E:				
Millersburg	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
368A:				
Au Gres	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Deford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
369:				
Deford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
371:				
Springport	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
373B:				
Grayling	Good	Probable	Improbable: too sandy.	Poor: too sandy.
374:				
Thunderbay	Severe: wetness.	Limitation: depth to rock.	Limitation: droughty.	Poor: wetness.
376A:				
Urban land	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
Udipsamments	Good	Probable	Improbable: too sandy.	Poor: too sandy.
380:				
Access denied.				
392:				
Caffey	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
393B:				
Morganlake	Fair: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too acid, too sandy.
393C:				
Morganlake	Fair: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too acid, too sandy.
396F:				
Proper	Fair: wetness.	Probable	Improbable: too sandy.	Poor: area reclaim, too sandy.
Deford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Rousseau	Good	Probable	Improbable: too sandy.	Poor: too sandy.
397:				
Spot	Poor: wetness.	Probable	Improbable: too sandy.	Poor: area reclaim, cemented pan, too sandy.
414B:				
Namur	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
415A:				
Potagannissing	Poor: depth to rock, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, wetness.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
416B:				
Negwegon	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
417B:				
Alpena	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
417C:				
Alpena	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
418E:				
Alpena	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
419:				
Chippeny	Poor: depth to rock, wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, small stones, wetness.
420A:				
Otisco	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
424B:				
Morganlake	Fair: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too acid, too sandy.
Ossineke	Fair: wetness.	Probable	Improbable: too sandy.	Fair: small stones, too clayey.
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
424C:				
Morganlake	Fair: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too acid, too sandy.
Ossineke	Fair: wetness.	Probable	Improbable: too sandy.	Fair: small stones, too clayey.
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
426B:				
Coppler	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
426C:				
Coppler	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
426D:				
Coppler	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
451C:				
Annalake	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones, thin layer.
477B:				
Algonquin	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Springport	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
478:				
Springport	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
479A:				
Algonquin	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
480B:				
Negwegon	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Algonquin	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Lupton	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
481C:				
Negwegon	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Lupton	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
482B:				
Summerville	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
482C:				
Summerville	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
483A:				
Lachine	Poor: depth to rock, thin layer.	Improbable: excess fines, thin layer.	Improbable: excess fines, thin layer.	Poor: depth to rock, large stones.
484A:				
Elcajon	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, thin layer, too clayey.
485A:				
Bowers	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
486B:				
Tonkey	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
Bowers	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
487B:				
Slade	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Angelica	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, wetness.
489F:				
Crowell	Fair: slope.	Probable	Improbable: too sandy.	Poor: area reclaim, cemented pan, too sandy.
Proper	Fair: wetness.	Probable	Improbable: too sandy.	Poor: area reclaim, too sandy.

Table 17.--Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
11B:							
Eastport	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
12B:							
Tawas	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave, slow refill.	Limitation: frost action, ponding, subsides.	Limitation: ponding, soil blowing.	Limitation: ponding, soil blowing, too sandy.	Limitation: wetness.
Au Gres	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Limitation: cutbanks cave.	Limitation: droughty, wetness.	Limitation: soil blowing, too sandy, wetness.	Limitation: droughty, wetness.
13:							
Tawas	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave, slow refill.	Limitation: frost action, ponding, subsides.	Limitation: ponding, soil blowing.	Limitation: ponding, soil blowing, too sandy.	Limitation: wetness.
Lupton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Limitation: frost action, ponding, subsides.	Limitation: ponding, soil blowing.	Limitation: ponding, soil blowing.	Limitation: wetness.
14:							
Dawson	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Limitation: frost action, ponding, subsides.	Limitation: ponding.	Limitation: ponding.	Limitation: wetness.
Loxley	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Limitation: frost action, ponding, subsides.	Limitation: ponding, too acid.	Limitation: ponding.	Limitation: wetness.
16B:							
Graycalm	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
16C:							
Graycalm	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
16D:							
Graycalm	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
16E: Graycalm--------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
17A: Croswell--------	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Limitation: cutbanks cave.	Limitation: droughty, wetness.	Limitation: too sandy, wetness.	Limitation: droughty.
17B: Croswell--------	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Limitation: cutbanks cave.	Limitation: droughty, wetness.	Limitation: too sandy, wetness.	Limitation: droughty.
18A: Au Gres---------	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Limitation: cutbanks cave.	Limitation: droughty, wetness.	Limitation: soil blowing, too sandy, wetness.	Limitation: droughty, wetness.
19: Leafriver-------	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Limitation: frost action, ponding, subsides.	Limitation: ponding, soil blowing.	Limitation: ponding, soil blowing, too sandy.	Limitation: wetness.
27A: Tacoda----------	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: no water.	Limitation: cutbanks cave.	Limitation: droughty, wetness.	Limitation: soil blowing, too sandy, wetness.	Limitation: droughty, wetness.
28B: East Lake-------	Severe: seepage.	Severe: seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
28C: East Lake-------	Severe: seepage.	Severe: seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
29A: Battlefield-----	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Limitation: cutbanks cave.	Limitation: droughty, fast intake, wetness.	Limitation: soil blowing, too sandy, wetness.	Limitation: droughty, wetness.
30: Wheatley--------	Severe: seepage.	Severe: ponding, seepage.	Severe: cutbanks cave.	Limitation: cutbanks cave, ponding.	Limitation: droughty, ponding.	Limitation: ponding, soil blowing, too sandy.	Limitation: droughty, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
31B:							
Klacking--------	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
31C:							
Klacking--------	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
31D:							
Klacking--------	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
31E:							
Klacking--------	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
35:							
Kinross---------	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Limitation: cutbanks cave, ponding.	Limitation: ponding.	Limitation: ponding, soil blowing, too sandy.	Limitation: wetness.
36B:							
Annalake--------	Severe: slope.	Severe: piping.	Severe: no water.	Limitation: cutbanks cave, slope.	Limitation: droughty, slope, wetness.	Limitation: slope, too sandy, wetness.	Limitation: droughty, slope.
36C:							
Annalake--------	Severe: slope.	Severe: piping.	Severe: no water.	Limitation: cutbanks cave, slope.	Limitation: droughty, slope, wetness.	Limitation: slope, too sandy, wetness.	Limitation: droughty, slope.
37A:							
Richter---------	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Limitation: cutbanks cave, frost action.	Limitation: droughty, wetness.	Limitation: soil blowing, too sandy, wetness.	Limitation: droughty, wetness.
37B:							
Richter---------	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Limitation: cutbanks cave, frost action.	Limitation: droughty, wetness.	Limitation: soil blowing, too sandy, wetness.	Limitation: droughty, wetness.
38:							
Tonkey----------	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Limitation: cutbanks cave, frost action, ponding.	Limitation: ponding.	Limitation: ponding, too sandy.	Limitation: rooting depth, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
41B: McGinn----------	Severe: seepage.	Severe: piping.	Severe: no water.	Limitation: deep to water.	Limitation: fast intake, slope, soil blowing.	Limitation: soil blowing.	Limitation: rooting depth.
41C: McGinn----------	Severe: seepage.	Severe: piping.	Severe: no water.	Limitation: deep to water.	Limitation: fast intake, slope, soil blowing.	Limitation: soil blowing.	Limitation: rooting depth.
41D: McGinn----------	Severe: seepage.	Severe: piping.	Severe: no water.	Limitation: deep to water.	Limitation: fast intake, slope, soil blowing.	Limitation: soil blowing.	Limitation: rooting depth.
41E: McGinn----------	Severe: seepage.	Severe: piping.	Severe: no water.	Limitation: deep to water.	Limitation: fast intake, slope, soil blowing.	Limitation: soil blowing.	Limitation: rooting depth.
42A: Killmaster------	Severe: seepage.	Severe: piping.	Severe: no water.	Limitation: frost action, percs slowly.	Limitation: droughty, soil blowing, wetness.	Limitation: percs slowly, soil blowing, wetness.	Limitation: droughty, rooting depth, wetness.
43: Wakeley---------	Severe: seepage.	Severe: ponding.	Severe: no water.	Limitation: percs slowly, ponding.	Limitation: droughty, fast intake, ponding.	Limitation: percs slowly, ponding, soil blowing.	Limitation: droughty, percs slowly, wetness.
44B: Ossineke--------	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Limitation: slope.	Limitation: slope, soil blowing, wetness.	Limitation: erodes easily, wetness.	Limitation: erodes easily, rooting depth.
44C: Ossineke--------	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Limitation: slope.	Limitation: slope, soil blowing, wetness.	Limitation: erodes easily, wetness.	Limitation: erodes easily, rooting depth.
45B: Hoist-----------	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Limitation: slope.	Limitation: slope, soil blowing, wetness.	Limitation: slope, soil blowing, wetness.	Limitation: rooting depth, slope.
45C: Hoist-----------	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Limitation: slope.	Limitation: slope, soil blowing, wetness.	Limitation: slope, soil blowing, wetness.	Limitation: rooting depth, slope.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
46:							
Ensley----------	Severe: seepage.	Severe: piping, ponding, seepage.	Moderate: slow refill.	Limitation: frost action, ponding.	Limitation: ponding.	Limitation: ponding.	Limitation: wetness.
47D:							
Graycalm--------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
53B:							
Negwegon--------	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Limitation: percs slowly, slope.	Limitation: percs slowly, slope, wetness.	Limitation: erodes easily, wetness.	Limitation: erodes easily, wetness.
53C:							
Negwegon--------	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Limitation: percs slowly, slope.	Limitation: percs slowly, slope, wetness.	Limitation: erodes easily, wetness.	Limitation: erodes easily, wetness.
54A:							
Algonquin-------	Slight--------	Severe: wetness.	Severe: slow refill.	Limitation: frost action, percs slowly.	Limitation: percs slowly, wetness.	Limitation: erodes easily, percs slowly, wetness.	Limitation: erodes easily, percs slowly, wetness.
55:							
Springport------	Slight--------	Severe: ponding.	Severe: slow refill.	Limitation: frost action, percs slowly, ponding.	Limitation: percs slowly, ponding.	Limitation: percs slowly, ponding.	Limitation: percs slowly, wetness.
57B:							
Kawkawlin-------	Slight--------	Severe: wetness.	Severe: slow refill.	Limitation: frost action, percs slowly.	Limitation: wetness.	Limitation: erodes easily, percs slowly, wetness.	Limitation: erodes easily, percs slowly, wetness.
59B:							
Algonquin-------	Slight--------	Severe: wetness.	Severe: slow refill.	Limitation: frost action, percs slowly.	Limitation: percs slowly, wetness.	Limitation: erodes easily, percs slowly, wetness.	Limitation: erodes easily, percs slowly, wetness.
Springport------	Slight--------	Severe: ponding.	Severe: slow refill.	Limitation: frost action, percs slowly, ponding.	Limitation: percs slowly, ponding.	Limitation: percs slowly, ponding.	Limitation: percs slowly, wetness.
62A:							
Allendale-------	Severe: seepage.	Severe: hard to pack, wetness.	Severe: no water.	Limitation: percs slowly.	Limitation: droughty, wetness.	Limitation: percs slowly, soil blowing, wetness.	Limitation: droughty, percs slowly, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
63D: Bamfield	Severe: slope.	Slight	Severe: no water.	Limitation: deep to water.	Limitation: percs slowly, slope, soil blowing.	Limitation: percs slowly, slope, soil blowing.	Limitation: percs slowly, rooting depth, slope.
63E: Bamfield	Severe: slope.	Slight	Severe: no water.	Limitation: deep to water.	Limitation: percs slowly, slope, soil blowing.	Limitation: percs slowly, slope, soil blowing.	Limitation: percs slowly, rooting depth, slope.
68: Rondeau	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Limitation: ponding, subsides.	Limitation: percs slowly, ponding, soil blowing.	Limitation: ponding, soil blowing.	Limitation: wetness.
69: Loxley	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Limitation: frost action, ponding, subsides.	Limitation: ponding, too acid.	Limitation: ponding.	Limitation: wetness.
70: Lupton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Limitation: frost action, ponding, subsides.	Limitation: ponding, soil blowing.	Limitation: ponding, soil blowing.	Limitation: wetness.
71: Tawas	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave, slow refill.	Limitation: frost action, ponding, subsides.	Limitation: ponding, soil blowing.	Limitation: ponding, soil blowing, too sandy.	Limitation: wetness.
72: Dorval	Severe: seepage.	Severe: ponding.	Severe: no water.	Limitation: percs slowly, ponding, subsides.	Limitation: percs slowly, ponding, soil blowing.	Limitation: percs slowly, ponding, soil blowing.	Limitation: percs slowly, wetness.
74C2: Negwegon	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Limitation: percs slowly, slope.	Limitation: percs slowly, slope, wetness.	Limitation: erodes easily, slope, wetness.	Limitation: erodes easily, slope, wetness.
75B: Rubicon	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
75D: Rubicon	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
75E:							
Rubicon---------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
77:							
Rollaway--------	Moderate: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave, slow refill.	Limitation: flooding, frost action, ponding.	Limitation: percs slowly, ponding, soil blowing.	Limitation: erodes easily, ponding, too sandy.	Limitation: erodes easily, wetness.
78:							
Pits, borrow.							
82B:							
Udorthents------	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
82C:							
Udorthents------	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
83B:							
Udipsamments----	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
83F:							
Udipsamments----	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
84B:							
Zimmerman-------	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake,	Limitation: soil blowing, too sandy.	Limitation: droughty.
84C:							
Zimmerman-------	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
84E:							
Zimmerman-------	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
85D:							
Zimmerman-------	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
85D:							
Annalake	Severe: slope.	Severe: piping.	Severe: no water.	Limitation: cutbanks cave, slope.	Limitation: droughty, slope, wetness.	Limitation: slope, too sandy, wetness.	Limitation: droughty, slope.
86:							
Histosols	Slight	Severe: excess humus, ponding.	Slight	Limitation: frost action, ponding.	Limitation: ponding, soil blowing.	Limitation: ponding, soil blowing.	Limitation: wetness.
Aquents	Slight	Severe: ponding.	Slight	Limitation: frost action, ponding.	Limitation: ponding.	Limitation: ponding.	Limitation: wetness.
87:							
Ausable	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Limitation: cutbanks cave, flooding, ponding.	Limitation: flooding, ponding, soil blowing.	Limitation: ponding, soil blowing, too sandy.	Limitation: wetness.
90B:							
Chinwhisker	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Limitation: cutbanks cave.	Limitation: droughty, wetness.	Limitation: soil blowing, too sandy, wetness.	Limitation: droughty.
92B:							
Klacking	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
McGinn	Severe: seepage.	Severe: piping.	Severe: no water.	Limitation: deep to water.	Limitation: fast intake, slope, soil blowing.	Limitation: soil blowing.	Limitation: rooting depth.
92C:							
Klacking	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
McGinn	Severe: seepage.	Severe: piping.	Severe: no water.	Limitation: deep to water.	Limitation: fast intake, slope, soil blowing.	Limitation: soil blowing.	Limitation: rooting depth.
93B:							
Tacoda	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: no water.	Limitation: cutbanks cave.	Limitation: droughty, wetness.	Limitation: soil blowing, too sandy, wetness.	Limitation: droughty, wetness.
Wakeley	Severe: seepage.	Severe: ponding.	Severe: no water.	Limitation: percs slowly, ponding.	Limitation: droughty, fast intake, ponding.	Limitation: percs slowly, ponding, soil blowing.	Limitation: droughty, percs slowly, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
94F:							
Klacking--------	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
McGinn----------	Severe: seepage.	Severe: piping.	Severe: no water.	Limitation: deep to water.	Limitation: fast intake, slope, soil blowing.	Limitation: soil blowing.	Limitation: rooting depth.
97:							
Colonville------	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Limitation: cutbanks cave, flooding, frost action.	Limitation: droughty, soil blowing, wetness.	Limitation: soil blowing, too sandy, wetness.	Limitation: droughty, wetness.
113:							
Angelica--------	Slight--------	Severe: piping, ponding.	Severe: slow refill.	Limitation: frost action, ponding.	Limitation: ponding, rooting depth.	Limitation: ponding.	Limitation: rooting depth, wetness.
116C:							
Mancelona-------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
127:							
Cathro----------	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill.	Limitation: frost action, ponding, subsides.	Limitation: ponding, soil blowing.	Limitation: ponding, soil blowing.	Limitation: wetness.
128:							
Dawson----------	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Limitation: frost action, ponding, subsides.	Limitation: ponding.	Limitation: ponding.	Limitation: wetness.
145C:							
Rousseau--------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
145E:							
Rousseau--------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
159A:							
Finch-----------	Severe: cemented pan, seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Limitation: cemented pan, cutbanks cave.	Limitation: droughty, wetness.	Limitation: cemented pan, too sandy, wetness.	Limitation: cemented pan, droughty, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
166A: Slade	Moderate: seepage.	Severe: thin layer.	Severe: no water.	Limitation: frost action.	Limitation: wetness.	Limitation: wetness.	Limitation: wetness.
182: Pits, quarry	Severe: depth to rock, slope.	Slight	Severe: no water.	Limitation: deep to water.	Limitation: depth to rock, slope.	Limitation: depth to rock, slope.	Limitation: depth to rock, slope.
300A: Hagensville	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Limitation: frost action.	Limitation: droughty, wetness.	Limitation: soil blowing, wetness.	Limitation: droughty, rooting depth, wetness.
304A: Iosco	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Limitation: frost action.	Limitation: droughty, fast intake, wetness.	Limitation: soil blowing, wetness.	Limitation: droughty, wetness.
305B: Johnswood	Moderate: slope.	Severe: large stones, piping, seepage.	Severe: no water.	Limitation: large stones, percs slowly, slope.	Limitation: large stones, slope, wetness.	Limitation: large stones, wetness.	Limitation: large stones, wetness.
308B: Krakow	Severe: slope.	Severe: large stones, piping.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, large stones, slope.	Limitation: large stones, slope.	Limitation: droughty, large stones, slope.
308C: Krakow	Severe: slope.	Severe: large stones, piping.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, large stones, slope.	Limitation: large stones, slope.	Limitation: droughty, large stones, slope.
308D: Krakow	Severe: slope.	Severe: large stones, piping.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, large stones, slope.	Limitation: large stones, slope.	Limitation: droughty, large stones, slope.
316: Ruse	Severe: depth to rock.	Severe: piping, ponding.	Severe: depth to rock.	Limitation: depth to rock, frost action, ponding.	Limitation: depth to rock, ponding.	Limitation: depth to rock, ponding, poor outlets.	Limitation: depth to rock, wetness.
350E: Blue Lake	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
359C:							
Algonquin-------	Slight--------	Severe: wetness.	Severe: slow refill.	Limitation: frost action, percs slowly.	Limitation: percs slowly, wetness.	Limitation: erodes easily, percs slowly, wetness.	Limitation: erodes easily, percs slowly, wetness.
Negwegon--------	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Limitation: percs slowly, slope.	Limitation: percs slowly, slope, wetness.	Limitation: erodes easily, wetness.	Limitation: erodes easily, wetness.
Dorval----------	Severe: seepage.	Severe: ponding.	Severe: no water.	Limitation: percs slowly, ponding, subsides.	Limitation: percs slowly, ponding, soil blowing.	Limitation: percs slowly, ponding, soil blowing.	Limitation: percs slowly, wetness.
361B:							
Allendale-------	Severe: seepage.	Severe: hard to pack, wetness.	Severe: no water.	Limitation: percs slowly.	Limitation: droughty, wetness.	Limitation: percs slowly, soil blowing, wetness.	Limitation: droughty, percs slowly, wetness.
Dorval----------	Severe: seepage.	Severe: ponding.	Severe: no water.	Limitation: percs slowly, ponding, subsides.	Limitation: percs slowly, ponding, soil blowing.	Limitation: percs slowly, ponding, soil blowing.	Limitation: percs slowly, wetness.
Blue Lake-------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
362D:							
Millersburg-----	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing.	Limitation: droughty, slope.
362E:							
Millersburg-----	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing.	Limitation: droughty, slope.
368A:							
Au Gres---------	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Limitation: cutbanks cave.	Limitation: droughty, wetness.	Limitation: soil blowing, too sandy, wetness.	Limitation: droughty, wetness.
Deford----------	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Limitation: cutbanks cave, ponding.	Limitation: droughty, ponding.	Limitation: ponding, soil blowing, too sandy.	Limitation: droughty, wetness.
369:							
Deford----------	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Limitation: cutbanks cave, ponding.	Limitation: droughty, ponding.	Limitation: ponding, soil blowing, too sandy.	Limitation: droughty, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
371:							
Springport------	Slight--------	Severe: ponding.	Severe: no water.	Limitation: frost action, percs slowly, ponding.	Limitation: percs slowly, ponding.	Limitation: erodes easily, percs slowly, ponding.	Limitation: erodes easily, percs slowly, wetness.
373B:							
Grayling--------	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: soil blowing, too sandy.	Limitation: droughty.
374:							
Thunderbay------	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Limitation: cutbanks cave, flooding.	Limitation: flooding.	Limitation: too sandy, wetness.	Limitation: wetness.
376A:							
Urban land------	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.	Limitation: variable.
Udipsamments----	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Limitation: deep to water.	Limitation: droughty, fast intake, soil blowing.	Limitation: soil blowing, too sandy.	Limitation: droughty.
380:							
Access denied.							
392:							
Caffey----------	Severe: seepage.	Severe: piping, ponding.	Severe: cutbanks cave, slow refill.	Limitation: cutbanks cave, ponding.	Limitation: droughty, fast intake, ponding.	Limitation: erodes easily, ponding, soil blowing.	Limitation: droughty, erodes easily, wetness.
393B:							
Morganlake------	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Limitation: slope, too acid.	Limitation: droughty, slope, wetness.	Limitation: erodes easily, wetness.	Limitation: droughty, erodes easily.
393C:							
Morganlake------	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Limitation: slope, too acid.	Limitation: droughty, slope, wetness.	Limitation: erodes easily, wetness.	Limitation: droughty, erodes easily.
396F:							
Proper----------	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Limitation: cutbanks cave, slope.	Limitation: droughty, slope, wetness.	Limitation: soil blowing, too sandy, wetness.	Limitation: droughty, rooting depth.
Deford----------	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Limitation: cutbanks cave, ponding.	Limitation: droughty, ponding.	Limitation: ponding, soil blowing, too sandy.	Limitation: droughty, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
396F:							
Rousseau--------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
397:							
Spot------------	Severe: cemented pan, seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Limitation: cemented pan, cutbanks cave, ponding.	Limitation: droughty, ponding, soil blowing.	Limitation: cemented pan, ponding, too sandy.	Limitation: cemented pan, droughty, wetness.
414B:							
Namur-----------	Severe: depth to rock.	Severe: thin layer.	Severe: no water.	Limitation: deep to water.	Limitation: depth to rock, slope.	Limitation: depth to rock.	Limitation: depth to rock.
415A:							
Potagannissing--	Severe: depth to rock.	Severe: thin layer, wetness.	Severe: no water.	Limitation: depth to rock, frost action.	Limitation: depth to rock, wetness.	Limitation: depth to rock, wetness.	Limitation: depth to rock, wetness.
416B:							
Negwegon--------	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Limitation: percs slowly, slope.	Limitation: percs slowly, slope, wetness.	Limitation: erodes easily, wetness.	Limitation: erodes easily, wetness.
417B:							
Alpena----------	Severe: seepage.	Severe: seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, slope.	Limitation: too sandy.	Limitation: droughty.
417C:							
Alpena----------	Severe: seepage.	Severe: seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, slope.	Limitation: too sandy.	Limitation: droughty.
418E:							
Alpena----------	Severe: seepage.	Severe: seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, slope.	Limitation: too sandy.	Limitation: droughty.
419:							
Chippeny--------	Moderate: depth to rock, seepage.	Severe: excess humus, ponding.	Severe: cutbanks cave, depth to rock, slow refill.	Limitation: depth to rock, percs slowly, ponding.	Limitation: percs slowly, ponding, soil blowing.	Limitation: depth to rock, ponding, soil blowing.	Limitation: depth to rock, rooting depth, wetness.
420A:							
Otisco----------	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Limitation: cutbanks cave.	Limitation: droughty, wetness.	Limitation: soil blowing, too sandy, wetness.	Limitation: droughty, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
424B:							
Morganlake------	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Limitation: slope, too acid.	Limitation: droughty, slope, wetness.	Limitation: erodes easily, wetness.	Limitation: droughty, erodes easily.
Ossineke--------	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Limitation: slope.	Limitation: slope, soil blowing, wetness.	Limitation: erodes easily, wetness.	Limitation: erodes easily, rooting depth.
Blue Lake-------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
424C:							
Morganlake------	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Limitation: slope, too acid.	Limitation: droughty, slope, wetness.	Limitation: erodes easily, wetness.	Limitation: droughty, erodes easily.
Ossineke--------	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Limitation: slope.	Limitation: slope, soil blowing, wetness.	Limitation: erodes easily, wetness.	Limitation: erodes easily, rooting depth.
Blue Lake-------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
426B:							
Coppler---------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
426C:							
Coppler---------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
426D:							
Coppler---------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: slope, soil blowing, too sandy.	Limitation: droughty, slope.
451C:							
Annalake--------	Severe: slope.	Severe: piping.	Severe: no water.	Limitation: cutbanks cave, slope.	Limitation: droughty, slope, wetness.	Limitation: slope, too sandy, wetness.	Limitation: droughty, slope.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
477B:							
Algonquin	Slight	Severe: wetness.	Severe: slow refill.	Limitation: frost action, percs slowly.	Limitation: percs slowly, wetness.	Limitation: erodes easily, percs slowly, wetness.	Limitation: erodes easily, percs slowly, wetness.
Springport	Slight	Severe: ponding.	Severe: slow refill.	Limitation: frost action, percs slowly, ponding.	Limitation: percs slowly, ponding.	Limitation: percs slowly, ponding.	Limitation: percs slowly, wetness.
478:							
Springport	Slight	Severe: ponding.	Severe: slow refill.	Limitation: frost action, percs slowly, ponding.	Limitation: percs slowly, ponding.	Limitation: percs slowly, ponding.	Limitation: percs slowly, wetness.
479A:							
Algonquin	Slight	Severe: wetness.	Severe: slow refill.	Limitation: frost action, percs slowly.	Limitation: percs slowly, wetness.	Limitation: erodes easily, percs slowly, wetness.	Limitation: erodes easily, percs slowly, wetness.
480B:							
Negwegon	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Limitation: percs slowly, slope.	Limitation: percs slowly, slope, wetness.	Limitation: erodes easily, wetness.	Limitation: erodes easily, wetness.
Algonquin	Slight	Severe: wetness.	Severe: slow refill.	Limitation: frost action, percs slowly.	Limitation: percs slowly, wetness.	Limitation: erodes easily, percs slowly, wetness.	Limitation: erodes easily, percs slowly, wetness.
Lupton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Limitation: frost action, ponding, subsides.	Limitation: ponding, soil blowing.	Limitation: ponding, soil blowing.	Limitation: wetness.
481C:							
Negwegon	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Limitation: percs slowly, slope.	Limitation: percs slowly, slope, wetness.	Limitation: erodes easily, wetness.	Limitation: erodes easily, wetness.
Lupton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Limitation: frost action, ponding, subsides.	Limitation: ponding, soil blowing.	Limitation: ponding, soil blowing.	Limitation: wetness.
482B:							
Summerville	Severe: depth to rock.	Severe: piping.	Severe: no water.	Limitation: deep to water.	Limitation: depth to rock, droughty, slope.	Limitation: depth to rock, soil blowing.	Limitation: depth to rock, droughty.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
482C:							
Summerville-----	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Limitation: deep to water.	Limitation: depth to rock, droughty, slope.	Limitation: depth to rock, slope, soil blowing.	Limitation: depth to rock, droughty, slope.
483A:							
Lachine---------	Severe: depth to rock.	Severe: piping, thin layer, wetness.	Severe: depth to rock.	Limitation: depth to rock, frost action.	Limitation: depth to rock.	Limitation: depth to rock, wetness.	Limitation: depth to rock, wetness.
484A:							
Elcajon---------	Moderate: depth to rock, seepage.	Severe: piping.	Severe: depth to rock.	Limitation: depth to rock, frost action.	Limitation: depth to rock.	Limitation: depth to rock, erodes easily, wetness.	Limitation: depth to rock, erodes easily, wetness.
485A:							
Bowers----------	Slight--------	Severe: wetness.	Severe: slow refill.	Limitation: frost action, percs slowly.	Limitation: wetness.	Limitation: percs slowly, wetness.	Limitation: percs slowly, wetness.
486B:							
Tonkey----------	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Limitation: cutbanks cave, frost action, ponding.	Limitation: ponding.	Limitation: ponding, too sandy.	Limitation: rooting depth, wetness.
Bowers----------	Slight--------	Severe: wetness.	Severe: slow refill.	Limitation: frost action, percs slowly.	Limitation: wetness.	Limitation: percs slowly, wetness.	Limitation: percs slowly, wetness.
487B:							
Slade-----------	Moderate: seepage.	Severe: thin layer.	Severe: no water.	Limitation: frost action.	Limitation: wetness.	Limitation: wetness.	Limitation: wetness.
Angelica--------	Slight--------	Severe: piping, ponding.	Severe: slow refill.	Limitation: frost action, ponding.	Limitation: ponding, rooting depth.	Limitation: ponding.	Limitation: rooting depth, wetness.
489F:							
Crowell---------	Severe: cemented pan, seepage, slope.	Severe: piping, seepage.	Severe: no water.	Limitation: deep to water.	Limitation: droughty, fast intake, slope.	Limitation: cemented pan, slope, too sandy.	Limitation: cemented pan, droughty, slope.
Proper----------	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Limitation: cutbanks cave, slope.	Limitation: droughty, slope, wetness.	Limitation: soil blowing, too sandy, wetness.	Limitation: droughty, rooting depth.

Table 18.--Engineering Index Properties

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				*Pct*	*Pct*					*Pct*	
11B:												
Eastport------	0-1	Sand	SM, SP-SM, SP	A-3, A-2-4, A-1-b	0	0	95-100	90-100	35-70	0-15	0-14	NP
	1-8	Sand	SP, SM, SP-SM	A-3, A-2-4, A-1-b	0	0	95-100	90-100	35-70	0-15	0-14	NP
	8-29	Sand	SM, SP, SP-SM	A-3, A-2-4, A-1-b	0	0	95-100	90-100	35-70	0-15	0-14	NP
	29-80	Sand	SP, SP-SM, SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-70	0-15	0-14	NP
12B:												
Tawas---------	0-3	Muck	PT	A-8	0	0	---	---	---	---	---	---
	3-28	Muck	PT	A-8	0	0	---	---	---	---	---	---
	28-80	Sand	SP-SM, SP, SM	A-2-4, A-1-b, A-4, A-3	0	0	95-100	92-100	35-70	0-40	0-14	NP
Au Gres-------	0-1	Moderately decomposed plant material	PT	A-8	0	0	---	---	---	---	---	---
	1-2	Sand	SM, SP-SM, SP	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-70	0-15	0-14	NP
	2-10	Sand	SP-SM, SP, SM, SC-SM	A-1-b, A-3, A-2-4	0	0	95-100	90-100	35-75	0-30	0-25	NP-7
	10-28	Sand	SP, SP-SM, SC-SM, SM	A-3, A-2-4, A-1-b	0	0	95-100	90-100	35-75	0-30	0-25	NP-7
	28-32	Sand	SC-SM, SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-75	0-30	0-25	NP-7
	32-80	Sand	SP, SP-SM, SM	A-3, A-1-b, A-2-4	0	0	95-100	90-100	35-70	0-15	0-14	NP
13:												
Tawas---------	0-3	Muck	PT	A-8	0	0	---	---	---	---	---	---
	3-28	Muck	PT	A-8	0	0	---	---	---	---	---	---
	28-80	Sand	SM, SP, SP-SM	A-4, A-3, A-1-b, A-2-4	0	0	95-100	92-100	30-80	0-40	0-14	NP
Lupton--------	0-4	Muck	PT	A-8	0	0	---	---	---	---	---	---
	4-80	Muck	PT	A-8	0	0	---	---	---	---	---	---
14:												
Dawson--------	0-6	Peat	PT	A-8	0	0	---	---	---	---	---	---
	6-31	Muck	PT	A-8	0	0	---	---	---	---	---	---
	31-80	Fine sand, sand	SC, SM, SP	A-2-4, A-3, A-4	0	0	100	100	50-90	0-45	0-20	NP-10
Loxley--------	0-4	Peat	PT	A-8	0	0	---	---	---	---	---	---
	4-80	Muck	PT	A-8	0	0	---	---	---	---	---	---
16B:												
Graycalm------	0-1	Sand	SM, SP, SP-SM	A-1-b, A-2, A-3	0	0	95-100	93-100	35-55	0-15	0-14	NP
	1-5	Sand	SM, SP, SP-SM	A-3, A-2-4, A-1	0	0	95-100	93-100	30-75	0-30	0-14	NP
	5-24	Sand	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0	95-100	93-100	30-75	0-30	0-14	NP
	24-80	Sand, loamy sand	SM, SP, SP-SM	A-3, A-2, A-1-b	0	0	95-100	93-100	35-55	0-15	0-14	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
16C:												
Graycalm------	0-1	Sand	SM, SP, SP-SM	A-3, A-2, A-1-b	0	0	95-100	93-100	35-55	0-15	0-14	NP
	1-5	Sand	SP, SP-SM, SM	A-1, A-2-4, A-3	0	0	95-100	93-100	30-75	0-30	0-14	NP
	5-24	Sand	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0	95-100	93-100	30-75	0-30	0-14	NP
	24-80	Sand, loamy sand	SM, SP, SP-SM	A-1-b, A-2, A-3	0	0	95-100	93-100	35-55	0-15	0-14	NP
16D:												
Graycalm------	0-1	Sand	SP, SM, SP-SM	A-1-b, A-2, A-3	0	0	95-100	93-100	35-55	0-15	0-14	NP
	1-5	Sand	SP, SM, SP-SM	A-1, A-2-4, A-3	0	0	95-100	93-100	30-75	0-30	0-14	NP
	5-24	Sand	SP-SM, SM, SP	A-2-4, A-3, A-1	0	0	95-100	93-100	30-75	0-30	0-14	NP
	24-80	Sand, loamy sand	SP-SM, SP, SM	A-3, A-2, A-1-b	0	0	95-100	93-100	35-55	0-15	0-14	NP
16E:												
Graycalm------	0-1	Sand	SP-SM, SP, SM	A-1-b, A-3, A-2	0	0	95-100	93-100	35-55	0-15	0-14	NP
	1-5	Sand	SM, SP-SM, SP	A-2-4, A-3, A-1	0	0	95-100	93-100	30-75	0-30	0-14	NP
	5-24	Sand	SM, SP, SP-SM	A-2-4, A-1, A-3	0	0	95-100	93-100	30-75	0-30	0-14	NP
	24-80	Sand, loamy sand	SP, SP-SM, SM	A-3, A-2, A-1-b	0	0	95-100	93-100	35-55	0-15	0-14	NP
17A:												
Croswell------	0-2	Sand	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	99-100	99-100	40-70	5-15	0-14	NP
	2-3	Sand	SP-SM, SM	A-1-b, A-2-4, A-3	0	0	99-100	99-100	40-70	5-15	0-14	NP
	3-11	Sand	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	99-100	99-100	40-75	3-30	0-14	NP
	11-24	Sand	SP-SM, SM, SP	A-1-b, A-2-4, A-3	0	0	99-100	99-100	40-75	3-30	0-14	NP
	24-80	Sand	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	0	99-100	99-100	40-70	3-15	0-14	NP
17B:												
Croswell------	0-2	Sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	99-100	99-100	40-70	5-15	0-14	NP
	2-3	Sand	SP-SM, SM	A-2-4, A-3, A-1-b	0	0	99-100	99-100	40-70	5-15	0-14	NP
	3-11	Sand	SP-SM, SP, SM	A-1-b, A-2-4, A-3	0	0	99-100	99-100	40-75	3-30	0-14	NP
	11-24	Sand	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	99-100	99-100	40-75	3-30	0-14	NP
	24-80	Sand	SP-SM, SP, SM	A-1-b, A-2-4, A-3	0	0	99-100	99-100	40-70	3-15	0-14	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
18A:												
Au Gres-------	0-1	Moderately decomposed plant material	PT	A-8	0	0	---	---	---	---	---	---
	1-2	Sand	SM, SP, SP-SM	A-2-4, A-1-b, A-3	0	0	95-100	90-100	35-70	0-15	0-14	NP
	2-10	Sand	SP-SM, SP, SM, SC-SM	A-2-4, A-1-b, A-3	0	0	95-100	90-100	35-75	0-30	0-25	NP-7
	10-28	Sand	SC-SM, SM, SP, SP-SM	A-2-4, A-1-b, A-3	0	0	95-100	90-100	35-75	0-30	0-25	NP-7
	28-32	Sand	SC-SM, SP, SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-75	0-30	0-25	NP-7
	32-80	Sand	SM, SP, SP-SM	A-3, A-1-b, A-2-4	0	0	95-100	90-100	35-70	0-15	0-14	NP
19:												
Leafriver-----	0-9	Muck	PT	A-8	0	0	---	---	---	---	---	---
	9-21	Loamy sand, sand	SM	A-2-4, A-4	0	0	100	95-100	55-80	15-50	15-20	NP-4
	21-80	Sand	SP-SM, SP, SM	A-2, A-2-4, A-3, A-1	0	0	95-100	80-100	45-70	3-35	---	NP
27A:												
Tacoda--------	0-3	Sand	SP-SM, SP, SM	A-3, A-2-4, A-2	0	0	90-100	85-100	35-70	0-15	---	NP
	3-14	Sand	SM, SP-SM	A-3, A-2	0	0	90-100	85-100	35-70	0-15	---	NP
	14-27	Sand	SP-SM, SM	A-2, A-3	0	0	90-100	85-100	35-70	0-15	---	NP
	27-44	Sand	SP-SM, SM	A-3, A-2	0	0	90-100	85-100	35-70	0-15	---	NP
	44-80	Silty clay, clay	CH, CL	A-7-6	0	0	98-100	97-100	90-100	75-95	45-60	30-40
28B:												
East Lake-----	0-1	Sand	SP-SM, SP, SM	A-1, A-3, A-2-4	0	0-15	95-100	85-100	40-70	0-15	0-14	NP
	1-2	Sand	SP-SM, SP, SM	A-1, A-3, A-2-4	0	0-15	95-100	85-100	40-70	0-15	0-14	NP
	2-11	Sand	SM, SP, SP-SM	A-2-4, A-1, A-3	0	0-15	85-100	70-100	35-75	0-30	0-14	NP
	11-34	Sand	SP, SP-SM, SM	A-3, A-2-4, A-1	0	0-15	85-100	70-100	35-75	0-30	0-14	NP
	34-80	Stratified very gravelly sand to sand	SP, GW	A-1-b, A-2-4, A-3	0	0-15	50-75	50-75	20-55	0-10	0-14	NP
28C:												
East Lake-----	0-1	Sand	SP, SP-SM, SM	A-2-4, A-3, A-1	0	0-15	90-100	80-93	40-70	0-15	0-14	NP
	1-2	Sand	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-15	90-100	80-93	40-70	0-15	0-14	NP
	2-11	Sand	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-15	90-100	80-93	35-75	0-30	0-14	NP
	11-34	Sand	SP-SM, SP, SM	A-1, A-3, A-2-4	0	0-15	90-100	80-93	35-75	0-30	0-14	NP
	34-80	Stratified very gravelly sand to sand	GW, SP	A-2-4, A-3, A-1-b	0	0-15	50-75	50-75	20-55	0-10	0-14	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
29A:												
Battlefield---	0-5	Sand	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-5	80-90	80-90	35-70	0-15	0-14	NP
	5-7	Sand, coarse sand	SM, SP, SP-SM	A-3, A-1, A-2-4	0	0-5	80-90	80-90	35-70	0-15	0-14	NP
	7-15	Gravelly sand, gravelly coarse sand	SM, SP, SP-SM, SC-SM	A-1, A-2-4, A-3	0	0-5	80-90	55-70	35-70	0-30	0-25	NP-7
	15-23	Gravelly sand, gravelly coarse sand	SM, SC-SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-5	80-90	55-70	35-70	0-30	0-25	NP-7
	23-80	Stratified gravelly coarse sand to gravelly sand	SP-SM, SP, SW, SW-SM	A-1-b, A-2-4, A-3	0	0-5	70-80	55-70	25-55	0-10	0-14	NP
30:												
Wheatley------	0-5	Muck	PT	A-8	0	0	---	---	---	---	---	---
	5-34	Sand, loamy sand	SP-SM, SM	A-1-b, A-3, A-2-4	0	0	85-95	85-92	30-75	5-30	0-20	NP-4
	34-80	Gravelly sand, gravelly loamy sand	GP, GW, SP, SW	A-3, A-1-b, A-2-4	0	0	50-80	50-75	20-60	0-20	0-20	NP-4
31B:												
Klacking------	0-4	Loamy sand	SM, SP-SM	A-1, A-2-4	0	0-2	95-100	92-100	35-75	10-30	0-14	NP
	4-12	Loamy sand, sand	SP-SM, SP, SM	A-3, A-2-4, A-1	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	12-25	Loamy sand, sand	SP, SP-SM, SM	A-3, A-1, A-2-4	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	25-33	Sand, loamy sand, sandy loam	SP-SM, SP, SM, SC-SM	A-2-4, A-1, A-3, A-4	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	33-64	Sandy loam, loamy sand, sand	SP-SM, SP, SM, SC-SM	A-3, A-4, A-2-4, A-1	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	64-80	Sand	SP-SM, SP, SM, SC-SM	A-2-4, A-1, A-4, A-3	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
31C:												
Klacking------	0-4	Loamy sand	SM, SP-SM	A-2-4, A-1	0	0-2	95-100	92-100	35-75	10-30	0-14	NP
	4-12	Loamy sand, sand	SM, SP, SP-SM	A-2-4, A-1, A-3	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	12-25	Loamy sand, sand	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	25-33	Sand, loamy sand, sandy loam	SC-SM, SM, SP, SP-SM	A-4, A-1, A-2-4, A-3	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	33-64	Sandy loam, loamy sand, sand	SP-SM, SC-SM, SM, SP	A-2-4, A-1, A-4, A-3	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	64-80	Sand	SM, SC-SM, SP, SP-SM	A-4, A-1, A-2-4, A-3	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
31D:												
Klacking------	0-4	Loamy sand	SP-SM, SM	A-1, A-2-4	0	0-2	95-100	92-100	35-75	10-30	0-14	NP
	4-12	Loamy sand, sand	SP, SP-SM, SM	A-1, A-2-4, A-3	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	12-25	Loamy sand, sand	SM, SP, SP-SM	A-3, A-1, A-2-4	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	25-33	Sand, loamy sand, sandy loam	SC-SM, SM, SP-SM, SP	A-4, A-1, A-2-4, A-3	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	33-64	Sandy loam, loamy sand, sand	SM, SP, SP-SM, SC-SM	A-4, A-3, A-2-4, A-1	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	64-80	Sand	SM, SP, SP-SM, SC-SM	A-1, A-4, A-2-4, A-3	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
31E:												
Klacking------	0-4	Loamy sand	SP-SM, SM	A-2-4, A-1	0	0-2	95-100	92-100	35-75	10-30	0-14	NP
	4-12	Loamy sand, sand	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	12-25	Loamy sand, sand	SP, SP-SM, SM	A-1, A-2-4, A-3	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	25-33	Sand, loamy sand, sandy loam	SC-SM, SM, SP, SP-SM	A-2-4, A-3, A-4, A-1	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	33-64	Sandy loam, loamy sand, sand	SC-SM, SM, SP, SP-SM	A-4, A-1, A-2-4, A-3	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	64-80	Sand	SC-SM, SM, SP, SP-SM	A-1, A-2-4, A-3, A-4	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
35:												
Kinross-------	0-5	Muck	PT	A-8	0	0	---	---	---	---	0-14	NP
	5-9	Fine sand, sand	SM, SP-SM	A-2-4, A-3	0	0	100	100	50-80	5-30	0-14	NP
	9-13	Fine sand, sand	SM, SP-SM	A-2-4, A-3	0	0	100	100	50-80	5-30	0-14	NP
	13-19	Fine sand, sand	SP-SM, SM	A-2-4, A-3	0	0	100	100	50-80	5-30	0-14	NP
	19-27	Fine sand, sand	SM, SP-SM	A-2-4, A-3	0	0	100	100	50-80	5-30	0-14	NP
	27-80	Fine sand, sand	SM, SP-SM	A-2-4, A-3	0	0	100	100	50-80	5-30	0-14	NP
36B:												
Annalake------	0-4	Loamy very fine sand	SC-SM, ML, SM, CL-ML	A-4, A-2-4	0	0	95-100	90-100	50-95	25-60	0-26	NP-8
	4-6	Loamy very fine sand	SC-SM, CL-ML, ML, SM	A-2-4, A-4	0	0	95-100	90-100	50-95	25-80	0-26	NP-8
	6-16	Loamy very fine sand, loamy fine sand	CL-ML, ML, SC-SM, SM	A-4, A-2-4	0	0	95-100	90-100	50-95	25-65	0-26	NP-8
	16-33	Loamy fine sand, loam	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	95-100	90-100	50-95	25-80	0-26	NP-8
	33-42	Loam, loamy sand	ML, CL, SC, SM	A-2-4, A-4	0	0	95-100	90-100	50-95	25-80	18-28	3-9
	42-80	Stratified fine sandy loam to silt loam	SC-SM, CL-ML, ML, SM	A-4, A-2-4	0	0	95-100	90-100	50-95	25-80	0-26	NP-8

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				*Pct*	*Pct*					*Pct*	
36C:												
Annalake------	0-4	Loamy very fine sand	SM, CL-ML, ML, SC-SM	A-2-4, A-4	0	0	95-100	90-100	50-95	25-60	0-26	NP-8
	4-6	Loamy very fine sand	SC-SM, SM, CL-ML, ML	A-2-4, A-4	0	0	95-100	90-100	50-95	25-80	0-26	NP-8
	6-16	Loamy very fine sand, loamy fine sand	CL-ML, ML, SC-SM, SM	A-2-4, A-4	0	0	95-100	90-100	50-95	25-65	0-26	NP-8
	16-33	Loamy fine sand, loam	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	95-100	90-100	50-95	25-80	0-26	NP-8
	33-42	Loam, loamy sand	SC, ML, CL, SM	A-2-4, A-4	0	0	95-100	90-100	50-95	25-80	18-28	3-9
	42-80	Stratified fine sandy loam to silt loam	SM, SC-SM, CL-ML, ML	A-2-4, A-4	0	0	95-100	90-100	50-95	25-80	0-26	NP-8
37A:												
Richter-------	0-8	Loamy fine sand	SM, SP-SM	A-1, A-2-4	0	0	95-100	92-100	45-80	10-35	0-20	NP-4
	8-12	Loamy sand, very fine sandy loam	SM, SC-SM, SC	A-6, A-4, A-2-4, A-1	0	0	95-100	92-100	45-90	15-45	10-30	NP-16
	12-18	Loamy sand, sandy loam	SC, SC-SM, SM	A-6, A-4, A-2-4, A-1	0	0	95-100	92-100	45-90	15-45	10-30	NP-16
	18-26	Very fine sandy loam, sandy loam, loamy sand	SM, SC-SM, SC	A-1, A-2-4, A-4, A-6	0	0	95-100	92-100	45-90	15-45	10-30	NP-16
	26-37	Stratified fine sandy loam to clay loam	SC, SC-SM, SM	A-4, A-2-4, A-1	0	0	95-100	92-100	45-80	15-45	10-25	NP-10
	37-80	Stratified loamy sand to silt loam	SC, SM, SC-SM	A-4, A-2-4, A-1	0	0	95-100	92-100	45-80	15-45	10-25	NP-10
37B:												
Richter-------	0-8	Loamy fine sand	SP-SM, SM	A-1, A-2-4	0	0	95-100	92-100	45-80	10-35	0-20	NP-4
	8-12	Loamy sand, very fine sandy loam	SM, SC-SM, SC	A-2-4, A-4, A-6, A-1	0	0	95-100	92-100	45-90	15-45	10-30	NP-16
	12-18	Loamy sand, sandy loam	SC, SC-SM, SM	A-2-4, A-4, A-6, A-1	0	0	95-100	92-100	45-90	15-45	10-30	NP-16
	18-26	Very fine sandy loam, sandy loam, loamy sand	SC, SC-SM, SM	A-6, A-4, A-2-4, A-1	0	0	95-100	92-100	45-90	15-45	10-30	NP-16
	26-37	Stratified fine sandy loam to clay loam	SC, SC-SM, SM	A-1, A-2-4, A-4	0	0	95-100	92-100	45-80	15-45	10-25	NP-10
	37-80	Stratified loamy sand to silt loam	SC, SC-SM, SM	A-1, A-2-4, A-4	0	0	95-100	92-100	45-80	15-45	10-25	NP-10
38:												
Tonkey--------	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	0	95-100	92-100	85-95	60-90	20-30	4-11
	7-22	Sandy loam, silt loam	SM, SC, SC-SM	A-4, A-2-4	0	0	95-100	92-100	50-75	15-40	15-25	NP-9
	22-80	Stratified silt loam to sandy loam to sand	ML, SC-SM, SM, SP-SM	A-1, A-2-4, A-3, A-4	0	0	95-100	92-100	40-80	5-65	15-30	NP-11

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
41B:												
McGinn--------	0-2	Loamy sand	SP-SM, SM	A-1-b, A-2-4	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	2-3	Loamy sand	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	3-12	Loamy sand	SP-SM, SM	A-1-b, A-2-4	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	12-22	Loamy sand, sandy loam, loam	SP-SM, SM, SC-SM, ML	A-1-b, A-2-4, A-4	0	0-8	90-100	85-100	35-95	10-60	0-25	NP-7
	22-26	Sandy loam, loam	CL-ML, CL, SC, SC-SM	A-4, A-6, A-2-4	0	0-8	90-100	85-100	45-95	20-60	25-30	7-11
	26-80	Sandy loam	SC-SM, SM	A-2-4, A-4, A-1-b	0	0-8	90-100	85-100	45-80	20-50	0-25	NP-7
41C:												
McGinn--------	0-2	Loamy sand	SP-SM, SM	A-1-b, A-2-4	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	2-3	Loamy sand	SM, SP-SM	A-2-4, A-1-b	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	3-12	Loamy sand	SM, SP-SM	A-2-4, A-1-b	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	12-22	Loamy sand, sandy loam, loam	SP-SM, SM, SC-SM, ML	A-2-4, A-4, A-1-b	0	0-8	90-100	85-100	35-95	10-60	0-25	NP-7
	22-26	Sandy loam, loam	CL-ML, CL, SC, SC-SM	A-6, A-4, A-2-4	0	0-8	90-100	85-100	45-95	20-60	25-30	7-11
	26-80	Sandy loam	SC-SM, SM	A-2-4, A-1-b, A-4	0	0-8	90-100	85-100	45-80	20-50	0-25	NP-7
41D:												
McGinn--------	0-2	Loamy sand	SM, SP-SM	A-2-4, A-1-b	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	2-3	Loamy sand	SM, SP-SM	A-2-4, A-1-b	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	3-12	Loamy sand	SM, SP-SM	A-2-4, A-1-b	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	12-22	Loamy sand, sandy loam, loam	SP-SM, SM, ML, SC-SM	A-2-4, A-1-b, A-4	0	0-8	90-100	85-100	35-95	10-60	0-25	NP-7
	22-26	Sandy loam, loam	CL, CL-ML, SC, SC-SM	A-2-4, A-6, A-4	0	0-8	90-100	85-100	45-95	20-60	25-30	7-11
	26-80	Sandy loam	SC-SM, SM	A-1-b, A-2-4, A-4	0	0-8	90-100	85-100	45-80	20-50	0-25	NP-7
41E:												
McGinn--------	0-2	Loamy sand	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	2-3	Loamy sand	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	3-12	Loamy sand	SP-SM, SM	A-1-b, A-2-4	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	12-22	Loamy sand, sandy loam, loam	ML, SC-SM, SP-SM, SM	A-1-b, A-4, A-2-4	0	0-8	90-100	85-100	35-95	10-60	0-25	NP-7
	22-26	Sandy loam, loam	CL, CL-ML, SC-SM, SC	A-2-4, A-4, A-6	0	0-8	90-100	85-100	45-95	20-60	25-30	7-11
	26-80	Sandy loam	SM, SC-SM	A-4, A-2-4, A-1-b	0	0-8	90-100	85-100	45-80	20-50	0-25	NP-7
42A:												
Killmaster----	0-11	Sandy loam	SC-SM, SM	A-1-b, A-2-4, A-4	0	0-7	90-100	85-100	45-85	20-50	0-25	NP-7
	11-12	Sandy loam	SC-SM, SM	A-4, A-2-4	0	0-7	90-100	85-100	45-85	25-50	0-25	NP-6
	12-17	Sandy loam	SC-SM, SM	A-4, A-2-4	0	0-7	90-100	85-100	35-75	25-50	0-25	NP-7
	17-22	Sandy loam, loam	SC-SM, SC	A-4, A-2-4	0	0-7	90-100	85-100	35-85	25-50	20-30	4-10
	22-80	Sandy loam	SC-SM, SM	A-1-b, A-2-4, A-4	0	0-7	90-95	85-90	45-80	20-50	0-25	NP-7

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
43:												
Wakeley-------	0-3	Mucky sand	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	85-100	35-70	0-15	0-14	NP
	3-21	Sand, loamy sand	SP, SP-SM, SC-SM, SM	A-2-4, A-3	0	0	95-100	85-100	35-75	0-30	15-25	NP-7
	21-80	Silty clay, clay	CH, CL	A-7-6	0	0	95-100	90-100	85-100	75-95	40-65	20-40
44B:												
Ossineke------	0-10	Fine sandy loam	SM, SC-SM, SC	A-2-4, A-4, A-6	0	0-5	95-100	85-100	55-85	30-50	0-30	NP-11
	10-15	Fine sandy loam	SC, SM, SC-SM	A-2-4, A-4, A-6	0	0-5	95-100	85-100	55-85	30-50	0-30	NP-11
	15-22	Fine sandy loam, clay loam, loam	CL, SC-SM	A-6, A-2, A-4	0	0-5	95-100	85-100	55-95	30-80	25-40	7-15
	22-35	Clay loam	CL	A-6	0	0-5	95-100	85-100	70-95	50-80	25-45	10-20
	35-41	Loam, clay loam	CL	A-6	0	0-5	95-100	85-100	70-95	50-80	25-45	10-20
	41-80	Fine sandy loam, loam, clay loam	CL, SC-SM	A-2, A-4, A-6	0	0-5	95-100	85-100	45-95	30-80	25-40	7-15
44C:												
Ossineke------	0-10	Fine sandy loam	SC-SM, SM, SC	A-2-4, A-4, A-6	0	0-5	95-100	85-100	55-85	30-50	0-30	NP-11
	10-15	Fine sandy loam	SM, SC, SC-SM	A-2-4, A-4, A-6	0	0-5	95-100	85-100	55-85	30-50	0-30	NP-11
	15-22	Fine sandy loam, clay loam, loam	CL, SC-SM	A-2, A-4, A-6	0	0-5	95-100	85-100	55-95	30-80	25-40	7-15
	22-35	Clay loam	CL	A-6	0	0-5	95-100	85-100	70-95	50-80	25-45	10-20
	35-41	Loam, clay loam	CL	A-6	0	0-5	95-100	85-100	70-95	50-80	25-45	10-20
	41-80	Fine sandy loam, loam, clay loam	CL, SC-SM	A-2, A-4, A-6	0	0-5	95-100	85-100	45-95	30-80	25-40	7-15
45B:												
Hoist---------	0-9	Sandy loam	SC-SM, SM	A-1-b, A-4, A-2-4	0	0-7	90-100	85-92	45-85	20-50	0-25	NP-7
	9-10	Sandy loam	SC-SM, SM	A-2-4, A-4, A-1-b	0	0-7	90-100	85-92	45-85	20-50	0-25	NP-7
	10-15	Sandy loam	SC-SM, SM	A-1-b, A-2-4, A-4	0	0-7	90-100	85-92	35-85	20-60	0-25	NP-7
	15-21	Loam, sandy loam	CL-ML, CL, SC, SC-SM	A-4, A-2-4, A-6	0	0-7	90-100	85-92	35-85	20-60	25-30	7-11
	21-47	Sandy loam, loam	SC-SM, SM	A-4, A-2-4, A-1-b	0	0-7	90-100	85-92	35-75	20-50	0-25	NP-7
	47-80	Sandy loam	SC-SM, SM	A-4, A-2-4, A-1-b	0	0-7	90-100	80-92	45-80	20-50	0-25	NP-7
45C:												
Hoist---------	0-9	Sandy loam	SC-SM, SM	A-4, A-2-4, A-1-b	0	0-7	90-100	85-92	45-85	20-50	0-25	NP-7
	9-10	Sandy loam	SC-SM, SM	A-2-4, A-4, A-1-b	0	0-7	90-100	85-92	45-85	20-50	0-25	NP-7
	10-15	Sandy loam	SM, SC-SM	A-1-b, A-2-4, A-4	0	0-7	90-100	85-92	35-85	20-60	0-25	NP-7
	15-21	Loam, sandy loam	SC-SM, SC, CL, CL-ML	A-2-4, A-4, A-6	0	0-7	90-100	85-92	35-85	20-60	25-30	7-11
	21-47	Sandy loam, loam	SC-SM, SM	A-1-b, A-2-4, A-4	0	0-7	90-100	85-92	35-75	20-50	0-25	NP-7
	47-80	Sandy loam	SC-SM, SM	A-4, A-2-4, A-1-b	0	0-7	90-100	80-92	45-80	20-50	0-25	NP-7

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				*Pct*	*Pct*					*Pct*	
46:												
Ensley--------	0-8	Mucky sandy loam	CL, SC, CL-ML, SC-SM	A-6, A-4, A-2	0	0-10	90-100	85-99	45-95	25-80	20-30	4-11
	8-29	Sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4, A-2, A-1	0	0-10	90-100	85-99	45-90	20-55	20-35	4-15
	29-80	Sandy loam	SC, SC-SM, SM	A-1, A-4, A-2-4	0	0-10	85-95	80-95	35-80	15-50	0-30	2-9
47D:												
Graycalm------	0-1	Sand	SP-SM, SM, SP	A-1-b, A-3, A-2	0	0	95-100	93-100	35-55	0-15	0-14	NP
	1-5	Sand	SP-SM, SM, SP	A-2-4, A-1, A-3	0	0	95-100	93-100	30-75	0-30	0-14	NP
	5-24	Sand	SP-SM, SP, SM	A-1, A-3, A-2-4	0	0	95-100	93-100	30-75	0-30	0-14	NP
	24-80	Sand, loamy sand	SP-SM, SP, SM	A-2, A-3, A-1-b	0	0	95-100	93-100	35-55	0-15	0-14	NP
53B:												
Negwegon------	0-9	Silt loam	CL-ML, CL	A-6, A-4	0	0	99-100	98-100	80-100	65-90	20-40	5-15
	9-12	Silt loam	CL, CL-ML	A-4, A-6	0	0	99-100	98-100	80-100	65-90	20-40	5-15
	12-14	Silty clay, silt loam	CL, CH	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	14-51	Silty clay loam, silty clay, clay	CL, CH	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	51-80	Stratified silty clay to silty clay loam to silt loam	CL, CH	A-7-6	0	0	99-100	98-100	80-100	65-95	40-65	20-40
53C:												
Negwegon------	0-9	Silt loam	CL, CL-ML	A-6, A-4	0	0	99-100	98-100	80-100	65-90	20-40	5-15
	9-12	Silt loam	CL-ML, CL	A-4, A-6	0	0	99-100	98-100	80-100	65-90	20-40	5-15
	12-14	Silty clay, silt loam	CH, CL	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	14-51	Silty clay, silty clay loam, clay	CH, CL	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	51-80	Stratified silty clay to silty clay loam to silt loam	CL, CH	A-7-6	0	0	99-100	98-100	80-100	65-95	40-65	20-40
54A:												
Algonquin-----	0-5	Silt loam	CL	A-4, A-6	0	0	99-100	95-100	80-100	70-90	25-40	7-15
	5-7	Silt loam	CL	A-6, A-4	0	0	99-100	95-100	80-100	70-90	25-40	7-15
	7-19	Clay, silty clay loam, silty clay	CH, CL	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	19-55	Stratified silty clay to silty clay loam to loam	CL, CH	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	55-80	Stratified silty clay to silty clay loam to loam	CH, CL	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
55:												
Springport----	0-9	Clay loam	CL	A-6, A-7-6	0	0	97-100	97-100	85-100	70-80	35-50	15-25
	9-16	Silty clay loam, silty clay	CH, CL	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
	16-23	Silty clay, clay	CH, CL	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
	23-80	Silty clay, clay	CL, CH	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
57B:												
Kawkawlin-----	0-10	Loam	ML, CL-ML, CL	A-6, A-4	0	0-5	95-100	92-100	70-95	50-75	20-40	2-15
	10-13	Clay loam, loam	CH, CL	A-7-6	0	0-5	95-100	92-100	75-100	55-95	40-55	20-30
	13-16	Clay loam, clay	CL, CH	A-7-6	0	0-5	95-100	92-100	75-100	55-95	40-55	20-30
	16-30	Clay loam, loam	CL	A-7-6, A-6	0	0-5	95-100	92-100	75-100	50-95	35-50	15-25
	30-80	Clay loam, loam	CL	A-7-6, A-6	0	0-5	95-100	92-100	75-100	50-95	35-50	15-25
59B:												
Algonquin-----	0-5	Silt loam	CL	A-4, A-6	0	0	99-100	95-100	80-100	70-90	25-40	7-15
	5-7	Silt loam	CL	A-4, A-6	0	0	99-100	95-100	80-100	70-90	25-40	7-15
	7-19	Clay, silty clay loam, silty clay	CL, CH	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	19-55	Stratified silty clay to silty clay loam to loam	CL, CH	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	55-80	Stratified silty clay to silty clay loam to loam	CL, CH	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
Springport----	0-9	Clay loam	CL	A-7-6, A-6	0	0	97-100	97-100	85-100	70-80	35-50	15-25
	9-16	Silty clay loam, silty clay	CH, CL	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
	16-23	Silty clay, clay	CL, CH	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
	23-80	Silty clay, clay	CL, CH	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
62A:												
Allendale-----	0-11	Loamy sand	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	95-100	45-80	10-30	0-14	NP
	11-13	Sand, loamy sand	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	95-100	95-100	45-80	5-30	0-14	NP
	13-22	Sand, loamy sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	95-100	45-80	5-30	0-14	NP
	22-25	Sandy loam, loamy sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	95-100	45-80	5-30	0-14	NP
	25-44	Silty clay, clay	MH, CH	A-7	0	0	95-100	95-100	90-100	75-95	50-70	20-40
	44-80	Silty clay, clay	MH, CH	A-7	0	0	95-100	95-100	90-100	75-95	50-70	20-40

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
63D:												
Bamfield------	0-6	Fine sandy loam	SC, SM, SC-SM	A-2-4, A-2-6, A-4	0	0-5	90-97	85-97	55-85	30-50	0-30	NP-11
	6-8	Fine sandy loam	SM, SC-SM, SC	A-4, A-2-4, A-2-6	0	0-5	90-97	85-97	50-85	25-50	0-30	NP-11
	8-11	Fine sandy loam	SM, SC-SM, SC	A-4, A-2-6, A-2-4	0	0-5	90-97	85-97	50-85	25-50	0-30	NP-11
	11-14	Loamy fine sand, clay loam	SM, SC-SM, SC	A-4, A-2-6, A-2-4	0	0-5	90-97	85-97	45-85	15-50	0-30	NP-11
	14-42	Clay loam	CL	A-6, A-7-6	0	0-5	90-97	85-97	70-90	50-80	35-50	15-25
	42-80	Loam	CL	A-6, A-7	0	0-5	85-95	80-95	70-90	50-80	35-45	15-25
63E:												
Bamfield------	0-6	Fine sandy loam	SM, SC-SM, SC	A-2-4, A-4, A-2-6	0	0-5	90-97	85-97	55-85	30-50	0-30	NP-11
	6-8	Fine sandy loam	SC-SM, SC, SM	A-2-4, A-2-6, A-4	0	0-5	90-97	85-97	50-85	25-50	0-30	NP-11
	8-11	Fine sandy loam	SM, SC-SM, SC	A-2-4, A-2-6, A-4	0	0-5	90-97	85-97	50-85	25-50	0-30	NP-11
	11-14	Loamy fine sand, clay loam	SM, SC-SM, SC	A-2-4, A-2-6, A-4	0	0-5	90-97	85-97	45-85	15-50	0-30	NP-11
	14-42	Clay loam	CL	A-6, A-7-6	0	0-5	90-97	85-97	70-90	50-80	35-50	15-25
	42-80	Loam	CL	A-7, A-6	0	0-5	85-95	80-95	70-90	50-80	35-45	15-25
68:												
Rondeau-------	0-27	Muck	PT	A-8	0	0	---	---	---	---	0-14	NP
	27-80	Marl	MH, OH	A-5, A-7, A-8	0	0	100	95-100	80-90	60-80	50-90	NP-20
69:												
Loxley--------	0-4	Peat	PT	A-8	0	0	---	---	---	---	---	---
	4-80	Muck	PT	A-8	0	0	---	---	---	---	---	---
70:												
Lupton--------	0-4	Muck	PT	A-8	0	0	---	---	---	---	---	---
	4-80	Muck	PT	A-8	0	0	---	---	---	---	---	---
71:												
Tawas---------	0-3	Muck	PT	A-8	0	0	---	---	---	---	---	---
	3-28	Muck	PT	A-8	0	0	---	---	---	---	---	---
	28-80	Sand	SP, SP-SM, SM	A-3, A-1-b, A-2-4, A-4	0	0	95-100	92-100	30-80	0-40	0-14	NP
72:												
Dorval--------	0-27	Muck	PT	A-8	0	0	---	---	---	---	0-14	---
	27-80	Silty clay, clay	CH, CL	A-7-6	0	0	100	100	90-100	80-100	45-70	25-40
74C2:												
Negwegon------	0-9	Silty clay loam	CL	A-7-6, A-6	0	0	99-100	98-100	80-100	75-95	35-50	15-25
	9-21	Silty clay, clay, silty clay loam	CH, CL	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	21-51	Silty clay	CL, CH	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	51-80	Stratified silty clay to silty clay loam to silt loam	CH, CL	A-7-6	0	0	99-100	98-100	80-100	65-95	40-65	20-40

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
75B:												
Rubicon-------	0-2	Sand	SP-SM, SP, SM	A-1, A-2, A-3	0	0	95-100	92-100	35-70	0-15	0-14	NP
	2-4	Sand	SP, SP-SM, SM	A-1, A-3, A-2	0	0	95-100	92-100	35-70	0-15	0-14	NP
	4-29	Sand	SM, SP, SP-SM	A-3, A-2, A-1	0	0	95-100	92-100	35-70	0-15	0-14	NP
	29-43	Sand	SM, SP, SP-SM	A-3, A-2, A-1-b	0	0	95-100	92-100	30-70	0-15	0-14	NP
	43-80	Sand	SM, SP, SP-SM	A-2, A-3, A-1-b	0	0	95-100	92-100	30-70	0-15	0-14	NP
75D:												
Rubicon-------	0-2	Sand	SM, SP, SP-SM	A-1, A-2, A-3	0	0	95-100	92-100	35-70	0-15	0-14	NP
	2-4	Sand	SM, SP, SP-SM	A-1, A-2, A-3	0	0	95-100	92-100	35-70	0-15	0-14	NP
	4-29	Sand	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	92-100	35-70	0-15	0-14	NP
	29-43	Sand	SP-SM, SP, SM	A-3, A-2, A-1-b	0	0	95-100	92-100	30-70	0-15	0-14	NP
	43-80	Sand	SP-SM, SM, SP	A-1-b, A-2, A-3	0	0	95-100	92-100	30-70	0-15	0-14	NP
75E:												
Rubicon-------	0-2	Sand	SM, SP, SP-SM	A-1, A-2, A-3	0	0	95-100	92-100	35-70	0-15	0-14	NP
	2-4	Sand	SM, SP-SM, SP	A-2, A-1, A-3	0	0	95-100	92-100	35-70	0-15	0-14	NP
	4-29	Sand	SM, SP, SP-SM	A-3, A-2, A-1	0	0	95-100	92-100	35-70	0-15	0-14	NP
	29-43	Sand	SP-SM, SP, SM	A-2, A-3, A-1-b	0	0	95-100	92-100	30-70	0-15	0-14	NP
	43-80	Sand	SM, SP, SP-SM	A-3, A-2, A-1-b	0	0	95-100	92-100	30-70	0-15	0-14	NP
77:												
Rollaway------	0-10	Muck	PT	A-8	0	0	---	---	---	---	---	---
	10-42	Fine sandy loam, silt loam, loamy fine sand	SC, SC-SM, SM	A-4, A-2-4	0	0	95-100	92-100	50-75	15-40	0-25	NP-8
	42-80	Silty clay, clay	CH, CL	A-7-6	0	0	99-100	98-100	80-100	80-100	45-65	25-40
78:												
Pits, borrow.												
82B:												
Udorthents----	0-80	Variable	---	---	---	---	---	---	---	---	---	---
82C:												
Udorthents----	0-80	Variable	---	---	---	---	---	---	---	---	---	---
83B:												
Udipsamments--	0-80	Fine sand	SM, SP-SM, SP	A-1, A-2-4, A-3	0	0	85-100	85-100	30-75	0-25	0-14	NP
83F:												
Udipsamments--	0-80	Fine sand	SP-SM, SM, SP	A-3, A-1, A-2-4	0	0	85-100	85-100	30-75	0-25	0-14	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
84B:												
Zimmerman-----	0-1	Loamy fine sand	SM	A-2-4	0	0	95-100	92-100	92-100	15-30	0-20	NP
	1-3	Fine sand, loamy fine sand	SM	A-2-4, A-3	0	0	95-100	92-100	92-100	5-20	0-20	NP
	3-24	Fine sand, loamy fine sand	SM	A-2-4, A-3	0	0	95-100	92-100	92-100	5-20	0-20	NP
	24-80	Fine sand, loamy fine sand, fine sandy loam	SM	A-2-4, A-3	0	0	95-100	92-100	92-100	5-20	0-20	NP
84C:												
Zimmerman-----	0-1	Loamy fine sand	SM	A-2-4	0	0	95-100	92-100	92-100	15-30	0-20	NP
	1-3	Fine sand, loamy fine sand	SM	A-3, A-2-4	0	0	95-100	92-100	92-100	5-20	0-20	NP
	3-24	Fine sand, loamy fine sand	SM	A-2-4, A-3	0	0	95-100	92-100	92-100	5-20	0-20	NP
	24-80	Fine sand, loamy fine sand, fine sandy loam	SM	A-2-4, A-3	0	0	95-100	92-100	92-100	5-20	0-20	NP
84E:												
Zimmerman-----	0-1	Loamy fine sand	SM	A-2-4	0	0	95-100	92-100	92-100	15-30	0-20	NP
	1-3	Fine sand, loamy fine sand	SM	A-2-4, A-3	0	0	95-100	92-100	92-100	5-20	0-20	NP
	3-24	Fine sand, loamy fine sand	SM	A-2-4, A-3	0	0	95-100	92-100	92-100	5-20	0-20	NP
	24-80	Fine sand, loamy fine sand, fine sandy loam	SM	A-3, A-2-4	0	0	95-100	92-100	92-100	5-20	0-20	NP
85D:												
Zimmerman-----	0-1	Loamy fine sand	SM	A-2-4	0	0	95-100	92-100	92-100	15-30	0-20	NP
	1-3	Fine sand, loamy fine sand	SM	A-3, A-2-4	0	0	95-100	92-100	92-100	5-20	0-20	NP
	3-24	Fine sand, loamy fine sand	SM	A-3, A-2-4	0	0	95-100	92-100	92-100	5-20	0-20	NP
	24-80	Fine sand, loamy fine sand, fine sandy loam	SM	A-2-4, A-3	0	0	95-100	92-100	92-100	5-20	0-20	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
Annalake------	0-4	Loamy very fine sand	SM, CL-ML, ML, SC-SM	A-2-4, A-4	0	0	95-100	90-100	50-95	25-60	0-26	NP-8
	4-6	Loamy very fine sand	CL-ML, SM, SC-SM, ML	A-2-4, A-4	0	0	95-100	90-100	50-95	25-80	0-26	NP-8
	6-16	Loamy very fine sand, loamy fine sand	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	95-100	90-100	50-95	25-65	0-26	NP-8
	16-33	Loamy fine sand, loam	CL-ML, ML, SC-SM, SM	A-4, A-2-4	0	0	95-100	90-100	50-95	25-80	0-26	NP-8
	33-42	Loam, loamy sand	CL, ML, SC, SM	A-2-4, A-4	0	0	95-100	90-100	50-95	25-80	18-28	3-9
	42-80	Stratified fine sandy loam to silt loam	CL-ML, ML, SC-SM, SM	A-2-4, A-4	0	0	95-100	90-100	50-95	25-80	0-26	NP-8
86:												
Histosols-----	0-51	Muck	PT	A-8	0	0	---	---	---	---	---	NP
	51-80	Variable	---	---	---	---	---	---	---	---	---	---
Aquents-------	0-80	Variable	---	---	---	---	---	---	---	---	---	---
87:												
Ausable-------	0-11	Muck	PT	A-8	0	0	---	---	---	---	---	---
	11-24	Sand, loamy sand	SM, SP-SM	A-2-4, A-3	0	0	100	100	50-75	5-30	0-14	NP
	24-80	Sand	SP-SM, SM, SP	A-1, A-2-4, A-3	0	0	100	100	35-75	0-30	0-14	NP
90B:												
Chinwhisker---	0-3	Sand	SP, SP-SM, SM	A-3, A-2-4, A-1-b	0	0	95-100	80-100	35-70	0-15	0-14	NP
	3-4	Sand	SP, SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	80-100	35-70	0-25	0-14	NP
	4-18	Sand	SM, SP, SP-SM	A-3, A-1-b, A-2-4	0	0	95-100	80-100	35-70	0-25	0-14	NP
	18-48	Sand	SM, SP, SP-SM	A-3, A-2-4, A-1-b	0	0	95-100	80-100	35-70	0-15	0-14	NP
	48-80	Sand, loamy sand	SP-SM, SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	80-100	35-75	0-25	0-14	NP
92B:												
Klacking------	0-4	Loamy sand	SP-SM, SM	A-1, A-2-4	0	0-2	95-100	92-100	35-75	10-30	0-14	NP
	4-12	Loamy sand, sand	SM, SP, SP-SM	A-3, A-1, A-2-4	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	12-25	Loamy sand, sand	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	25-33	Sand, loamy sand, sandy loam	SC-SM, SM, SP, SP-SM	A-1, A-2-4, A-3, A-4	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	33-64	Sandy loam, loamy sand, sand	SC-SM, SM, SP, SP-SM	A-2-4, A-3, A-4, A-1	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	64-80	Sand	SC-SM, SM, SP, SP-SM	A-2-4, A-3, A-4, A-1	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
92B:												
McGinn--------	0-2	Loamy sand	SP-SM, SM	A-2-4, A-1-b	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	2-3	Loamy sand	SM, SP-SM	A-2-4, A-1-b	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	3-12	Loamy sand	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	12-22	Loamy sand, sandy loam, loam	SP-SM, SM, SC-SM, ML	A-1-b, A-2-4, A-4	0	0-8	90-100	85-100	35-95	10-60	0-25	NP-7
	22-26	Sandy loam, loam	SC, SC-SM, CL, CL-ML	A-2-4, A-4, A-6	0	0-8	90-100	85-100	45-95	20-60	25-30	7-11
	26-80	Sandy loam	SC-SM, SM	A-1-b, A-2-4, A-4	0	0-8	90-100	85-100	45-80	20-50	0-25	NP-7
92C:												
Klacking------	0-4	Loamy sand	SP-SM, SM	A-2-4, A-1	0	0-2	95-100	92-100	35-75	10-30	0-14	NP
	4-12	Loamy sand, sand	SP-SM, SP, SM	A-2-4, A-3, A-1	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	12-25	Loamy sand, sand	SM, SP, SP-SM	A-2-4, A-3, A-1	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	25-33	Sand, loamy sand, sandy loam	SP, SP-SM, SC-SM, SM	A-1, A-2-4, A-3, A-4	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	33-64	Sandy loam, loamy sand, sand	SC-SM, SM, SP, SP-SM	A-2-4, A-3, A-4, A-1	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	64-80	Sand	SC-SM, SM, SP, SP-SM	A-1, A-2-4, A-3, A-4	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
McGinn--------	0-2	Loamy sand	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	2-3	Loamy sand	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	3-12	Loamy sand	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	12-22	Loamy sand, sandy loam, loam	SP-SM, SM, SC-SM, ML	A-1-b, A-2-4, A-4	0	0-8	90-100	85-100	35-95	10-60	0-25	NP-7
	22-26	Sandy loam, loam	CL, CL-ML, SC, SC-SM	A-2-4, A-4, A-6	0	0-8	90-100	85-100	45-95	20-60	25-30	7-11
	26-80	Sandy loam	SM, SC-SM	A-2-4, A-4, A-1-b	0	0-8	90-100	85-100	45-80	20-50	0-25	NP-7
93B:												
Tacoda--------	0-3	Sand	SM, SP, SP-SM	A-3, A-2, A-2-4	0	0	90-100	85-100	35-70	0-15	---	NP
	3-14	Sand	SP-SM, SM	A-2, A-3	0	0	90-100	85-100	35-70	0-15	---	NP
	14-27	Sand	SP-SM, SM	A-3, A-2	0	0	90-100	85-100	35-70	0-15	---	NP
	27-44	Sand	SM, SP-SM	A-3, A-2	0	0	90-100	85-100	35-70	0-15	---	NP
	44-80	Silty clay, clay	CL, CH	A-7-6	0	0	98-100	97-100	90-100	75-95	45-60	30-40
Wakeley-------	0-3	Mucky sand	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	85-100	35-70	0-15	0-14	NP
	3-21	Sand, loamy sand	SC-SM, SM, SP, SP-SM	A-2-4, A-3	0	0	95-100	85-100	35-75	0-30	15-25	NP-7
	21-80	Silty clay, clay	CH, CL	A-7-6	0	0	95-100	90-100	85-100	75-95	40-65	20-40

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
94F:												
Klacking------	0-4	Loamy sand	SP-SM, SM	A-1, A-2-4	0	0-2	95-100	92-100	35-75	10-30	0-14	NP
	4-12	Loamy sand, sand	SP-SM, SP, SM	A-2-4, A-3, A-1	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	12-25	Loamy sand, sand	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-2	95-100	92-100	35-75	0-30	0-14	NP
	25-33	Sand, loamy sand, sandy loam	SM, SP, SP-SM, SC-SM	A-1, A-2-4, A-3, A-4	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	33-64	Sandy loam, loamy sand, sand	SC-SM, SM, SP, SP-SM	A-2-4, A-1, A-3, A-4	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
	64-80	Sand	SC-SM, SM, SP, SP-SM	A-4, A-1, A-2-4, A-3	0	0-2	95-100	92-100	35-70	0-40	0-25	NP-7
McGinn--------	0-2	Loamy sand	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	2-3	Loamy sand	SM, SP-SM	A-2-4, A-1-b	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	3-12	Loamy sand	SP-SM, SM	A-1-b, A-2-4	0	0-8	90-100	85-100	35-75	10-30	0-14	NP
	12-22	Loamy sand, sandy loam, loam	ML, SC-SM, SM, SP-SM	A-1-b, A-2-4, A-4	0	0-8	90-100	85-100	35-95	10-60	0-25	NP-7
	22-26	Sandy loam, loam	CL, SC, SC-SM, CL-ML	A-6, A-4, A-2-4	0	0-8	90-100	85-100	45-95	20-60	25-30	7-11
	26-80	Sandy loam	SC-SM, SM	A-1-b, A-2-4, A-4	0	0-8	90-100	85-100	45-80	20-50	0-25	NP-7
97:												
Colonville----	0-19	Very fine sandy loam	CL-ML, CL	A-4	0	0	100	100	85-95	50-65	20-25	4-8
	19-35	Very fine sandy loam, fine sandy loam, sandy loam	CL, ML, SC, SM	A-2-4, A-1-b, A-4	0	0	99-100	99-100	35-85	5-55	0-30	NP-9
	35-80	Very fine sandy loam, fine sandy loam, sandy loam	SM, SC, ML, CL	A-4, A-1-b, A-2-4	0	0	99-100	99-100	35-85	5-55	0-30	NP-9
113:												
Angelica------	0-8	Loam	CL, ML	A-4, A-6	0	0-7	90-100	85-95	80-95	30-90	15-30	2-13
	8-29	Loam, sandy loam	CL, CL-ML, SC	A-4, A-6	0	0-7	90-100	85-95	80-95	30-90	15-30	5-13
	29-80	Loam, sandy loam	CL, CL-ML	A-4, A-6	0	0-7	90-100	85-95	80-95	30-90	20-30	4-12

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
116C:												
Mancelona-----	0-3	Sand	SP, SM, SP-SM	A-1-b, A-2, A-3	0	0-15	90-100	85-100	35-70	0-15	0-14	NP
	3-6	Loamy sand, sand, gravelly loamy sand, gravelly sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0-15	80-100	65-95	30-75	5-30	0-14	NP
	6-20	Loamy sand, sand, gravelly loamy sand, gravelly sand	SM, SP-SM	A-2-4, A-1-b, A-3	0	0-15	80-100	65-95	30-75	5-30	0-14	NP
	20-29	Sand, gravelly loamy sand, loamy sand, gravelly sand	SC, SP-SC, SC-SM	A-6, A-4, A-1, A-2-4	0	0-15	80-100	65-95	35-80	10-50	20-35	4-15
	29-35	Gravelly sandy loam, sandy clay loam, sandy loam, gravelly sandy clay loam	SP-SC, SC-SM, SC	A-1, A-2-4, A-4, A-6	0	0-15	80-100	65-95	35-80	10-50	20-35	4-15
	35-80	Stratified very gravelly sand to sand	GP, GW, SP-SM, SW	A-1-b, A-2, A-3	0	0-15	40-90	30-85	20-60	0-15	0-14	NP
127:												
Cathro--------	0-6	Muck	PT	A-8	0	0	---	---	---	---	---	---
	6-28	Muck	PT	A-8	0	0	---	---	---	---	---	---
	28-80	Loam, silty clay loam, silt loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-5	90-100	85-100	60-100	35-90	20-40	4-20
128:												
Dawson--------	0-6	Peat	PT	A-8	0	0	---	---	---	---	---	---
	6-31	Muck	PT	A-8	0	0	---	---	---	---	---	---
	31-80	Fine sand, sand	SC, SM, SP	A-2-4, A-4, A-3	0	0	100	100	50-90	0-45	0-20	NP-10
145C:												
Rousseau------	0-1	Slightly decomposed plant material	PT	A-8	0	0	---	---	---	---	---	---
	1-3	Fine sand	SM	A-2-4	0	0	100	100	65-80	20-35	0-14	NP
	3-6	Fine sand	SM	A-2-4	0	0	100	100	65-80	20-35	0-14	NP
	6-23	Fine sand	SM	A-2-4	0	0	100	100	65-100	20-35	0-14	NP
	23-37	Fine sand	SM	A-2-4	0	0	100	100	65-100	20-35	0-14	NP
	37-80	Fine sand	SM, SP-SM	A-2-4, A-3	0	0	100	100	50-100	5-35	0-14	NP
145E:												
Rousseau------	0-1	Slightly decomposed plant material	PT	A-8	0	0	---	---	---	---	---	---
	1-3	Fine sand	SM	A-2-4	0	0	100	100	65-80	20-35	0-14	NP
	3-6	Fine sand	SM	A-2-4	0	0	100	100	65-80	20-35	0-14	NP
	6-23	Fine sand	SM	A-2-4	0	0	100	100	65-100	20-35	0-14	NP
	23-37	Fine sand	SM	A-2-4	0	0	100	100	65-100	20-35	0-14	NP
	37-80	Fine sand	SM, SP-SM	A-2-4, A-3	0	0	100	100	50-100	5-35	0-14	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
159A:												
Finch---------	0-1	Highly decomposed plant material	PT	A-8	0	0	---	---	---	---	---	---
	1-11	Sand	SP-SM, SM	A-2-4, A-3	0	0	100	100	35-70	0-15	0-14	NP
	11-16	Sand	SP-SM, SM	A-2-4, A-3	0	0	100	100	35-70	0-15	0-14	NP
	16-23	Sand	SM, SP-SM	A-3, A-2-4	0	0	100	100	35-70	0-15	0-14	NP
	23-80	Sand	SM, SP-SM	A-2-4, A-3	0	0	100	100	35-70	0-15	0-14	NP
166A:												
Slade---------	0-5	Loam	ML, CL	A-4	0	0-9	80-100	80-100	55-95	45-85	15-28	NP-9
	5-7	Fine sandy loam, loam	ML, SC, SM, CL	A-2-4, A-4	0	0-9	80-100	80-100	45-90	20-65	0-26	NP-8
	7-9	Clay loam, fine sandy loam, loam	CL, SC-SM, SC, CL-ML	A-2-4, A-2-6, A-4, A-6	0	0-9	80-100	80-100	45-90	20-65	23-35	6-15
	9-26	Clay loam, loam	SC, CL	A-2-4, A-2-6, A-4, A-6	0	0-9	80-100	80-100	50-90	30-70	28-35	9-15
	26-60	Loam	CL-ML, CL, SC, SC-SM	A-2-4, A-4	0	0-9	80-100	80-100	45-90	20-60	23-28	6-9
	60-80	Loam	SC-SM, CL, CL-ML, SC	A-2-4, A-4	0	0-9	80-100	80-100	45-90	20-60	23-28	6-9
182:												
Pits, quarry.												
300A:												
Hagensville---	0-7	Fine sandy loam	SC-SM, SC	A-4, A-2-4	0	0-7	90-100	85-92	55-80	30-50	20-30	4-10
	7-18	Fine sandy loam	CL, SC, SC-SM, CL-ML	A-4, A-2-4	0	0-7	90-100	85-92	55-90	30-70	20-30	4-10
	18-80	Gravelly fine sandy loam, fine sandy loam	SC, SC-SM	A-2-4, A-1-b, A-4	0	0-7	80-95	70-85	40-80	20-50	20-30	4-10
304A:												
Iosco---------	0-10	Loamy sand	SC, SC-SM, SM, SP-SM	A-1, A-2-4, A-4	0	0-5	90-100	85-97	35-85	10-45	15-25	2-9
	10-19	Loamy sand	SP-SM, SM	A-2-4, A-3, A-4, A-1	0	0-5	90-100	85-97	35-80	5-45	0-14	NP
	19-24	Loamy sand	SM, SP-SM	A-2-4, A-3, A-1, A-4	0	0-5	90-100	85-97	35-80	5-45	0-14	NP
	24-37	Sandy loam, clay loam	SC, CL	A-2, A-4, A-6	0	0-5	85-100	85-97	45-95	20-75	26-35	8-15
	37-52	Sandy loam, loam	SC, CL, ML, SM	A-1, A-2, A-4	0	0-5	85-100	85-97	35-95	15-75	20-30	NP-10
	52-80	Sandy loam, loam	CL, ML, SC, SM	A-1, A-2, A-4	0	0-5	85-100	85-97	35-95	15-75	20-30	NP-10
305B:												
Johnswood-----	0-5	Very flaggy loam	CL, CL-ML	A-4	0	15-50	80-100	75-90	65-90	50-70	20-30	4-10
	5-12	Very gravelly clay loam, very gravelly loam, gravelly clay loam	ML, SC, SM, CL	A-1, A-2, A-4, A-6	0	0-15	80-100	60-90	35-90	15-70	20-40	2-19
	12-80	Very gravelly sandy loam, gravelly sandy loam, very gravelly loam, gravelly loam	SM, SC-SM, SC, CL	A-4, A-6, A-2, A-1	0	0-20	80-100	60-90	35-90	15-70	15-30	3-15

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				*Pct*	*Pct*					*Pct*	
308B:												
Krakow--------	0-3	Flaggy fine sandy loam	SM, SC-SM, SC	A-4, A-2-4	0-7	20-40	85-95	75-90	50-80	25-50	15-30	NP-10
	3-8	Flaggy fine sandy loam	SC, SC-SM, SM	A-4, A-2-4	0-7	20-40	85-95	75-90	50-80	25-50	15-30	NP-10
	8-15	Very flaggy clay loam	CL, ML, SC, SM	A-4, A-2-4	0-7	50-70	85-95	75-90	60-75	25-75	15-30	NP-10
	15-80	Very flaggy loam	CL, ML, SC, SM	A-2-4, A-4	0-7	50-70	85-95	75-90	50-90	25-70	15-30	NP-10
308C:												
Krakow--------	0-3	Flaggy fine sandy loam	SM, SC-SM, SC	A-2-4, A-4	0-7	20-40	85-95	75-90	50-80	25-50	15-30	NP-10
	3-8	Flaggy fine sandy loam	SM, SC, SC-SM	A-4, A-2-4	0-7	20-40	85-95	75-90	50-80	25-50	15-30	NP-10
	8-15	Very flaggy clay loam	CL, ML, SC, SM	A-4, A-2-4	0-7	50-70	85-95	75-90	60-75	25-75	15-30	NP-10
	15-80	Very flaggy loam	CL, ML, SC, SM	A-2-4, A-4	0-7	50-70	85-95	75-90	50-90	25-70	15-30	NP-10
308D:												
Krakow--------	0-3	Flaggy fine sandy loam	SC, SC-SM, SM	A-4, A-2-4	0-7	20-40	85-95	75-90	50-80	25-50	15-30	NP-10
	3-8	Flaggy fine sandy loam	SM, SC-SM, SC	A-4, A-2-4	0-7	20-40	85-95	75-90	50-80	25-50	15-30	NP-10
	8-15	Very flaggy clay loam	SC, ML, CL, SM	A-4, A-2-4	0-7	50-70	85-95	75-90	60-75	25-75	15-30	NP-10
	15-80	Very flaggy loam	CL, ML, SC, SM	A-4, A-2-4	0-7	50-70	85-95	75-90	50-90	25-70	15-30	NP-10
316:												
Ruse----------	0-8	Loam	CL, CL-ML	A-4, A-6	0	0	90-100	80-92	65-92	50-75	20-30	4-11
	8-13	Flaggy sandy loam	CL-ML, SC-SM, CL, SC	A-6, A-2-4, A-2-6, A-4	0	0-30	90-100	75-92	50-92	20-75	20-35	5-15
	13-17	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
350E:												
Blue Lake-----	0-3	Sand	SM, SP-SM	A-3, A-2-4, A-1-b	0	0	95-100	95-100	40-70	5-15	0-14	NP
	3-6	Sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	95-100	40-75	5-30	0-14	NP
	6-25	Sand	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam	SM, SP-SM	A-4, A-3, A-2-4, A-1	0	0	95-100	95-100	40-75	5-40	0-14	NP
359C:												
Algonquin-----	0-5	Silt loam	CL	A-6, A-4	0	0	99-100	95-100	80-100	70-90	25-40	7-15
	5-7	Silt loam	CL	A-6, A-4	0	0	99-100	95-100	80-100	70-90	25-40	7-15
	7-19	Clay, silty clay loam, silty clay	CL, CH	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	19-55	Stratified silty clay to silty clay loam to loam	CL, CH	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	55-80	Stratified silty clay to silty clay loam to loam	CL, CH	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
359C:												
Negwegon------	0-9	Silt loam	CL, CL-ML	A-4, A-6	0	0	99-100	98-100	80-100	65-90	20-40	5-15
	9-12	Silt loam	CL-ML, CL	A-4, A-6	0	0	99-100	98-100	80-100	65-90	20-40	5-15
	12-14	Silty clay, silt loam	CH, CL	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	14-51	Silty clay, silty clay loam, clay	CL, CH	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	51-80	Stratified silty clay to silty clay loam to silt loam	CH, CL	A-7-6	0	0	99-100	98-100	80-100	65-95	40-65	20-40
Dorval--------	0-18	Muck	PT	A-8	0	0	---	---	---	---	0-14	---
	18-80	Clay, silty clay	CL, CH	A-7-6	0	0	100	100	90-100	80-100	45-70	25-40
361B:												
Allendale-----	0-11	Loamy sand	SP-SM, SM	A-1-b, A-2-4	0	0	95-100	95-100	45-80	10-30	0-14	NP
	11-13	Sand, loamy sand	SM, SP-SM	A-2-4, A-1-b, A-3	0	0	95-100	95-100	45-80	5-30	0-14	NP
	13-22	Sand, loamy sand	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	95-100	95-100	45-80	5-30	0-14	NP
	22-25	Sandy loam, loamy sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	95-100	45-80	5-30	0-14	NP
	25-44	Silty clay, clay	MH, CH	A-7	0	0	95-100	95-100	90-100	75-95	50-70	20-40
	44-80	Silty clay, clay	CH, MH	A-7	0	0	95-100	95-100	90-100	75-95	50-70	20-40
Dorval--------	0-18	Muck	PT	A-8	0	0	---	---	---	---	0-14	---
	18-80	Clay, silty clay	CH, CL	A-7-6	0	0	100	100	90-100	80-100	45-70	25-40
Blue Lake-----	0-3	Sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	0	95-100	95-100	40-70	5-15	0-14	NP
	3-6	Sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	0	95-100	95-100	40-75	5-30	0-14	NP
	6-25	Sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam	SP-SM, SM	A-3, A-2-4, A-1, A-4	0	0	95-100	95-100	40-75	5-40	0-14	NP
362D:												
Millersburg---	0-3	Loamy sand	SM, SC-SM	A-2-4, A-1-b	0	0-8	95-100	85-100	40-75	15-25	0-20	NP-5
	3-5	Loamy sand, sand	SC-SM, SM, SP-SM	A-2-4, A-3, A-1-b	0	0-8	95-100	85-100	35-70	5-20	0-20	NP-5
	5-18	Loamy sand, sand	SC-SM, SM, SP-SM	A-2-4, A-1-b, A-3	0	0-8	95-100	85-100	35-70	5-20	0-20	NP-5
	18-27	Loamy sand, sandy clay loam	SC-SM, SM, SP-SM	A-4, A-1-b, A-2-4	0	0-8	95-100	85-100	35-65	5-40	0-20	NP-5
	27-33	Sandy clay loam, loam	CL, ML, SC, SM	A-1-b, A-2-4, A-4	0	0-8	95-100	85-100	45-90	20-60	0-30	NP-10
	33-80	Sandy loam	SP-SM, SM	A-1-b, A-2-4	0	0-8	90-100	85-100	40-65	10-35	0-30	NP-5

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
362E:												
Millersburg---	0-3	Loamy sand	SC-SM, SM	A-1-b, A-2-4	0	0-8	95-100	85-100	40-75	15-25	0-20	NP-5
	3-5	Loamy sand, sand	SM, SP-SM, SC-SM	A-3, A-2-4, A-1-b	0	0-8	95-100	85-100	35-70	5-20	0-20	NP-5
	5-18	Loamy sand, sand	SC-SM, SM, SP-SM	A-3, A-2-4, A-1-b	0	0-8	95-100	85-100	35-70	5-20	0-20	NP-5
	18-27	Loamy sand, sandy clay loam	SP-SM, SM, SC-SM	A-4, A-1-b, A-2-4	0	0-8	95-100	85-100	35-65	5-40	0-20	NP-5
	27-33	Sandy clay loam, loam	SM, SC, ML, CL	A-1-b, A-2-4, A-4	0	0-8	95-100	85-100	45-90	20-60	0-30	NP-10
	33-80	Sandy loam	SP-SM, SM	A-1-b, A-2-4	0	0-8	90-100	85-100	40-65	10-35	0-30	NP-5
368A:												
Au Gres-------	0-1	Moderately decomposed plant material	PT	A-8	0	0	---	---	---	---	---	---
	1-2	Sand	SM, SP, SP-SM	A-3, A-2-4, A-1-b	0	0	95-100	90-100	35-70	0-15	0-14	NP
	2-10	Sand	SP-SM, SP, SC-SM, SM	A-3, A-2-4, A-1-b	0	0	95-100	90-100	35-75	0-30	0-25	NP-7
	10-28	Sand	SM, SP, SP-SM, SC-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-75	0-30	0-25	NP-7
	28-32	Sand	SP, SM, SC-SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-75	0-30	0-25	NP-7
	32-80	Sand	SP-SM, SP, SM	A-3, A-2-4, A-1-b	0	0	95-100	90-100	35-70	0-15	0-14	NP
Deford--------	0-4	Muck	PT	A-8	0	0	---	---	---	---	---	---
	4-5	Sand, fine sand	SM, SP, SP-SM	A-2-4, A-3	0	0	100	100	50-80	0-35	15-20	NP-4
	5-80	Sand, fine sand	SP-SM, SP, SM	A-2-4, A-3	0	0	100	100	50-80	0-35	15-20	NP-4
369:												
Deford--------	0-4	Muck	PT	A-8	0	0	---	---	---	---	---	---
	4-5	Sand, fine sand	SM, SP-SM, SP	A-3, A-2-4	0	0	100	100	50-80	0-35	15-20	NP-4
	5-80	Sand, fine sand	SP-SM, SP, SM	A-3, A-2-4	0	0	100	100	50-80	0-35	15-20	NP-4
371:												
Springport----	0-3	Silt loam	CL	A-6, A-4	0	0	97-100	97-100	80-100	70-90	25-40	7-15
	3-9	Silt loam, silty clay loam	CH, CL	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
	9-13	Silty clay loam, silt loam	CH, CL	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
	13-35	Silty clay	CL, CH	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
	35-80	Silty clay, silty clay loam	CH, CL	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
373B:												
Grayling------	0-2	Sand	SP-SM, SM	A-3, A-2, A-1	0	0	99-100	98-100	40-70	0-15	0-14	NP
	2-3	Sand	SP-SM, SM	A-1, A-2, A-3	0	0	99-100	98-100	40-70	0-15	0-14	NP
	3-15	Sand	SP-SM, SM	A-1, A-2, A-3	0	0	99-100	98-100	40-70	0-15	0-14	NP
	15-80	Sand	SP-SM, SP, SM	A-1, A-2, A-3	0	0	99-100	98-100	40-70	0-15	0-14	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
374:												
Thunderbay----	0-14	Very fine sandy loam	ML	A-4	0	0	98-100	98-100	85-95	50-65	15-20	NP-4
	14-19	Loam	ML	A-4	0	0	98-100	98-100	85-95	50-65	15-30	NP-9
	19-24	Stratified silt loam to sand	ML	A-4	0	0	98-100	98-100	85-95	60-75	15-30	NP-9
	24-80	Sand	SP-SM, SM	A-3, A-2-4	0	0	95-100	85-100	40-70	5-15	0-14	NP
376A:												
Urban land.												
Udipsamments--	0-4	Fine sand	SM, SP-SM	A-2-4, A-3	0	0	100	100	50-80	5-35	0-14	NP
	4-42	Sand, fine sand	SM, SP-SM	A-2-4, A-3	0	0	100	100	50-80	5-35	0-14	NP
	42-80	Sand, fine sand	SM, SP-SM	A-3, A-2-4	0	0	100	100	50-80	5-35	0-14	NP
380:												
Access denied.												
392:												
Caffey--------	0-9	Mucky sand	SM	A-3, A-2-4	0	0	99-100	97-100	50-70	5-15	0-14	NP
	9-21	Sand, loamy sand, fine sand	SP-SM, SM	A-4, A-2-4, A-3	0	0	99-100	97-100	50-90	5-45	0-14	NP
	21-80	Stratified fine sand to very fine sandy loam to silty clay loam	CL, CL-ML	A-6, A-4	0	0	99-100	97-100	65-100	50-90	20-40	4-20
393B:												
Morganlake----	0-2	Loamy sand	SP-SM, SM	A-3	0	0-7	95-100	92-100	50-75	0-15	0-14	NP
	2-6	Loamy sand	SP-SM, SM	A-2-4	0	0-7	95-100	92-100	50-75	5-30	0-14	NP
	6-34	Loamy sand, sand	SM, SP-SM	A-2-4	0	0-7	95-100	92-100	50-75	5-30	0-14	NP
	34-37	Fine sandy loam, sandy loam, loam	CL	A-7, A-6	0	0-7	80-100	80-95	65-95	55-75	25-45	10-20
	37-43	Loam	CL	A-6, A-7	0	0-7	80-100	80-95	65-95	55-75	25-45	10-20
	43-80	Loam, fine sandy loam	CL, SC-SM, SC	A-7, A-2, A-6	0	0-7	80-100	80-95	65-95	30-95	25-45	10-20
393C:												
Morganlake----	0-2	Loamy sand	SP-SM, SM	A-3	0	0-7	95-100	90-100	50-75	0-15	0-14	NP
	2-6	Loamy sand	SP-SM, SM	A-2-4	0	0-7	95-100	90-100	50-75	5-30	0-14	NP
	6-34	Loamy sand, sand	SP-SM, SM	A-2-4	0	0-7	95-100	90-100	50-75	5-30	0-14	NP
	34-37	Fine sandy loam, sandy loam, loam	CL	A-6, A-7	0	0-7	80-100	80-95	65-95	55-75	25-45	10-20
	37-43	Loam	CL	A-7, A-6	0	0-7	80-100	80-95	65-95	55-75	25-45	10-20
	43-80	Loam, fine sandy loam	SC-SM, SC, CL	A-7, A-2, A-6	0	0-7	80-100	80-95	65-95	30-95	25-45	10-20
396F:												
Proper--------	0-3	Fine sand	SM, SP-SM	A-3, A-2-4	0	0	100	100	40-70	5-15	0-14	NP
	3-11	Fine sand	SM, SP-SM	A-3, A-2-4	0	0	100	100	40-70	5-15	0-14	NP
	11-24	Fine sand	SM, SP-SM	A-3, A-2-4	0	0	100	100	40-70	5-15	0-14	NP
	24-41	Fine sand	SM, SP-SM	A-3, A-2-4	0	0	100	100	40-70	5-15	0-14	NP
	41-80	Fine sand	SP-SM, SM	A-3, A-2-4	0	0	100	100	40-70	5-15	0-14	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
396F:												
Deford--------	0-4	Muck	PT	A-8	0	0	---	---	---	---	---	---
	4-5	Sand, fine sand	SM, SP, SP-SM	A-3, A-2-4	0	0	100	100	50-80	0-35	15-20	NP-4
	5-80	Sand, fine sand	SM, SP, SP-SM	A-3, A-2-4	0	0	100	100	50-80	0-35	15-20	NP-4
Rousseau------	0-1	Slightly decomposed plant material	PT	A-8	0	0	---	---	---	---	---	---
	1-3	Fine sand	SM	A-2-4	0	0	100	100	65-80	20-35	0-14	NP
	3-6	Fine sand	SM	A-2-4	0	0	100	100	65-80	20-35	0-14	NP
	6-23	Fine sand	SM	A-2-4	0	0	100	100	65-100	20-35	0-14	NP
	23-37	Fine sand	SM	A-2-4	0	0	100	100	65-100	20-35	0-14	NP
	37-80	Fine sand	SM, SP-SM	A-3, A-2-4	0	0	100	100	50-100	5-35	0-14	NP
397:												
Spot----------	0-3	Peat	PT	A-8	0	0	---	---	---	---	---	---
	3-6	Muck	PT	A-8	0	0	---	---	---	---	---	---
	6-13	Sand	SM, SP-SM	A-3, A-2-4, A-1	0	0	100	100	40-90	5-15	0-14	NP
	13-15	Sand	SM, SP-SM	A-3, A-1, A-2-4	0	0	100	100	40-90	5-15	0-14	NP
	15-21	Sand	SP-SM, SM	A-1, A-2-4, A-3	0	0	100	100	40-90	5-30	0-14	NP
	21-28	Sand	SP-SM, SM	A-3, A-2-4, A-1	0	0	100	100	40-90	5-30	0-14	NP
	28-80	Sand	SP-SM, SM	A-1, A-2-4, A-3	0	0	100	100	40-90	5-30	0-14	NP
414B:												
Namur---------	0-5	Channery silt loam	CL-ML, CL, ML	A-4	0	0-5	60-100	55-70	40-70	35-70	20-30	3-10
	5-9	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
415A:												
Potagannissing	0-6	Silt loam	CL-ML, CL	A-4	0	0	100	90-100	80-100	70-90	0-30	5-9
	6-9	Very flaggy silt loam	SP-SM, ML, SM	A-2-4, A-4, A-1-b	0	0-20	85-100	60-95	30-95	10-80	0-30	NP-6
	9-11	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
416B:												
Negwegon------	0-9	Silt loam	CL-ML, CL	A-6, A-4	0	0	99-100	98-100	80-100	65-90	20-40	5-15
	9-12	Silt loam	CL-ML, CL	A-4, A-6	0	0	99-100	98-100	80-100	65-90	20-40	5-15
	12-14	Silty clay, silt loam	CL, CH	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	14-51	Silty clay, clay, silty clay loam	CL, CH	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	51-62	Stratified silty clay to silty clay loam to silt loam	CH, CL	A-7-6	0	0	99-100	98-100	80-100	65-95	40-65	20-40
	62-80	Loam, fine sandy loam	CH, CL	A-7-6	0	0	95-100	90-100	80-100	65-95	40-65	20-40

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
417B:												
Alpena--------	0-6	Gravelly sandy loam	SP-SM, SM, SC-SM	A-1-b, A-2-4, A-3	0	0-10	75-90	50-75	10-55	5-35	15-25	NP-7
	6-80	Extremely gravelly coarse sand, very gravelly sand	SP, SP-SM, GP-GM, GP	A-1-a	0	0-10	35-65	10-50	5-35	0-10	---	NP
417C:												
Alpena--------	0-6	Gravelly sandy loam	SC-SM, SM, SP-SM	A-3, A-2-4, A-1-b	0	0-10	75-90	50-75	10-55	5-35	15-25	NP-7
	6-80	Extremely gravelly coarse sand, very gravelly sand	GP-GM, SP-SM, SP, GP	A-1-a	0	0-10	35-65	10-50	5-35	0-10	---	NP
418E:												
Alpena--------	0-6	Gravelly sandy loam	SC-SM, SM, SP-SM	A-3, A-2-4, A-1-b	0	0-10	75-90	50-75	10-55	5-35	15-25	NP-7
	6-80	Extremely gravelly coarse sand, very gravelly sand	SP-SM, GP, GP-GM, SP	A-1-a	0	0-10	35-65	10-50	5-35	0-10	---	NP
419:												
Chippeny------	0-19	Muck	PT		---	---	---	---	---	---	---	---
	19-24	Very channery silt loam	SC, ML, SM, CL	A-6, A-2, A-1-a, A-4	0	0-30	45-100	35-100	20-100	5-90	0-50	NP-30
	24-26	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
420A:												
Otisco--------	0-5	Mucky sand	SM, SP-SM	A-3, A-2-4	0	0	95-100	90-100	50-80	5-35	15-20	NP-4
	5-10	Sand	SM, SC-SM, SP-SM	A-3, A-1-b, A-2-4	0	0	95-100	90-100	45-75	5-30	0-20	NP-5
	10-25	Sand	SC-SM, SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	45-75	5-30	0-20	NP-5
	25-45	Sand, loamy sand	CL, SC, SM, SP-SM	A-2-4, A-3, A-4, A-6	0	0	95-100	90-100	45-90	5-55	0-30	NP-15
	45-60	Loamy sand	SC-SM, SP-SM, SM	A-3, A-2-4, A-1-b	0	0	95-100	90-100	45-75	5-30	0-20	NP-5
	60-80	Sand	SP-SM, SC-SM, SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	45-75	5-30	0-20	NP-5

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
424B:												
Morganlake----	0-4	Highly decomposed plant material	PT	A-8	0	0	---	---	---	---	---	---
	4-8	Loamy sand, sand	SP-SM, SM	A-2-4	0	0-7	95-100	92-100	50-75	5-30	0-14	NP
	8-17	Loamy sand, sand	SM, SP-SM	A-2-4	0	0-7	95-100	92-100	50-75	5-30	0-14	NP
	17-32	Loamy sand, sandy clay loam	CL	A-6, A-7	0	0-7	80-100	80-95	65-95	55-75	25-45	10-20
	32-36	Clay loam, loamy sand	CL	A-7, A-6	0	0-7	80-100	80-95	65-95	55-75	25-45	10-20
	36-46	Sandy clay loam, silty clay loam, clay loam	CL	A-7, A-6	0	0-7	80-100	80-95	65-95	55-75	25-45	10-20
	46-66	Sandy loam, sandy clay loam	SC-SM, SC, CL	A-2, A-7, A-6	0	0-7	80-100	80-95	65-95	30-95	25-45	10-20
	66-80	Loam, clay loam, silty clay loam	SC, CL, SC-SM	A-7, A-6, A-2	0	0-7	80-100	80-95	65-95	30-95	25-45	10-20
Ossineke------	0-8	Fine sandy loam	SC, SM, SC-SM	A-6, A-2-4	0	0-5	95-100	85-100	55-85	30-50	0-30	NP-11
	8-13	Fine sandy loam, sandy loam	SC, SC-SM, SM	A-6, A-4, A-2-4	0	0-5	95-100	85-100	55-85	30-50	0-30	NP-11
	13-21	Sandy clay loam, sandy loam, clay loam, fine sandy loam	SC-SM, CL	A-4, A-2, A-6	0	0-5	95-100	85-100	55-95	30-80	25-40	7-15
	21-38	Sandy clay loam, clay loam, loam, sandy clay loam	CL	A-6	0	0-5	95-100	85-100	70-95	50-80	25-45	10-20
	38-51	Sandy loam, loam	CL	A-6	0	0-5	95-100	85-100	70-95	50-80	25-45	10-20
	51-77	Sandy loam, loam, fine sandy loam, clay loam	CL, SC-SM	A-4, A-6, A-2	0	0-5	95-100	85-100	45-95	30-80	25-40	7-15
	77-80	Sand, loamy sand, gravelly sand, gravelly loamy sand	SM, SP-SM	A-2-4	0	0-5	95-100	85-100	50-75	5-30	0-14	NP
Blue Lake-----	0-3	Sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	0	95-100	95-100	40-70	5-15	0-14	NP
	3-6	Sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	0	95-100	95-100	40-75	5-30	0-14	NP
	6-25	Sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam	SP-SM, SM	A-3, A-2-4, A-1, A-4	0	0	95-100	95-100	40-75	5-40	0-14	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
424C:												
Morganlake----	0-4	Highly decomposed plant material	PT	A-8	0	0	---	---	---	---	---	---
	4-8	Loamy sand, sand	SM, SP-SM	A-2-4	0	0-7	95-100	92-100	50-75	5-30	0-14	NP
	8-17	Loamy sand, sand	SM, SP-SM	A-2-4	0	0-7	95-100	92-100	50-75	5-30	0-14	NP
	17-32	Loamy sand, sandy clay loam	CL	A-6, A-7	0	0-7	80-100	80-95	65-95	55-75	25-45	10-20
	32-36	Clay loam, loamy sand	CL	A-6, A-7	0	0-7	80-100	80-95	65-95	55-75	25-45	10-20
	36-46	Sandy clay loam, silty clay loam, clay loam	CL	A-7, A-6	0	0-7	80-100	80-95	65-95	55-75	25-45	10-20
	46-66	Sandy loam, sandy clay loam	SC-SM, SC, CL	A-6, A-2, A-7	0	0-7	80-100	80-95	65-95	30-95	25-45	10-20
	66-80	Loam, clay loam, silty clay loam	SC, CL, SC-SM	A-7, A-2, A-6	0	0-7	80-100	80-95	65-95	30-95	25-45	10-20
Ossineke------	0-8	Fine sandy loam	SC, SC-SM, SM	A-6, A-2-4	0	0-5	95-100	85-100	55-85	30-50	0-30	NP-11
	8-13	Sandy loam, fine sandy loam	SC, SC-SM, SM	A-6, A-2-4, A-4	0	0-5	95-100	85-100	55-85	30-50	0-30	NP-11
	13-21	Sandy clay loam, sandy loam, clay loam, fine sandy loam	SC-SM, CL	A-6, A-4, A-2	0	0-5	95-100	85-100	55-95	30-80	25-40	7-15
	21-38	Sandy clay loam, clay loam, loam	CL	A-6	0	0-5	95-100	85-100	70-95	50-80	25-45	10-20
	38-51	Sandy loam, clay loam, loam	CL	A-6	0	0-5	95-100	85-100	70-95	50-80	25-45	10-20
	51-77	Sandy loam, loam, fine sandy loam, clay loam	SC-SM, CL	A-6, A-2, A-4	0	0-5	95-100	85-100	45-95	30-80	25-40	7-15
	77-80	Sand, loamy sand, gravelly sand, gravelly loamy sand	SM, SP-SM	A-2-4	0	0-5	95-100	85-100	50-75	5-30	0-14	NP
Blue Lake-----	0-3	Sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	0	95-100	95-100	40-70	5-15	0-14	NP
	3-6	Sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	0	95-100	95-100	40-75	5-30	0-14	NP
	6-25	Sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam	SP-SM, SM	A-3, A-2-4, A-1, A-4	0	0	95-100	95-100	40-75	5-40	0-14	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
426B:												
Coppler-------	0-3	Loamy sand	SM, SP-SM	A-2-4	0	0-15	85-100	85-95	40-70	10-30	0-14	NP
	3-4	Loamy sand	SM, SP-SM	A-3, A-1-b	0	0-15	85-100	85-95	30-70	5-30	0-14	NP
	4-14	Loamy sand, sand	SP-SM, SM	A-1-b, A-3	0	0-15	85-100	85-95	30-70	5-30	0-14	NP
	14-21	Gravelly loamy sand, gravelly sand	SM, SP-SM	A-1-b, A-3	0	0-15	65-100	60-95	30-70	5-30	0-14	NP
	21-26	Very gravelly sandy loam, very gravelly sandy clay loam	GC, GC-GM	A-2-4, A-4, A-6	0	0-15	35-55	30-50	10-45	5-45	20-35	4-15
	26-80	Stratified very gravelly coarse sand to gravelly sand	GM, GC-GM	A-1-a	0	0-15	30-55	20-50	5-45	0-25	0-14	NP
426C:												
Coppler-------	0-3	Loamy sand	SM, SP-SM	A-2-4	0	0-15	85-100	85-95	40-70	10-30	0-14	NP
	3-4	Loamy sand	SM, SP-SM	A-3, A-1-b	0	0-15	85-100	85-95	30-70	5-30	0-14	NP
	4-14	Loamy sand, sand	SP-SM, SM	A-3, A-1-b	0	0-15	85-100	85-95	30-70	5-30	0-14	NP
	14-21	Gravelly loamy sand, gravelly sand	SM, SP-SM	A-3, A-1-b	0	0-15	65-100	60-95	30-70	5-30	0-14	NP
	21-26	Very gravelly sandy loam, very gravelly sandy clay loam	GC-GM, GC	A-2-4, A-4, A-6	0	0-15	35-55	30-50	10-45	5-45	20-35	4-15
	26-80	Stratified very gravelly coarse sand to gravelly sand	GC-GM, GM	A-1-a	0	0-15	30-55	20-50	5-45	0-25	0-14	NP
426D:												
Coppler-------	0-3	Loamy sand	SM, SP-SM	A-2-4	0	0-15	85-100	85-95	40-70	10-30	0-14	NP
	3-4	Loamy sand	SM, SP-SM	A-3, A-1-b	0	0-15	85-100	85-95	30-70	5-30	0-14	NP
	4-14	Loamy sand, sand	SM, SP-SM	A-1-b, A-3	0	0-15	85-100	85-95	30-70	5-30	0-14	NP
	14-21	Gravelly loamy sand, gravelly sand	SP-SM, SM	A-3, A-1-b	0	0-15	65-100	60-95	30-70	5-30	0-14	NP
	21-26	Very gravelly sandy loam, very gravelly sandy clay loam	GC, GC-GM	A-4, A-2-4, A-6	0	0-15	35-55	30-50	10-45	5-45	20-35	4-15
	26-80	Stratified very gravelly coarse sand to gravelly sand	GC-GM, GM	A-1-a	0	0-15	30-55	20-50	5-45	0-25	0-14	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				*Pct*	*Pct*					*Pct*	
451C:												
Annalake------	0-9	Loamy fine sand	CL-ML, ML, SC-SM, SM	A-4, A-2-4	0	0	95-100	90-100	50-95	25-60	0-26	NP-8
	9-11	Fine sand	SM	A-2-4	0	0	95-100	90-100	50-95	15-35	0-14	NP
	11-16	Loamy fine sand	SM	A-2-4	0	0	95-100	90-100	50-95	15-35	0-26	NP-8
	16-30	Sandy loam, loam, loamy fine sand	CL, ML, SM, SC	A-2, A-4	0	0	95-100	90-100	65-90	20-70	15-30	NP-8
	30-37	Sandy loam, very fine sandy loam, loam	SM, SC, ML, CL	A-2-4, A-4	0	0	95-100	90-100	50-95	25-80	18-28	3-9
	37-46	Sandy loam	SC, ML, SM, CL	A-2-4, A-4	0	0	95-100	90-100	50-95	25-80	18-28	3-9
	46-80	Stratified fine sand to silt loam	CL-ML, ML, SC-SM, SM	A-4, A-2-4	0	0	95-100	90-100	50-95	25-80	0-26	NP-8
477B:												
Algonquin-----	0-5	Silt loam	CL	A-4, A-6	0	0	99-100	95-100	80-100	70-90	25-40	7-15
	5-7	Silt loam	CL	A-4, A-6	0	0	99-100	95-100	80-100	70-90	25-40	7-15
	7-19	Clay, silty clay loam, silty clay	CH, CL	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	19-55	Stratified silty clay to silty clay loam to loam	CH, CL	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	55-65	Stratified silty clay to silty clay loam to loam	CH, CL	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	65-80	Loam	CL-ML, CL	A-4, A-6	0	0-7	95-100	90-100	80-100	30-90	20-30	4-12
Springport----	0-9	Silty clay loam	CL	A-6, A-7-6	0	0	97-100	97-100	85-100	70-80	35-50	15-25
	9-16	Silty clay loam, silty clay	CH, CL	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
	16-23	Silty clay, clay	CL, CH	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
	23-67	Silty clay, clay	CL, CH	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
	67-80	Loam, fine sandy loam	CL, SC-SM, SC, CL-ML	A-2-4, A-4	0	0-7	90-100	85-100	45-90	20-60	23-28	6-9
478:												
Springport----	0-9	Silty clay loam	CL	A-6, A-7-6	0	0	97-100	97-100	85-100	70-80	35-50	15-25
	9-16	Silty clay loam, silty clay	CH, CL	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
	16-23	Silty clay, clay	CH, CL	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
	23-67	Silty clay, clay	CH, CL	A-7-6	0	0	97-100	97-100	85-100	80-95	40-65	20-40
	67-80	Loam, fine sandy loam	CL-ML, CL, SC, SC-SM	A-2-4, A-4	0	0-7	90-100	85-100	45-90	20-60	23-28	6-9

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
479A:												
Algonquin-----	0-5	Silt loam	CL	A-4, A-6	0	0	99-100	95-100	80-100	70-90	25-40	7-15
	5-7	Silt loam	CL	A-6, A-4	0	0	99-100	95-100	80-100	70-90	25-40	7-15
	7-19	Clay, silty clay loam, silty clay	CL, CH	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	19-55	Stratified silty clay to silty clay loam to loam	CL, CH	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	55-65	Stratified silty clay to silty clay loam to loam	CL, CH	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	65-80	Loam	CL, CL-ML	A-4, A-6	0	0-7	95-100	90-100	80-100	30-90	20-30	4-12
480B:												
Negwegon------	0-9	Silt loam	CL, CL-ML	A-4, A-6	0	0	99-100	98-100	80-100	65-90	20-40	5-15
	9-12	Silt loam	CL-ML, CL	A-4, A-6	0	0	99-100	98-100	80-100	65-90	20-40	5-15
	12-14	Silty clay, silt loam	CH, CL	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	14-51	Silty clay, silty clay loam, clay	CH, CL	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	51-80	Stratified silty clay to silty clay loam to silt loam	CL, CH	A-7-6	0	0	99-100	98-100	80-100	65-95	40-65	20-40
Algonquin-----	0-5	Silt loam	CL	A-6, A-4	0	0	99-100	95-100	80-100	70-90	25-40	7-15
	5-7	Silt loam	CL	A-6, A-4	0	0	99-100	95-100	80-100	70-90	25-40	7-15
	7-19	Clay, silty clay loam, silty clay	CL, CH	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	19-55	Stratified silty clay to silty clay loam to loam	CL, CH	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
	55-80	Stratified silty clay to silty clay loam to loam	CL, CH	A-7-6	0	0	99-100	95-100	85-100	80-95	40-65	20-40
Lupton--------	0-4	Muck	PT	A-8	0	0	---	---	---	---	---	---
	4-80	Muck	PT	A-8	0	0	---	---	---	---	---	---
481C:												
Negwegon------	0-9	Silt loam	CL, CL-ML	A-6, A-4	0	0	99-100	98-100	80-100	65-90	20-40	5-15
	9-12	Silt loam	CL, CL-ML	A-6, A-4	0	0	99-100	98-100	80-100	65-90	20-40	5-15
	12-14	Silty clay, silt loam	CH, CL	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	14-51	Silty clay, silty clay loam, clay	CL, CH	A-7-6	0	0	99-100	98-100	85-100	75-95	40-65	20-40
	51-80	Stratified sandy clay loam to silty clay loam to silt loam	CL, CH	A-7-6	0	0	99-100	98-100	80-100	65-95	40-65	20-40

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
481C:												
Lupton--------	0-4	Muck	PT	A-8	0	0	---	---	---	---	---	---
	4-80	Muck	PT	A-8	0	0	---	---	---	---	---	---
482B:												
Summerville---	0-5	Fine sandy loam	CL, SC-SM, SC, CL-ML	A-2-4, A-4	0	0-15	95-100	90-100	55-85	25-55	20-30	4-10
	5-16	Fine sandy loam	CL-ML, CL, SC, SC-SM	A-2-4, A-4, A-2-6	0	0-15	95-100	90-100	55-95	25-75	20-35	4-15
	16-18	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
482C:												
Summerville---	0-5	Fine sandy loam	SC-SM, SC, CL-ML, CL	A-4, A-2-4	0	0-15	95-100	90-100	55-85	25-55	20-30	4-10
	5-16	Fine sandy loam	CL, CL-ML, SC, SC-SM	A-2-6, A-4, A-2-4	0	0-15	95-100	90-100	55-95	25-75	20-35	4-15
	16-18	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
483A:												
Lachine-------	0-9	Loam	SC, CL-ML, CL, SC-SM	A-6, A-4	0	0-7	95-100	80-100	40-100	40-90	20-35	4-15
	9-13	Loam, flaggy loam, flaggy sandy loam	SC-SM, CL-ML, CL, SC	A-4, A-6	0	0-7	95-100	80-100	40-90	40-80	20-35	4-15
	13-16	Gravelly fine sandy loam, loam, sandy loam, flaggy loam	CL-ML, SC-SM, CL, SC	A-4, A-6, A-2-4	0	0-7	85-90	60-90	30-90	10-80	20-35	4-15
	16-20	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
484A:												
Elcajon-------	0-6	Loam	CL-ML, CL	A-4	0	0	100	100	85-95	50-65	16-30	4-11
	6-12	Very fine sandy loam, loam	CL-ML, CL	A-4, A-6	0	0	100	100	85-95	50-75	20-36	4-15
	12-29	Clay loam	CL	A-6, A-7	0	0-1	90-100	80-100	80-90	55-85	36-43	15-21
	29-37	Very flaggy loam	CL, CL-ML	A-4, A-6	10-50	50-70	90-100	80-100	65-95	50-75	16-36	4-15
	37-41	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
485A:												
Bowers--------	0-10	Silt loam	CL	A-4, A-6	0	0	100	100	85-100	60-90	25-40	7-16
	10-14	Silty clay loam, fine sandy loam, silt loam	SC, CL	A-4, A-6	0	0	100	100	70-100	40-90	25-40	7-16
	14-27	Silty clay loam, clay loam	CL	A-7-6	0	0	100	100	90-100	70-95	40-50	20-25
	27-80	Stratified silty clay loam to silt loam	CL	A-6, A-7-6	0	0	100	100	90-100	70-95	35-50	15-25

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
486B:												
Tonkey--------	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	0	95-100	95-100	85-95	60-90	20-30	4-11
	7-22	Sandy loam, silt loam	SC, SC-SM, SM	A-2-4, A-4	0	0	95-100	95-100	50-75	15-40	15-25	NP-9
	22-80	Stratified silt loam to sandy loam to sand	SC-SM, SM, SP-SM, ML	A-1, A-2-4, A-3, A-4	0	0	95-100	95-100	40-80	5-65	15-30	NP-11
Bowers--------	0-10	Silt loam	CL	A-6, A-4	0	0	100	100	85-100	60-90	25-40	7-16
	10-14	Silty clay loam, fine sandy loam, silt loam	CL, SC	A-6, A-4	0	0	100	100	70-100	40-90	25-40	7-16
	14-27	Silty clay loam, clay loam	CL	A-7-6	0	0	100	100	90-100	70-95	40-50	20-25
	27-80	Stratified silty clay loam to silt loam	CL	A-6, A-7-6	0	0	100	100	90-100	70-95	35-50	15-25
487B:												
Slade---------	0-5	Loam	CL, ML	A-4	0	0-9	80-100	80-100	55-95	45-85	15-28	NP-9
	5-7	Fine sandy loam, loam	CL, ML, SC, SM	A-2-4, A-4	0	0-9	80-100	80-100	45-90	20-65	0-26	NP-8
	7-9	Clay loam, fine sandy loam, loam	CL, CL-ML, SC, SC-SM	A-6, A-2-4, A-2-6, A-4	0	0-9	80-100	80-100	45-90	20-65	23-35	6-15
	9-26	Clay loam, loam	SC, CL	A-2-6, A-2-4, A-4, A-6	0	0-9	80-100	80-100	50-90	30-70	28-35	9-15
	26-60	Loam	SC-SM, SC, CL-ML, CL	A-2-4, A-4	0	0-9	80-100	80-100	45-90	20-60	23-28	6-9
	60-80	Loam	SC-SM, SC, CL-ML, CL	A-4, A-2-4	0	0-9	80-100	80-100	45-90	20-60	23-28	6-9
Angelica------	0-8	Loam	ML, CL	A-6, A-4	0	0-7	90-100	85-95	80-95	30-90	15-30	2-13
	8-29	Loam, sandy loam	CL-ML, SC, CL	A-4, A-6	0	0-7	90-100	85-95	80-95	30-90	15-30	5-13
	29-80	Loam, sandy loam	CL, CL-ML	A-6, A-4	0	0-7	90-100	85-95	80-95	30-90	20-30	4-12
489F:												
Crowell-------	0-2	Fine sand	SP-SM, SM	A-1, A-2-4, A-3	0	0	100	100	35-80	5-15	0-14	NP
	2-5	Fine sand	SM, SP-SM	A-1, A-2-4, A-3	0	0	100	100	35-80	5-15	0-14	NP
	5-10	Sand	SM, SP-SM	A-1, A-2-4, A-3	0	0	100	100	35-80	5-15	0-14	NP
	10-29	Sand	SM, SP-SM	A-2-4, A-3, A-1	0	0	100	100	35-80	5-15	0-14	NP
	29-80	Sand	SP-SM, SM	A-1, A-2-4, A-3	0	0	100	100	35-80	5-15	0-14	NP
Proper--------	0-3	Fine sand	SP-SM, SM	A-2-4, A-3	0	0	100	100	35-70	5-15	0-14	NP
	3-11	Fine sand	SP-SM, SM	A-2-4, A-3	0	0	100	100	35-70	5-15	0-14	NP
	11-24	Fine sand	SM, SP-SM	A-2-4, A-3	0	0	100	100	35-70	5-15	0-14	NP
	24-41	Fine sand	SP-SM, SM	A-2-4, A-3	0	0	100	100	35-70	5-15	0-14	NP
	41-80	Fine sand	SP-SM, SM	A-2-4, A-3	0	0	100	100	35-70	5-15	0-14	NP

Table 19.--Physical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer.)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility (Ksat)	Available water capacity	Linear extensi-bility	Erosion factors			Wind erodi-bility group	Wind erodi-bility index
							K	Kf	T		
	In	*Pct*	*g/cc*	*In/hr*	*In/in*	*Pct*					
11B:											
Eastport--------	0-1	0-10	1.40-1.60	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15	5	1	220
	1-8	0-10	1.40-1.60	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	8-29	0-10	1.40-1.60	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	29-80	0-4	1.40-1.55	5.95-19.98	0.03-0.06	0.0-2.9	.15	.15			
12B:											
Tawas-----------	0-3	---	0.30-0.55	0.20-5.95	0.35-0.45	---	---	---	2	2	134
	3-28	---	0.30-0.55	0.20-5.95	0.24-0.45	---	---	---			
	28-80	0-10	1.40-1.65	5.95-19.98	0.03-0.10	0.0-2.9	.15	.15			
Au Gres---------	0-1	0-0	0.20-0.30	---	0.35-0.45	---	---	---	5	1	220
	1-2	0-8	1.30-1.55	5.95-19.98	0.07-0.10	0.0-2.9	.10	.15			
	2-10	1-10	1.50-1.70	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15			
	10-28	1-10	1.50-1.70	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15			
	28-32	1-10	1.50-1.70	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15			
	32-80	0-8	1.50-1.70	5.95-19.98	0.05-0.07	0.0-2.9	.10	.15			
13:											
Tawas-----------	0-3	---	0.30-0.55	0.20-5.95	0.35-0.45	---	---	---	2	2	134
	3-28	---	0.30-0.55	0.20-5.95	0.24-0.45	---	---	---			
	28-80	0-10	1.40-1.65	5.95-19.98	0.03-0.10	0.0-2.9	.15	.15			
Lupton----------	0-4	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	---	---	3	2	134
	4-80	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	---	---			
14:											
Dawson----------	0-6	0-0	0.15-0.30	5.95-19.98	0.55-0.65	---	---	---	2	7	38
	6-31	0-0	0.15-0.40	0.20-5.95	0.35-0.45	---	---	---			
	31-80	0-10	1.55-1.75	5.95-19.98	0.03-0.10	0.0-2.9	.10	.15			
Loxley----------	0-4	0-0	0.30-0.40	5.95-19.98	0.35-0.65	---	---	---	3	7	38
	4-80	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	---	---			
16B:											
Graycalm--------	0-1	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	.10	.15	5	1	220
	1-5	0-10	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	.10	.15			
	5-24	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	.10	.15			
	24-80	0-15	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	.10	.15			
16C:											
Graycalm--------	0-1	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	.10	.15	5	1	220
	1-5	0-10	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	.10	.15			
	5-24	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	.10	.15			
	24-80	0-15	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	.10	.15			
16D:											
Graycalm--------	0-1	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	.10	.15	5	1	220
	1-5	0-10	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	.10	.15			
	5-24	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	.10	.15			
	24-80	0-15	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	.10	.15			
16E:											
Graycalm--------	0-1	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	.10	.15	5	1	220
	1-5	0-10	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	.10	.15			
	5-24	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	.10	.15			
	24-80	0-15	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	.10	.15			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct					
17A:											
Croswell--------	0-2	0-10	1.30-1.55	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15	5	1	220
	2-3	0-10	1.30-1.55	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15			
	3-11	0-10	1.40-1.60	5.95-19.98	0.06-0.10	0.0-2.9	.10	.15			
	11-24	0-10	1.40-1.60	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15			
	24-80	0-10	1.50-1.65	5.95-19.98	0.05-0.07	0.0-2.9	.10	.15			
17B:											
Croswell--------	0-2	0-10	1.30-1.55	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15	5	1	220
	2-3	0-10	1.30-1.55	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15			
	3-11	0-10	1.40-1.60	5.95-19.98	0.06-0.10	0.0-2.9	.10	.15			
	11-24	0-10	1.40-1.60	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15			
	24-80	0-10	1.50-1.65	5.95-19.98	0.05-0.07	0.0-2.9	.10	.15			
18A:											
Au Gres---------	0-1	0-0	0.20-0.30	---	0.35-0.45	---	---	---	5	1	220
	1-2	0-8	1.30-1.55	5.95-19.98	0.07-0.10	0.0-2.9	.10	.15			
	2-10	1-10	1.50-1.70	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15			
	10-28	1-10	1.50-1.70	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15			
	28-32	1-10	1.50-1.70	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15			
	32-80	0-8	1.50-1.70	5.95-19.98	0.05-0.07	0.0-2.9	.10	.15			
19:											
Leafriver-------	0-9	---	0.10-0.25	0.57-5.95	0.35-0.50	---	---	---	5	2	134
	9-21	3-15	1.40-1.65	1.98-19.98	0.08-0.14	0.0-2.9	.17	.17			
	21-80	0-10	1.50-1.65	5.95-19.98	0.03-0.08	0.0-2.9	.17	.17			
27A:											
Tacoda----------	0-3	0-5	1.40-1.60	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15	4	1	220
	3-14	0-5	1.40-1.60	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	14-27	0-5	1.30-1.65	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	27-44	0-5	1.45-1.65	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	44-80	40-60	1.60-1.70	0.00-0.06	0.08-0.12	6.0-8.9	.32	.32			
28B:											
East Lake-------	0-1	0-8	1.30-1.60	5.95-19.98	0.05-0.09	0.0-2.9	.15	.15	4	1	220
	1-2	0-8	1.30-1.60	5.95-19.98	0.05-0.09	0.0-2.9	.15	.15			
	2-11	0-10	1.30-1.60	5.95-19.98	0.07-0.10	0.0-2.9	.15	.15			
	11-34	0-10	1.30-1.60	5.95-19.98	0.07-0.10	0.0-2.9	.15	.15			
	34-80	0-10	1.50-1.65	19.98-19.98	0.02-0.06	0.0-2.9	.10	.15			
28C:											
East Lake-------	0-1	0-8	1.30-1.60	5.95-19.98	0.05-0.09	0.0-2.9	.15	.15	4	1	220
	1-2	0-8	1.30-1.60	5.95-19.98	0.05-0.09	0.0-2.9	.15	.15			
	2-11	0-10	1.30-1.60	5.95-19.98	0.07-0.10	0.0-2.9	.15	.15			
	11-34	0-10	1.30-1.60	5.95-19.98	0.07-0.10	0.0-2.9	.15	.15			
	34-80	0-10	1.50-1.65	19.98-19.98	0.02-0.06	0.0-2.9	.10	.15			
29A:											
Battlefield-----	0-5	0-10	1.25-1.45	5.95-19.98	0.07-0.09	0.0-2.9	.10	.15	5	1	220
	5-7	0-10	1.25-1.45	5.95-19.98	0.07-0.09	0.0-2.9	.10	.15			
	7-15	0-10	1.40-1.60	5.95-19.98	0.06-0.12	0.0-2.9	.10	.15			
	15-23	0-10	1.40-1.60	5.95-19.98	0.06-0.11	0.0-2.9	.10	.15			
	23-80	0-5	1.50-1.65	19.98-19.98	0.02-0.04	0.0-2.9	.10	.15			
30:											
Wheatley--------	0-5	---	0.30-0.40	0.20-5.95	0.35-0.45	0.0-2.9	---	---	5	2	134
	5-34	2-10	1.45-1.70	5.95-19.98	0.06-0.08	0.0-2.9	.15	.20			
	34-80	0-10	1.55-1.70	19.98-19.98	0.02-0.04	0.0-2.9	.10	.17			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct					
31B:											
Klacking--------	0-4	2-12	1.35-1.65	5.95-19.98	0.08-0.11	0.0-2.9	.15	.17	5	2	134
	4-12	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	12-25	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	25-33	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	33-64	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	64-80	0-10	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
31C:											
Klacking--------	0-4	2-12	1.35-1.65	5.95-19.98	0.08-0.11	0.0-2.9	.15	.17	5	2	134
	4-12	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	12-25	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	25-33	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	33-64	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	64-80	0-10	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
31D:											
Klacking--------	0-4	2-12	1.35-1.65	5.95-19.98	0.08-0.11	0.0-2.9	.15	.17	5	2	134
	4-12	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	12-25	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	25-33	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	33-64	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	64-80	0-10	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
31E:											
Klacking--------	0-4	2-12	1.35-1.65	5.95-19.98	0.08-0.11	0.0-2.9	.15	.17	5	2	134
	4-12	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	12-25	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	25-33	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	33-64	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	64-80	0-10	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
35:											
Kinross---------	0-5	0-0	0.10-0.35	1.98-19.98	0.35-0.45	---	---	---	3	2	134
	5-9	0-10	1.40-1.70	5.95-19.98	0.04-0.09	0.0-2.9	.15	.15			
	9-13	0-10	1.40-1.70	5.95-19.98	0.04-0.09	0.0-2.9	.15	.15			
	13-19	0-10	1.40-1.70	5.95-19.98	0.04-0.09	0.0-2.9	.15	.15			
	19-27	0-10	1.40-1.70	5.95-19.98	0.04-0.06	0.0-2.9	.15	.15			
	27-80	0-10	1.40-1.70	5.95-19.98	0.04-0.06	0.0-2.9	.15	.15			
36B:											
Annalake--------	0-4	5-15	1.25-1.55	0.57-1.98	0.08-0.18	0.0-2.9	.24	.24	5	3	86
	4-6	2-15	1.30-1.60	0.57-1.98	0.11-0.22	0.0-2.9	.24	.24			
	6-16	5-15	1.40-1.70	0.57-1.98	0.10-0.14	0.0-2.9	.24	.24			
	16-33	5-15	1.40-1.70	0.57-1.98	0.10-0.14	0.0-2.9	.24	.24			
	33-42	8-18	1.40-1.70	0.57-1.98	0.10-0.19	0.0-2.9	.24	.24			
	42-80	5-15	1.45-1.70	0.57-1.98	0.10-0.15	0.0-2.9	.24	.24			
36C:											
Annalake--------	0-4	5-15	1.25-1.55	0.57-1.98	0.08-0.18	0.0-2.9	.24	.24	5	3	86
	4-6	2-15	1.30-1.60	0.57-1.98	0.11-0.22	0.0-2.9	.24	.24			
	6-16	5-15	1.40-1.70	0.57-1.98	0.10-0.14	0.0-2.9	.24	.24			
	16-33	5-15	1.40-1.70	0.57-1.98	0.10-0.14	0.0-2.9	.24	.24			
	33-42	8-18	1.40-1.70	0.57-1.98	0.10-0.19	0.0-2.9	.24	.24			
	42-80	5-15	1.45-1.70	0.57-1.98	0.10-0.15	0.0-2.9	.24	.24			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct					
37A:											
Richter---------	0-8	0-10	1.20-1.50	1.98-5.95	0.10-0.12	0.0-2.9	.17	.17	5	2	134
	8-12	0-20	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	.20	.20			
	12-18	0-20	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	.20	.20			
	18-26	0-20	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	.20	.20			
	26-37	10-35	1.60-1.70	0.57-1.98	0.08-0.13	0.0-2.9	.20	.20			
	37-80	2-15	1.60-1.70	0.57-1.98	0.08-0.13	0.0-2.9	.20	.20			
37B:											
Richter---------	0-8	0-10	1.20-1.50	1.98-5.95	0.10-0.12	0.0-2.9	.17	.17	5	2	134
	8-12	0-20	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	.20	.20			
	12-18	0-20	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	.20	.20			
	18-26	0-20	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	.20	.20			
	26-37	10-35	1.60-1.70	0.57-1.98	0.08-0.13	0.0-2.9	.20	.20			
	37-80	2-15	1.60-1.70	0.57-1.98	0.08-0.13	0.0-2.9	.20	.20			
38:											
Tonkey----------	0-7	10-20	1.10-1.50	0.57-1.98	0.20-0.24	0.0-2.9	.32	.32	5	5	56
	7-22	8-18	1.30-1.80	0.57-1.98	0.10-0.15	0.0-2.9	.24	.24			
	22-80	0-20	1.60-1.80	0.57-19.98	0.05-0.19	0.0-2.9	.24	.24			
41B:											
McGinn----------	0-2	0-5	1.25-1.40	1.98-5.95	0.11-0.14	0.0-2.9	.17	.17	5	2	134
	2-3	0-5	1.30-1.65	1.98-5.95	0.10-0.12	0.0-2.9	.17	.17			
	3-12	0-5	1.30-1.65	1.98-5.95	0.09-0.11	0.0-2.9	.17	.17			
	12-22	5-15	1.30-1.65	1.98-5.95	0.10-0.13	0.0-2.9	.17	.17			
	22-26	15-20	1.50-1.75	0.57-1.98	0.12-0.14	0.0-2.9	.28	.28			
	26-80	5-15	1.65-1.80	0.57-1.98	0.11-0.13	0.0-2.9	.28	.28			
41C:											
McGinn----------	0-2	0-5	1.25-1.40	1.98-5.95	0.11-0.14	0.0-2.9	.17	.17	5	2	134
	2-3	0-5	1.30-1.65	1.98-5.95	0.10-0.12	0.0-2.9	.17	.17			
	3-12	0-5	1.30-1.65	1.98-5.95	0.09-0.11	0.0-2.9	.17	.17			
	12-22	5-15	1.30-1.65	1.98-5.95	0.10-0.13	0.0-2.9	.17	.17			
	22-26	15-20	1.50-1.75	0.57-1.98	0.12-0.14	0.0-2.9	.28	.28			
	26-80	5-15	1.65-1.80	0.57-1.98	0.11-0.13	0.0-2.9	.28	.28			
41D:											
McGinn----------	0-2	0-5	1.25-1.40	1.98-5.95	0.11-0.14	0.0-2.9	.17	.17	5	2	134
	2-3	0-5	1.30-1.65	1.98-5.95	0.10-0.12	0.0-2.9	.17	.17			
	3-12	0-5	1.30-1.65	1.98-5.95	0.09-0.11	0.0-2.9	.17	.17			
	12-22	5-15	1.30-1.65	1.98-5.95	0.10-0.13	0.0-2.9	.17	.17			
	22-26	15-20	1.50-1.75	0.57-1.98	0.12-0.14	0.0-2.9	.28	.28			
	26-80	5-15	1.65-1.80	0.57-1.98	0.11-0.13	0.0-2.9	.28	.28			
41E:											
McGinn----------	0-2	0-5	1.25-1.40	1.98-5.95	0.11-0.14	0.0-2.9	.17	.17	5	2	134
	2-3	0-5	1.30-1.65	1.98-5.95	0.10-0.12	0.0-2.9	.17	.17			
	3-12	0-5	1.30-1.65	1.98-5.95	0.09-0.11	0.0-2.9	.17	.17			
	12-22	5-15	1.30-1.65	1.98-5.95	0.10-0.13	0.0-2.9	.17	.17			
	22-26	15-20	1.50-1.75	0.57-1.98	0.12-0.14	0.0-2.9	.28	.28			
	26-80	5-15	1.65-1.80	0.57-1.98	0.11-0.13	0.0-2.9	.28	.28			
42A:											
Killmaster------	0-11	5-15	1.30-1.65	1.98-5.95	0.12-0.15	0.0-2.9	.24	.24	4	3	86
	11-12	3-12	1.40-1.70	1.98-5.95	0.10-0.14	0.0-2.9	.24	.24			
	12-17	5-15	1.40-1.70	1.98-5.95	0.09-0.14	0.0-2.9	.24	.24			
	17-22	10-18	1.50-1.75	0.57-1.98	0.11-0.15	0.0-2.9	.24	.24			
	22-80	5-15	1.80-2.00	0.00-0.06	0.03-0.04	0.0-2.9	.24	.28			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct					
43:											
Wakeley---------	0-3	0-10	1.00-1.20	5.95-19.98	0.15-0.20	0.0-2.9	.10	.15	4	1	220
	3-21	0-15	1.45-1.60	5.95-19.98	0.05-0.10	0.0-2.9	.10	.15			
	21-80	35-60	1.50-1.70	0.00-0.06	0.08-0.12	6.0-8.9	.32	.32			
44B:											
Ossineke--------	0-10	5-20	1.30-1.60	0.57-1.98	0.14-0.18	0.0-2.9	.17	.24	5	3	86
	10-15	5-20	1.50-1.70	0.57-1.98	0.13-0.17	0.0-2.9	.17	.24			
	15-22	11-27	1.60-1.80	0.57-1.98	0.14-0.19	0.0-2.9	.24	.24			
	22-35	18-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	.37	.37			
	35-41	18-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	.28	.37			
	41-80	11-27	1.80-2.00	0.06-0.20	0.03-0.04	3.0-5.9	.28	.37			
44C:											
Ossineke--------	0-10	5-20	1.30-1.60	0.57-1.98	0.14-0.18	0.0-2.9	.17	.24	5	3	86
	10-15	5-20	1.50-1.70	0.57-1.98	0.13-0.17	0.0-2.9	.17	.24			
	15-22	11-27	1.60-1.80	0.57-1.98	0.14-0.19	0.0-2.9	.24	.24			
	22-35	18-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	.37	.37			
	35-41	18-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	.28	.37			
	41-80	11-27	1.80-2.00	0.06-0.20	0.03-0.04	3.0-5.9	.28	.37			
45B:											
Hoist-----------	0-9	5-15	1.30-1.65	1.98-5.95	0.12-0.15	0.0-2.9	.24	.24	4	3	86
	9-10	5-15	1.40-1.70	1.98-5.95	0.10-0.14	0.0-2.9	.24	.24			
	10-15	5-15	1.40-1.70	1.98-5.95	0.09-0.14	0.0-2.9	.24	.24			
	15-21	15-18	1.50-1.75	0.20-0.57	0.11-0.18	0.0-2.9	.32	.32			
	21-47	5-15	1.60-1.80	0.20-0.57	0.11-0.15	0.0-2.9	.24	.24			
	47-80	5-15	1.80-2.00	0.00-0.06	0.03-0.04	0.0-2.9	.28	.28			
45C:											
Hoist-----------	0-9	5-15	1.30-1.65	1.98-5.95	0.12-0.15	0.0-2.9	.24	.24	4	3	86
	9-10	5-15	1.40-1.70	1.98-5.95	0.10-0.14	0.0-2.9	.24	.24			
	10-15	5-15	1.40-1.70	1.98-5.95	0.09-0.14	0.0-2.9	.24	.24			
	15-21	15-18	1.50-1.75	0.20-0.57	0.11-0.18	0.0-2.9	.32	.32			
	21-47	5-15	1.60-1.80	0.20-0.57	0.11-0.15	0.0-2.9	.24	.24			
	47-80	5-15	1.80-2.00	0.00-0.06	0.03-0.04	0.0-2.9	.28	.28			
46:											
Ensley----------	0-8	10-20	1.10-1.30	1.98-5.95	0.17-0.22	0.0-2.9	.24	.24	5	3	56
	8-29	10-20	1.30-1.70	0.57-1.98	0.11-0.18	0.0-2.9	.24	.24			
	29-80	8-18	1.45-1.70	0.57-5.95	0.10-0.14	0.0-2.9	.20	.28			
47D:											
Graycalm--------	0-1	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	.10	.15	5	1	220
	1-5	0-10	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	.10	.15			
	5-24	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	.10	.15			
	24-80	0-15	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	.10	.15			
53B:											
Negwegon--------	0-9	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37	5	5	56
	9-12	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37			
	12-14	20-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	14-51	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	51-80	20-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
53C:											
Negwegon--------	0-9	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37	5	5	56
	9-12	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37			
	12-14	20-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	14-51	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	51-80	20-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct					
54A:											
Algonquin-------	0-5	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37	5	6	48
	5-7	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37			
	7-19	35-60	1.40-1.60	0.06-0.20	0.11-0.20	6.0-8.9	.32	.32			
	19-55	25-60	1.40-1.60	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	55-80	25-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
55:											
Springport------	0-9	27-40	1.25-1.50	0.20-0.57	0.17-0.19	3.0-5.9	.32	.32	5	6	48
	9-16	35-60	1.40-1.65	0.06-0.20	0.11-0.20	6.0-8.9	.32	.32			
	16-23	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	23-80	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
57B:											
Kawkawlin-------	0-10	8-27	1.45-1.60	0.57-1.98	0.20-0.22	0.0-2.9	.37	.37	5	5	56
	10-13	20-40	1.45-1.60	0.06-0.20	0.10-0.20	3.0-5.9	.32	.32			
	13-16	35-45	1.45-1.60	0.06-0.20	0.10-0.20	3.0-5.9	.32	.32			
	16-30	20-40	1.50-1.60	0.06-0.20	0.13-0.20	3.0-5.9	.32	.32			
	30-80	20-40	1.50-1.60	0.06-0.20	0.13-0.20	3.0-5.9	.32	.32			
59B:											
Algonquin-------	0-5	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37	5	6	48
	5-7	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37			
	7-19	35-60	1.40-1.60	0.06-0.20	0.11-0.20	6.0-8.9	.32	.32			
	19-55	25-60	1.40-1.60	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	55-80	25-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
Springport------	0-9	27-40	1.25-1.50	0.20-0.57	0.17-0.19	3.0-5.9	.32	.32	5	6	48
	9-16	35-60	1.40-1.65	0.06-0.20	0.11-0.20	6.0-8.9	.32	.32			
	16-23	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	23-80	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
62A:											
Allendale-------	0-11	0-12	1.25-1.40	5.95-19.98	0.09-0.12	0.0-2.9	.17	.17	4	2	134
	11-13	0-15	1.35-1.45	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	13-22	0-15	1.35-1.45	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	22-25	0-15	1.35-1.45	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	25-44	40-60	1.45-1.70	0.00-0.06	0.08-0.12	6.0-8.9	.32	.32			
	44-80	40-60	1.45-1.70	0.00-0.06	0.08-0.12	6.0-8.9	.32	.32			
63D:											
Bamfield--------	0-6	5-20	1.30-1.60	1.98-5.95	0.14-0.18	0.0-2.9	.24	.24	4	3	86
	6-8	5-20	1.35-1.70	1.98-5.95	0.11-0.17	0.0-2.9	.20	.24			
	8-11	5-20	1.35-1.70	1.98-5.95	0.11-0.17	0.0-2.9	.20	.24			
	11-14	5-39	1.60-1.80	0.57-1.98	0.11-0.17	0.0-2.9	.20	.24			
	14-42	27-40	1.35-1.65	0.20-0.57	0.13-0.19	3.0-5.9	.32	.37			
	42-80	10-28	1.70-2.00	0.00-0.06	0.03-0.04	3.0-5.9	.32	.37			
63E:											
Bamfield--------	0-6	5-20	1.30-1.60	1.98-5.95	0.14-0.18	0.0-2.9	.24	.24	4	3	86
	6-8	5-20	1.35-1.70	1.98-5.95	0.11-0.17	0.0-2.9	.20	.24			
	8-11	5-20	1.35-1.70	1.98-5.95	0.11-0.17	0.0-2.9	.20	.24			
	11-14	5-39	1.60-1.80	0.57-1.98	0.11-0.17	0.0-2.9	.20	.24			
	14-42	27-40	1.35-1.65	0.20-0.57	0.13-0.19	3.0-5.9	.32	.37			
	42-80	10-28	1.70-2.00	0.00-0.06	0.03-0.04	3.0-5.9	.32	.37			
68:											
Rondeau---------	0-27	0-0	0.10-0.25	0.20-5.95	0.35-0.48	---	---	---	1	2	134
	27-80	5-15	0.05-0.20	0.06-0.20	0.20-0.22	---	---	---			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	*Pct*	*g/cc*	*In/hr*	*In/in*	*Pct*					
69:											
Loxley----------	0-4	0-0	0.30-0.40	5.95-19.98	0.35-0.65	---	---	---	3	7	38
	4-80	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	---	---			
70:											
Lupton----------	0-4	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	---	---	3	2	134
	4-80	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	---	---			
71:											
Tawas-----------	0-3	---	0.30-0.55	0.20-5.95	0.35-0.45	---	---	---	2	2	134
	3-28	---	0.30-0.55	0.20-5.95	0.24-0.45	---	---	---			
	28-80	0-10	1.40-1.65	5.95-19.98	0.03-0.10	0.0-2.9	.15	.15			
72:											
Dorval----------	0-27	0-0	0.13-0.42	0.57-5.95	0.20-0.25	---	---	---	2	2	134
	27-80	35-60	1.40-1.65	0.00-0.06	0.10-0.20	6.0-8.9	.28	.28			
74C2:											
Negwegon--------	0-9	27-40	1.40-1.60	0.20-0.57	0.21-0.23	0.0-2.9	.37	.37	3	7	38
	9-21	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	21-51	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	51-80	20-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
75B:											
Rubicon---------	0-2	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	.15	.15	5	1	220
	2-4	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	.10	.15			
	4-29	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	.10	.15			
	29-43	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	.10	.15			
	43-80	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	.10	.15			
75D:											
Rubicon---------	0-2	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	.15	.15	5	1	220
	2-4	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	.10	.15			
	4-29	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	.10	.15			
	29-43	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	.10	.15			
	43-80	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	.10	.15			
75E:											
Rubicon---------	0-2	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	.15	.15	5	1	220
	2-4	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	.10	.15			
	4-29	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	.10	.15			
	29-43	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	.10	.15			
	43-80	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	.10	.15			
77:											
Rollaway--------	0-10	0-0	0.30-0.40	0.20-5.95	0.35-0.45	---	---	---	5	2	134
	10-42	5-15	1.40-1.65	0.57-1.98	0.09-0.12	0.0-2.9	.28	.28			
	42-80	40-60	1.40-1.60	0.00-0.06	0.10-0.12	6.0-8.9	.28	.28			
78:											
Pits, borrow.											
82B:											
Udorthents------	0-80	---	---	---	---	---	---	---	-	---	---
82C:											
Udorthents------	0-80	---	---	---	---	---	---	---	-	---	---
83B:											
Udipsamments----	0-80	0-10	1.35-1.65	5.95-19.98	0.05-0.09	0.0-2.9	.15	.15	5	1	250

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct					
83F:											
Udipsamments----	0-80	0-10	1.35-1.65	5.95-19.98	0.05-0.09	0.0-2.9	.15	.15	5	1	250
84B:											
Zimmerman-------	0-1	2-12	1.27-1.56	5.95-19.98	0.10-0.12	0.0-2.9	.17	.17	5	2	134
	1-3	0-12	1.60-1.70	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	3-24	0-12	1.60-1.70	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	24-80	0-12	1.60-1.70	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
84C:											
Zimmerman-------	0-1	2-12	1.27-1.56	5.95-19.98	0.10-0.12	0.0-2.9	.17	.17	5	2	134
	1-3	0-12	1.60-1.70	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	3-24	0-12	1.60-1.70	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	24-80	0-12	1.60-1.70	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
84E:											
Zimmerman-------	0-1	2-12	1.27-1.56	5.95-19.98	0.10-0.12	0.0-2.9	.17	.17	5	2	134
	1-3	0-12	1.60-1.70	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	3-24	0-12	1.60-1.70	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	24-80	0-12	1.60-1.70	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
85D:											
Zimmerman-------	0-1	2-12	1.27-1.56	5.95-19.98	0.10-0.12	0.0-2.9	.17	.17	5	2	134
	1-3	0-12	1.60-1.70	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	3-24	0-12	1.60-1.70	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	24-80	0-12	1.60-1.70	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
Annalake--------	0-4	5-15	1.25-1.55	0.57-1.98	0.08-0.18	0.0-2.9	.24	.24	5	3	86
	4-6	2-15	1.30-1.60	0.57-1.98	0.11-0.22	0.0-2.9	.24	.24			
	6-16	5-15	1.40-1.70	0.57-1.98	0.10-0.14	0.0-2.9	.24	.24			
	16-33	5-15	1.40-1.70	0.57-1.98	0.10-0.14	0.0-2.9	.24	.24			
	33-42	8-18	1.40-1.70	0.57-1.98	0.10-0.19	0.0-2.9	.24	.24			
	42-80	5-15	1.45-1.70	0.57-1.98	0.10-0.15	0.0-2.9	.24	.24			
86:											
Histosols-------	0-51	---	---	0.20-5.95	---	---	---	---	-	---	---
	51-80	---	---	---	---	---	---	---			
Aquents---------	0-80	---	---	---	---	---	---	---	-	---	---
87:											
Ausable---------	0-11	0-0	0.20-0.30	0.57-5.95	0.35-0.45	---	---	---	3	2	134
	11-24	0-10	1.40-1.65	5.95-19.98	0.06-0.10	0.0-2.9	.15	.15			
	24-80	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	.10	.15			
90B:											
Chinwhisker-----	0-3	0-5	1.30-1.55	5.95-19.98	0.07-0.09	0.0-2.9	.10	.15	5	1	220
	3-4	0-10	1.30-1.55	5.95-19.98	0.06-0.08	0.0-2.9	.10	.15			
	4-18	0-10	1.30-1.55	5.95-19.98	0.06-0.08	0.0-2.9	.10	.15			
	18-48	0-5	1.30-1.55	5.95-19.98	0.05-0.07	0.0-2.9	.10	.15			
	48-80	3-10	1.50-1.65	5.95-19.98	0.05-0.10	0.0-2.9	.10	.15			
92B:											
Klacking--------	0-4	2-12	1.35-1.65	5.95-19.98	0.08-0.11	0.0-2.9	.15	.17	5	2	134
	4-12	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	12-25	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	25-33	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	33-64	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	64-80	0-10	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility (Ksat)	Available water capacity	Linear extensi-bility	Erosion factors K	Kf	T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in	Pct					
92B:											
McGinn----------	0-2	0-5	1.25-1.40	1.98-5.95	0.11-0.14	0.0-2.9	.17	.17	5	2	134
	2-3	0-5	1.30-1.65	1.98-5.95	0.10-0.12	0.0-2.9	.17	.17			
	3-12	0-5	1.30-1.65	1.98-5.95	0.09-0.11	0.0-2.9	.17	.17			
	12-22	5-15	1.30-1.65	1.98-5.95	0.10-0.13	0.0-2.9	.17	.17			
	22-26	15-20	1.50-1.75	0.57-1.98	0.12-0.14	0.0-2.9	.28	.28			
	26-80	5-15	1.65-1.80	0.57-1.98	0.11-0.13	0.0-2.9	.28	.28			
92C:											
Klacking--------	0-4	2-12	1.35-1.65	5.95-19.98	0.08-0.11	0.0-2.9	.15	.17	5	2	134
	4-12	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	12-25	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	25-33	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	33-64	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	64-80	0-10	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
McGinn----------	0-2	0-5	1.25-1.40	1.98-5.95	0.11-0.14	0.0-2.9	.17	.17	5	2	134
	2-3	0-5	1.30-1.65	1.98-5.95	0.10-0.12	0.0-2.9	.17	.17			
	3-12	0-5	1.30-1.65	1.98-5.95	0.09-0.11	0.0-2.9	.17	.17			
	12-22	5-15	1.30-1.65	1.98-5.95	0.10-0.13	0.0-2.9	.17	.17			
	22-26	15-20	1.50-1.75	0.57-1.98	0.12-0.14	0.0-2.9	.28	.28			
	26-80	5-15	1.65-1.80	0.57-1.98	0.11-0.13	0.0-2.9	.28	.28			
93B:											
Tacoda----------	0-3	0-5	1.40-1.60	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15	4	1	220
	3-14	0-5	1.40-1.60	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	14-27	0-5	1.30-1.65	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	27-44	0-5	1.45-1.65	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	44-80	40-60	1.60-1.70	0.00-0.06	0.08-0.12	6.0-8.9	.32	.32			
Wakeley---------	0-3	0-10	1.00-1.20	5.95-19.98	0.15-0.20	0.0-2.9	.10	.15	4	1	220
	3-21	0-15	1.45-1.60	5.95-19.98	0.05-0.10	0.0-2.9	.10	.15			
	21-80	35-60	1.50-1.70	0.00-0.06	0.08-0.12	6.0-8.9	.32	.32			
94F:											
Klacking--------	0-4	2-12	1.35-1.65	5.95-19.98	0.08-0.11	0.0-2.9	.15	.17	5	2	134
	4-12	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	12-25	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	.10	.15			
	25-33	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	33-64	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
	64-80	0-10	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.15	.17			
McGinn----------	0-2	0-5	1.25-1.40	1.98-5.95	0.11-0.14	0.0-2.9	.17	.17	5	2	134
	2-3	0-5	1.30-1.65	1.98-5.95	0.10-0.12	0.0-2.9	.17	.17			
	3-12	0-5	1.30-1.65	1.98-5.95	0.09-0.11	0.0-2.9	.17	.17			
	12-22	5-15	1.30-1.65	1.98-5.95	0.10-0.13	0.0-2.9	.17	.17			
	22-26	15-20	1.50-1.75	0.57-1.98	0.12-0.14	0.0-2.9	.28	.28			
	26-80	5-15	1.65-1.80	0.57-1.98	0.11-0.13	0.0-2.9	.28	.28			
97:											
Colonville------	0-19	10-15	1.35-1.45	1.98-5.95	0.20-0.22	0.0-2.9	.28	.28	5	3	86
	19-35	0-18	1.40-1.65	1.98-5.95	0.02-0.12	0.0-2.9	.15	.15			
	35-80	0-18	1.40-1.65	1.98-5.95	0.02-0.12	0.0-2.9	.15	.15			
113:											
Angelica--------	0-8	10-20	1.15-1.60	0.57-1.98	0.18-0.22	0.0-2.9	.28	.32	5	5	56
	8-29	10-20	1.50-1.80	0.20-0.57	0.10-0.20	3.0-5.9	.28	.32			
	29-80	5-20	1.45-1.95	0.20-0.57	0.10-0.20	0.0-2.9	.24	.32			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	*Pct*	*g/cc*	*In/hr*	*In/in*	*Pct*					
116C:											
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	.15	.15	4	1	220
	3-6	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	.17	.24			
	20-29	2-15	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	.10	.15			
127:											
Cathro----------	0-6	0-0	0.28-0.45	0.20-5.95	0.35-0.45	---	---	---	2	2	134
	6-28	0-0	0.15-0.30	0.20-5.95	0.35-0.45	---	.24	.32			
	28-80	10-30	1.50-1.70	0.20-0.57	0.11-0.22	0.0-2.9	.32	.32			
128:											
Dawson----------	0-6	0-0	0.15-0.30	5.95-19.98	0.55-0.65	---	---	---	2	7	38
	6-31	0-0	0.15-0.40	0.20-5.95	0.35-0.45	---	---	---			
	31-80	0-10	1.55-1.75	5.95-19.98	0.03-0.10	0.0-2.9	.10	.15			
145C:											
Rousseau--------	0-1	0-0	0.15-0.30	---	0.55-0.65	---	---	---	5	1	250
	1-3	0-10	1.30-1.55	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15			
	3-6	0-10	1.30-1.55	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15			
	6-23	0-10	1.30-1.60	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	23-37	0-10	1.30-1.60	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	37-80	0-10	1.50-1.65	5.95-19.98	0.05-0.07	0.0-2.9	.15	.15			
145E:											
Rousseau--------	0-1	0-0	0.15-0.30	---	0.55-0.65	---	---	---	5	1	250
	1-3	0-10	1.30-1.55	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15			
	3-6	0-10	1.30-1.55	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15			
	6-23	0-10	1.30-1.60	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	23-37	0-10	1.30-1.60	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	37-80	0-10	1.50-1.65	5.95-19.98	0.05-0.07	0.0-2.9	.15	.15			
159A:											
Finch-----------	0-1	0-0	0.20-0.30	---	0.35-0.45	---	---	---	2	1	220
	1-11	5-10	1.30-1.55	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	11-16	5-10	1.75-2.05	0.57-5.95	0.02-0.04	0.0-2.9	.15	.15			
	16-23	5-10	1.75-2.05	0.57-5.95	0.02-0.04	0.0-2.9	.15	.15			
	23-80	0-10	1.40-1.55	5.95-19.98	0.02-0.04	0.0-2.9	.15	.15			
166A:											
Slade-----------	0-5	6-18	1.35-1.55	0.57-1.98	0.16-0.24	0.0-2.9	.32	.32	5	5	56
	5-7	4-16	1.45-1.65	0.57-1.98	0.09-0.22	0.0-2.9	.24	.24			
	7-9	13-35	1.55-1.65	0.57-1.98	0.09-0.18	3.0-5.9	.24	.24			
	9-26	18-35	1.55-1.70	0.57-1.98	0.09-0.18	3.0-5.9	.32	.32			
	26-60	13-17	1.55-1.80	0.20-1.98	0.09-0.18	0.0-2.9	.28	.28			
	60-80	13-17	1.55-1.80	0.20-1.98	0.09-0.18	0.0-2.9	.28	.28			
182:											
Pits, quarry.											
300A:											
Hagensville-----	0-7	10-18	1.30-1.60	0.57-1.98	0.13-0.18	0.0-2.9	.20	.20	5	3	86
	7-18	10-18	1.35-1.65	0.57-1.98	0.12-0.20	0.0-2.9	.24	.24			
	18-80	10-18	1.55-1.80	0.57-1.98	0.08-0.15	0.0-2.9	.28	.37			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility (Ksat)	Available water capacity	Linear extensi-bility	Erosion factors K	Kf	T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in	Pct					
304A:											
Iosco-----------	0-10	5-15	1.35-1.70	1.98-5.95	0.10-0.13	0.0-2.9	.17	.17	5	2	134
	10-19	5-15	1.45-1.60	5.95-19.98	0.06-0.11	0.0-2.9	.15	.17			
	19-24	5-15	1.45-1.60	5.95-19.98	0.06-0.11	0.0-2.9	.15	.17			
	24-37	15-30	1.55-1.65	0.57-1.98	0.15-0.19	0.0-2.9	.24	.32			
	37-52	8-20	1.30-1.70	0.57-1.98	0.10-0.19	0.0-2.9	.17	.24			
	52-80	8-20	1.30-1.70	0.57-1.98	0.10-0.19	0.0-2.9	.17	.24			
305B:											
Johnswood-------	0-5	8-18	1.30-1.60	1.98-5.95	0.13-0.17	0.0-2.9	.20	.28	3	8	0
	5-12	8-30	1.35-1.70	0.57-1.98	0.04-0.12	0.0-2.9	.24	.32			
	12-80	10-25	1.80-2.10	0.06-0.20	0.02-0.06	0.0-2.9	.24	.32			
308B:											
Krakow----------	0-3	5-18	1.40-1.60	1.98-5.95	0.09-0.12	0.0-2.9	.17	.24	5	8	0
	3-8	5-18	1.40-1.60	1.98-5.95	0.09-0.12	0.0-2.9	.17	.24			
	8-15	28-35	1.40-1.60	0.57-1.98	0.08-0.13	0.0-2.9	.24	.32			
	15-80	10-20	1.40-1.60	0.57-1.98	0.06-0.13	0.0-2.9	.20	.28			
308C:											
Krakow----------	0-3	5-18	1.40-1.60	1.98-5.95	0.09-0.12	0.0-2.9	.17	.24	5	8	0
	3-8	5-18	1.40-1.60	1.98-5.95	0.09-0.12	0.0-2.9	.17	.24			
	8-15	28-35	1.40-1.60	0.57-1.98	0.08-0.13	0.0-2.9	.24	.32			
	15-80	10-20	1.40-1.60	0.57-1.98	0.06-0.13	0.0-2.9	.20	.28			
308D:											
Krakow----------	0-3	5-18	1.40-1.60	1.98-5.95	0.09-0.12	0.0-2.9	.17	.24	5	8	0
	3-8	5-18	1.40-1.60	1.98-5.95	0.09-0.12	0.0-2.9	.17	.24			
	8-15	28-35	1.40-1.60	0.57-1.98	0.08-0.13	0.0-2.9	.24	.32			
	15-80	10-20	1.40-1.60	0.57-1.98	0.06-0.13	0.0-2.9	.20	.28			
316:											
Ruse------------	0-8	10-20	1.20-1.50	0.57-1.98	0.16-0.22	0.0-2.9	.32	.32	1	5	56
	8-13	10-20	1.50-1.70	0.57-5.95	0.10-0.20	0.0-2.9	.24	.32			
	13-17	---	---	0.00-0.57	---	---	---	---			
350E:											
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15	5	1	220
	3-6	5-10	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	.17	.17			
	6-25	5-10	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	.17	.17			
359C:											
Algonquin-------	0-5	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37	5	6	48
	5-7	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37			
	7-19	35-60	1.40-1.60	0.06-0.20	0.11-0.20	6.0-8.9	.32	.32			
	19-55	25-60	1.40-1.60	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	55-80	25-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
Negwegon--------	0-9	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37	5	5	56
	9-12	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37			
	12-14	20-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	14-51	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	51-80	20-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
Dorval----------	0-18	0-0	0.13-0.42	0.57-5.95	0.20-0.25	---	---	---	2	2	134
	18-80	35-60	1.40-1.65	0.00-0.06	0.10-0.20	6.0-8.9	.28	.28			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	*Pct*	*g/cc*	*In/hr*	*In/in*	*Pct*					
361B:											
Allendale-------	0-11	0-12	1.25-1.40	5.95-19.98	0.09-0.12	0.0-2.9	.17	.17	4	2	134
	11-13	0-15	1.35-1.45	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	13-22	0-15	1.35-1.45	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	22-25	0-15	1.35-1.45	5.95-19.98	0.06-0.10	0.0-2.9	.17	.17			
	25-44	40-60	1.45-1.70	0.00-0.06	0.08-0.12	6.0-8.9	.32	.32			
	44-80	40-60	1.45-1.70	0.00-0.06	0.08-0.12	6.0-8.9	.32	.32			
Dorval----------	0-18	0-0	0.13-0.42	0.57-5.95	0.20-0.25	---	---	---	2	2	134
	18-80	35-60	1.40-1.65	0.00-0.06	0.10-0.20	6.0-8.9	.28	.28			
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15	5	1	220
	3-6	5-10	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	.17	.17			
	6-25	5-10	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	.17	.17			
362D:											
Millersburg-----	0-3	3-12	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	.17	.17	5	2	134
	3-5	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.17	.17			
	5-18	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.17	.17			
	18-27	2-25	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	.24	.24			
	27-33	8-25	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	.24	.24			
	33-80	3-12	1.55-1.80	0.57-1.98	0.06-0.13	0.0-2.9	.17	.17			
362E:											
Millersburg-----	0-3	3-12	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	.17	.17	5	2	134
	3-5	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.17	.17			
	5-18	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	.17	.17			
	18-27	2-25	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	.24	.24			
	27-33	8-25	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	.24	.24			
	33-80	3-12	1.55-1.80	0.57-1.98	0.06-0.13	0.0-2.9	.17	.17			
368A:											
Au Gres---------	0-1	0-0	0.20-0.30	---	0.35-0.45	---	---	---	5	1	220
	1-2	0-8	1.30-1.55	5.95-19.98	0.07-0.10	0.0-2.9	.10	.15			
	2-10	1-10	1.50-1.70	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15			
	10-28	1-10	1.50-1.70	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15			
	28-32	1-10	1.50-1.70	5.95-19.98	0.06-0.09	0.0-2.9	.10	.15			
	32-80	0-8	1.50-1.70	5.95-19.98	0.05-0.07	0.0-2.9	.10	.15			
Deford----------	0-4	---	0.30-0.50	0.20-5.95	0.35-0.45	---	---	---	5	2	134
	4-5	0-10	1.40-1.60	5.95-19.98	0.05-0.07	0.0-2.9	.17	.17			
	5-80	0-10	1.40-1.60	5.95-19.98	0.05-0.07	0.0-2.9	.17	.17			
369:											
Deford----------	0-4	---	0.30-0.50	0.20-5.95	0.35-0.45	---	---	---	5	2	134
	4-5	0-10	1.40-1.60	5.95-19.98	0.05-0.07	0.0-2.9	.17	.17			
	5-80	0-10	1.40-1.60	5.95-19.98	0.05-0.07	0.0-2.9	.17	.17			
371:											
Springport------	0-3	15-27	1.10-1.40	0.20-0.57	0.22-0.24	0.0-2.9	.37	.37	5	6	48
	3-9	20-60	1.40-1.65	0.06-0.20	0.11-0.20	6.0-8.9	.32	.32			
	9-13	20-60	1.40-1.65	0.06-0.20	0.11-0.20	6.0-8.9	.32	.32			
	13-35	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	35-80	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
373B:											
Grayling--------	0-2	0-4	1.30-1.55	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15	5	1	220
	2-3	0-4	1.30-1.55	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15			
	3-15	0-4	1.40-1.60	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	15-80	0-4	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	.15	.15			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility (Ksat)	Available water capacity	Linear extensi-bility	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	*Pct*	*g/cc*	*In/hr*	*In/in*	*Pct*					
374:											
Thunderbay------	0-14	5-10	1.35-1.45	1.98-5.95	0.20-0.22	0.0-2.9	.28	.28	4	3	86
	14-19	7-18	1.35-1.45	1.98-5.95	0.20-0.22	0.0-2.9	.32	.32			
	19-24	7-18	1.35-1.50	1.98-5.95	0.17-0.19	0.0-2.9	.32	.32			
	24-80	0-8	1.40-1.60	5.95-19.98	0.05-0.07	0.0-2.9	.15	.15			
376A:											
Urban land.											
Udipsamments----	0-4	0-3	1.25-1.65	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15	5	1	250
	4-42	0-3	1.30-1.65	5.95-19.98	0.05-0.07	0.0-2.9	.15	.15			
	42-80	0-3	1.30-1.65	5.95-19.98	0.05-0.07	0.0-2.9	.15	.15			
380:											
Access denied.											
392:											
Caffey----------	0-9	2-10	1.10-1.30	1.98-5.95	0.10-0.15	0.0-2.9	.15	.15	5	1	220
	9-21	2-10	1.40-1.55	1.98-19.98	0.06-0.09	0.0-2.9	.17	.17			
	21-80	8-30	1.50-1.80	0.20-0.57	0.10-0.20	0.0-2.9	.43	.43			
393B:											
Morganlake------	0-2	1-10	1.30-1.55	5.95-19.98	0.07-0.12	0.0-2.9	.15	.15	5	1	220
	2-6	1-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	6-34	1-10	1.40-1.65	5.95-19.98	0.09-0.11	0.0-2.9	.15	.15			
	34-37	10-25	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
	37-43	10-25	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
	43-80	10-25	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
393C:											
Morganlake------	0-2	1-10	1.30-1.55	5.95-19.98	0.07-0.12	0.0-2.9	.15	.15	5	1	220
	2-6	1-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	6-34	1-10	1.40-1.65	5.95-19.98	0.09-0.11	0.0-2.9	.15	.15			
	34-37	10-25	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
	37-43	10-25	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
	43-80	10-25	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
396F:											
Proper----------	0-3	0-5	1.30-1.55	5.95-19.98	0.07-0.10	0.0-2.9	.15	.15	5	1	220
	3-11	0-5	1.30-1.55	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	11-24	0-5	1.65-2.00	0.57-5.95	0.03-0.04	0.0-2.9	.15	.15			
	24-41	0-5	1.50-1.60	5.95-19.98	0.05-0.07	0.0-2.9	.15	.15			
	41-80	0-5	1.50-1.60	5.95-19.98	0.05-0.07	0.0-2.9	.15	.15			
Deford----------	0-4	---	0.30-0.50	0.20-5.95	0.35-0.45	---	---	---	5	2	134
	4-5	0-10	1.40-1.60	5.95-19.98	0.05-0.07	0.0-2.9	.17	.17			
	5-80	0-10	1.40-1.60	5.95-19.98	0.05-0.07	0.0-2.9	.17	.17			
Rousseau--------	0-1	0-0	0.15-0.30	---	0.55-0.65	---	---	---	5	1	250
	1-3	0-10	1.30-1.55	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15			
	3-6	0-10	1.30-1.55	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15			
	6-23	0-10	1.30-1.60	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	23-37	0-10	1.30-1.60	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	37-80	0-10	1.50-1.65	5.95-19.98	0.05-0.07	0.0-2.9	.15	.15			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	*Pct*	*g/cc*	*In/hr*	*In/in*	*Pct*					
397:											
Spot------------	0-3	---	0.30-1.40	0.20-5.95	0.35-0.45	---	---	---	2	2	134
	3-6	---	0.30-1.40	0.20-5.95	0.35-0.45	---	---	---			
	6-13	0-10	1.20-1.60	5.95-19.98	0.07-0.12	0.0-2.9	.15	.15			
	13-15	0-10	1.20-1.60	5.95-19.98	0.07-0.12	0.0-2.9	.15	.15			
	15-21	0-10	1.75-2.00	0.57-5.95	0.05-0.06	0.0-2.9	.15	.15			
	21-28	0-10	1.45-1.70	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	28-80	0-10	1.50-1.70	5.95-19.98	0.05-0.08	0.0-2.9	.15	.15			
414B:											
Namur-----------	0-5	12-20	1.35-1.65	0.57-1.98	0.14-0.23	0.0-2.9	.32	.32	1	5	56
	5-9	---	---	0.06-19.98	---	---	---	---			
415A:											
Potagannissing--	0-6	10-18	1.25-1.50	0.57-1.98	0.22-0.24	0.0-2.9	.32	.32	1	5	56
	6-9	10-18	1.40-1.70	0.57-1.98	0.09-0.16	0.0-2.9	.24	.32			
	9-11	---	---	0.00-0.57	---	---	---	---			
416B:											
Negwegon--------	0-9	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37	3	5	56
	9-12	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37			
	12-14	20-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	14-51	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	51-62	20-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	62-80	15-28	1.40-1.70	0.57-1.98	0.11-0.20	0.0-2.9	.32	.32			
417B:											
Alpena----------	0-6	5-15	1.25-1.55	1.98-19.98	0.05-0.14	0.0-2.9	.15	.17	2	8	0
	6-80	0-10	1.25-1.65	19.98-19.98	0.02-0.04	0.0-2.9	.10	.15			
417C:											
Alpena----------	0-6	5-15	1.25-1.55	1.98-19.98	0.05-0.14	0.0-2.9	.15	.17	2	8	0
	6-80	0-10	1.25-1.65	19.98-19.98	0.02-0.04	0.0-2.9	.10	.15			
418E:											
Alpena----------	0-6	5-15	1.25-1.55	1.98-19.98	0.05-0.14	0.0-2.9	.15	.17	2	8	0
	6-80	0-10	1.25-1.65	19.98-19.98	0.02-0.04	0.0-2.9	.10	.15			
419:											
Chippeny--------	0-19	0-0	0.15-0.30	0.20-0.57	0.35-0.45	---	---	---	1	2	134
	19-24	5-28	1.45-1.75	0.06-1.98	0.04-0.19	0.0-2.9	.32	.43			
	24-26	---	---	0.06-0.57	---	---	---	---			
420A:											
Otisco----------	0-5	0-15	1.35-1.50	5.95-19.98	0.10-0.20	0.0-2.9	.15	.15	5	2	134
	5-10	2-12	1.25-1.40	1.98-19.98	0.06-0.11	0.0-2.9	.17	.17			
	10-25	2-12	1.25-1.40	1.98-19.98	0.06-0.11	0.0-2.9	.17	.17			
	25-45	5-15	1.35-1.45	1.98-5.95	0.05-0.17	0.0-2.9	.17	.17			
	45-60	0-12	1.25-1.50	1.98-19.98	0.05-0.10	0.0-2.9	.17	.17			
	60-80	0-12	1.25-1.50	1.98-19.98	0.05-0.10	0.0-2.9	.17	.17			
424B:											
Morganlake------	0-4	0-0	0.20-0.30	---	0.35-0.45	---	---	---	5	1	220
	4-8	1-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	8-17	1-10	1.40-1.65	5.95-19.98	0.09-0.11	0.0-2.9	.15	.15			
	17-32	5-30	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
	32-36	5-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
	36-46	27-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
	46-66	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
	66-80	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct					
424B:											
Ossineke--------	0-8	5-20	1.30-1.60	0.57-1.98	0.14-0.18	0.0-2.9	.17	.24	5	3	86
	8-13	5-20	1.50-1.70	0.57-1.98	0.13-0.17	0.0-2.9	.17	.24			
	13-21	11-27	1.60-1.80	0.57-1.98	0.14-0.19	0.0-2.9	.24	.24			
	21-38	18-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	.37	.37			
	38-51	18-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	.28	.37			
	51-77	11-27	1.80-2.00	0.06-0.20	0.03-0.04	3.0-5.9	.28	.37			
	77-80	1-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15	5	1	220
	3-6	5-10	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	.17	.17			
	6-25	5-10	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	.17	.17			
424C:											
Morganlake------	0-4	0-0	0.20-0.30	---	0.35-0.45	---	---	---	5	1	220
	4-8	1-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	8-17	1-10	1.40-1.65	5.95-19.98	0.09-0.11	0.0-2.9	.15	.15			
	17-32	5-30	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
	32-36	5-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
	36-46	27-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
	46-66	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
	66-80	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	.37	.43			
Ossineke--------	0-8	5-20	1.30-1.60	0.57-1.98	0.14-0.18	0.0-2.9	.17	.24	5	3	86
	8-13	5-20	1.50-1.70	0.57-1.98	0.13-0.17	0.0-2.9	.17	.24			
	13-21	11-27	1.60-1.80	0.57-1.98	0.14-0.19	0.0-2.9	.24	.24			
	21-38	18-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	.37	.37			
	38-51	18-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	.28	.37			
	51-77	11-27	1.80-2.00	0.06-0.20	0.03-0.04	3.0-5.9	.28	.37			
	77-80	1-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15	5	1	220
	3-6	5-10	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	.17	.17			
	6-25	5-10	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	.17	.17			
426B:											
Coppler---------	0-3	0-10	1.35-1.65	1.98-5.95	0.09-0.12	0.0-2.9	.15	.17	5	2	134
	3-4	2-15	1.30-1.70	1.98-5.95	0.06-0.11	0.0-2.9	.15	.17			
	4-14	2-15	1.30-1.70	1.98-5.95	0.06-0.11	0.0-2.9	.15	.17			
	14-21	2-15	1.30-1.70	1.98-5.95	0.06-0.11	0.0-2.9	.15	.17			
	21-26	10-25	1.30-1.70	1.98-5.95	0.06-0.12	0.0-2.9	.10	.24			
	26-80	0-5	1.55-1.70	19.98-19.98	0.02-0.04	0.0-2.9	.10	.15			
426C:											
Coppler---------	0-3	0-10	1.35-1.65	1.98-5.95	0.09-0.12	0.0-2.9	.15	.17	5	2	134
	3-4	2-15	1.30-1.70	1.98-5.95	0.06-0.11	0.0-2.9	.15	.17			
	4-14	2-15	1.30-1.70	1.98-5.95	0.06-0.11	0.0-2.9	.15	.17			
	14-21	2-15	1.30-1.70	1.98-5.95	0.06-0.11	0.0-2.9	.15	.17			
	21-26	10-25	1.30-1.70	1.98-5.95	0.06-0.12	0.0-2.9	.10	.24			
	26-80	0-5	1.55-1.70	19.98-19.98	0.02-0.04	0.0-2.9	.10	.15			
426D:											
Coppler---------	0-3	0-10	1.35-1.65	1.98-5.95	0.09-0.12	0.0-2.9	.15	.17	5	2	134
	3-4	2-15	1.30-1.70	1.98-5.95	0.06-0.11	0.0-2.9	.15	.17			
	4-14	2-15	1.30-1.70	1.98-5.95	0.06-0.11	0.0-2.9	.15	.17			
	14-21	2-15	1.30-1.70	1.98-5.95	0.06-0.11	0.0-2.9	.15	.17			
	21-26	10-25	1.30-1.70	1.98-5.95	0.06-0.12	0.0-2.9	.10	.24			
	26-80	0-5	1.55-1.70	19.98-19.98	0.02-0.04	0.0-2.9	.10	.15			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct					
451C:											
Annalake--------	0-9	5-10	1.25-1.55	0.57-1.98	0.08-0.18	0.0-2.9	.24	.24	5	3	86
	9-11	0-10	1.30-1.60	5.95-19.98	0.08-0.10	0.0-2.9	.24	.24			
	11-16	5-10	1.40-1.70	5.95-19.98	0.10-0.14	0.0-2.9	.24	.24			
	16-30	5-15	1.40-1.70	0.57-1.98	0.10-0.14	0.0-2.9	.28	.28			
	30-37	8-18	1.40-1.70	0.57-1.98	0.10-0.19	0.0-2.9	.24	.24			
	37-46	5-15	1.40-1.70	0.57-1.98	0.10-0.19	0.0-2.9	.24	.24			
	46-80	5-15	1.45-1.70	0.57-1.98	0.10-0.15	0.0-2.9	.24	.24			
477B:											
Algonquin-------	0-5	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37	5	6	48
	5-7	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37			
	7-19	35-60	1.40-1.60	0.06-0.20	0.11-0.20	6.0-8.9	.32	.32			
	19-55	25-60	1.40-1.60	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	55-65	25-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	65-80	10-20	1.45-1.95	0.20-0.57	0.10-0.20	0.0-2.9	.24	.32			
Springport------	0-9	27-40	1.25-1.50	0.20-0.57	0.17-0.19	3.0-5.9	.32	.32	5	6	48
	9-16	35-60	1.40-1.65	0.06-0.20	0.11-0.20	6.0-8.9	.32	.32			
	16-23	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	23-67	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	67-80	13-17	1.55-1.80	0.20-1.98	0.09-0.18	0.0-2.9	.28	.28			
478:											
Springport------	0-9	27-40	1.25-1.50	0.20-0.57	0.17-0.19	3.0-5.9	.32	.32	5	6	48
	9-16	35-60	1.40-1.65	0.06-0.20	0.11-0.20	6.0-8.9	.32	.32			
	16-23	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	23-67	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	67-80	13-17	1.55-1.80	0.20-1.98	0.09-0.18	0.0-2.9	.28	.28			
479A:											
Algonquin-------	0-5	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37	5	6	48
	5-7	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37			
	7-19	35-60	1.40-1.60	0.06-0.20	0.11-0.20	6.0-8.9	.32	.32			
	19-55	25-60	1.40-1.60	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	55-65	25-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	65-80	10-20	1.45-1.95	0.20-0.57	0.10-0.20	0.0-2.9	.24	.32			
480B:											
Negwegon--------	0-9	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37	5	5	56
	9-12	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37			
	12-14	20-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	14-51	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	51-80	20-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
Algonquin-------	0-5	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37	5	6	48
	5-7	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37			
	7-19	35-60	1.40-1.60	0.06-0.20	0.11-0.20	6.0-8.9	.32	.32			
	19-55	25-60	1.40-1.60	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	55-80	25-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
Lupton----------	0-4	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	---	---	3	2	134
	4-80	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	---	---			
481C:											
Negwegon--------	0-9	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37	5	5	56
	9-12	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	.37	.37			
	12-14	20-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	14-51	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			
	51-80	20-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	.32	.32			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct					
481C:											
Lupton----------	0-4	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	---	---	3	2	134
	4-80	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	---	---			
482B:											
Summerville-----	0-5	10-18	1.30-1.60	1.98-5.95	0.08-0.18	0.0-2.9	.24	.24	1	3	86
	5-16	10-20	1.35-1.65	0.57-1.98	0.10-0.16	0.0-2.9	.24	.24			
	16-18	---	---	0.06-5.95	---	---	---	---			
482C:											
Summerville-----	0-5	10-18	1.30-1.60	1.98-5.95	0.08-0.18	0.0-2.9	.24	.24	1	3	86
	5-16	10-20	1.35-1.65	0.57-1.98	0.10-0.16	0.0-2.9	.24	.24			
	16-18	---	---	0.06-5.95	---	---	---	---			
483A:											
Lachine---------	0-9	7-25	1.35-1.50	0.20-1.98	0.16-0.22	0.0-2.9	.20	.28	2	5	56
	9-13	7-25	1.35-1.70	0.20-1.98	0.06-0.19	0.0-2.9	.24	.37			
	13-16	7-25	1.55-1.80	0.20-1.98	0.06-0.19	0.0-2.9	.24	.37			
	16-20	---	---	0.06-19.98	---	---	---	---			
484A:											
Elcajon---------	0-6	7-20	1.35-1.50	0.57-1.98	0.20-0.22	0.0-2.9	.20	.28	4	5	56
	6-12	7-27	1.45-1.70	0.20-1.98	0.17-0.19	0.0-2.9	.43	.43			
	12-29	27-35	1.45-1.60	0.20-1.98	0.12-0.19	3.0-5.9	.20	.32			
	29-37	7-27	1.65-1.80	0.20-1.98	0.04-0.12	0.0-2.9	.17	.37			
	37-41	---	---	0.06-19.98	---	---	---	---			
485A:											
Bowers----------	0-10	15-27	1.40-1.70	0.57-1.98	0.20-0.22	0.0-2.9	.32	.32	5	6	48
	10-14	15-34	1.40-1.70	0.57-1.98	0.16-0.22	0.0-2.9	.32	.32			
	14-27	35-40	1.45-1.60	0.06-0.20	0.18-0.20	3.0-5.9	.32	.32			
	27-80	25-40	1.50-1.65	0.06-0.57	0.18-0.22	3.0-5.9	.32	.32			
486B:											
Tonkey----------	0-7	10-20	1.10-1.50	0.57-1.98	0.20-0.24	0.0-2.9	.32	.32	5	5	56
	7-22	8-18	1.30-1.80	0.57-1.98	0.10-0.15	0.0-2.9	.24	.24			
	22-80	0-20	1.60-1.80	0.57-19.98	0.05-0.19	0.0-2.9	.24	.24			
Bowers----------	0-10	15-27	1.40-1.70	0.57-1.98	0.20-0.22	0.0-2.9	.32	.32	5	6	48
	10-14	15-34	1.40-1.70	0.57-1.98	0.16-0.22	0.0-2.9	.32	.32			
	14-27	35-40	1.45-1.60	0.06-0.20	0.18-0.20	3.0-5.9	.32	.32			
	27-80	25-40	1.50-1.65	0.06-0.57	0.18-0.22	3.0-5.9	.32	.32			
487B:											
Slade-----------	0-5	6-18	1.35-1.55	0.57-1.98	0.16-0.24	0.0-2.9	.32	.32	5	5	56
	5-7	4-16	1.45-1.65	0.57-1.98	0.09-0.22	0.0-2.9	.24	.24			
	7-9	13-35	1.55-1.65	0.57-1.98	0.09-0.18	3.0-5.9	.24	.24			
	9-26	18-35	1.55-1.70	0.57-1.98	0.09-0.18	3.0-5.9	.32	.32			
	26-60	13-17	1.55-1.80	0.20-1.98	0.09-0.18	0.0-2.9	.28	.28			
	60-80	13-17	1.55-1.80	0.20-1.98	0.09-0.18	0.0-2.9	.28	.28			
Angelica--------	0-8	10-20	1.15-1.60	0.57-1.98	0.18-0.22	0.0-2.9	.28	.32	5	5	56
	8-29	10-20	1.50-1.80	0.20-0.57	0.10-0.20	3.0-5.9	.28	.32			
	29-80	5-20	1.45-1.95	0.20-0.57	0.10-0.20	0.0-2.9	.24	.32			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	*Pct*	*g/cc*	*In/hr*	*In/in*	*Pct*					
489F:											
Crowell---------	0-2	0-10	1.30-1.45	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15	2	1	220
	2-5	0-10	1.30-1.45	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15			
	5-10	0-10	1.30-1.45	5.95-19.98	0.07-0.09	0.0-2.9	.15	.15			
	10-29	0-10	1.75-2.05	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	29-80	0-10	1.40-1.60	5.95-19.98	0.05-0.07	0.0-2.9	.15	.15			
Proper----------	0-3	0-5	1.30-1.55	5.95-19.98	0.07-0.10	0.0-2.9	.15	.15	5	1	220
	3-11	0-5	1.30-1.55	5.95-19.98	0.06-0.08	0.0-2.9	.15	.15			
	11-24	0-5	1.65-2.00	0.57-5.95	0.03-0.04	0.0-2.9	.15	.15			
	24-41	0-5	1.50-1.60	5.95-19.98	0.05-0.07	0.0-2.9	.15	.15			
	41-80	0-5	1.50-1.60	5.95-19.98	0.05-0.07	0.0-2.9	.15	.15			

Table 20.--Chemical Properties of the Soils

(Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	pH	Pct	meq/100 g	meq/100 g	Pct
11B:						
Eastport--------	0-1	5.1-7.3	1.0-2.0	3.0-10	---	0
	1-8	5.1-7.8	---	1.0-4.0	---	0
	8-29	5.1-7.8	---	1.0-4.0	---	0
	29-80	6.6-8.4	---	1.0-2.0	---	0
12B:						
Tawas-----------	0-3	4.5-7.8	40-60	80-120	---	0
	3-28	4.5-7.8	40-60	80-120	---	0
	28-80	5.6-8.4	---	1.0-3.0	---	0
Au Gres---------	0-1	3.5-7.3	70-90	140-180	---	0
	1-2	3.5-7.3	2.0-4.0	5.0-10	---	0
	2-10	4.5-7.3	0.5-2.0	2.0-5.0	---	0
	10-28	4.5-7.3	0.5-3.0	2.0-5.0	---	0
	28-32	4.5-7.3	0.0-0.5	2.0-5.0	---	0
	32-80	5.1-7.3	0.0-0.5	1.0-2.0	---	0
13:						
Tawas-----------	0-3	4.5-7.8	40-60	80-120	---	0
	3-28	4.5-7.8	40-60	80-120	---	0
	28-80	5.6-8.4	---	1.0-3.0	---	0
Lupton----------	0-4	5.6-7.8	70-90	140-180	---	0
	4-80	5.6-7.8	70-90	140-180	---	0
14:						
Dawson----------	0-6	3.6-4.4	65-85	---	80-120	0
	6-31	3.6-4.4	65-85	---	150-230	0
	31-80	4.5-6.5	0.0-0.5	1.0-2.0	---	0
Loxley----------	0-4	2.0-4.4	70-90	---	50-100	0
	4-80	2.0-4.4	70-90	---	50-120	0
16B:						
Graycalm--------	0-1	4.5-6.5	0.5-2.0	4.0-10	---	0
	1-5	4.5-7.3	0.0-0.5	2.0-4.0	---	0
	5-24	4.5-7.3	0.0-0.5	1.0-5.0	---	0
	24-80	5.6-7.3	0.0-0.5	0.0-2.0	---	0
16C:						
Graycalm--------	0-1	4.5-6.5	0.5-2.0	4.0-10	---	0
	1-5	4.5-7.3	0.0-0.5	2.0-4.0	---	0
	5-24	4.5-7.3	0.0-0.5	1.0-5.0	---	0
	24-80	5.6-7.3	0.0-0.5	0.0-2.0	---	0
16D:						
Graycalm--------	0-1	4.5-6.5	0.5-2.0	4.0-10	---	0
	1-5	4.5-7.3	0.0-0.5	2.0-4.0	---	0
	5-24	4.5-7.3	0.0-0.5	1.0-5.0	---	0
	24-80	5.6-7.3	0.0-0.5	0.0-2.0	---	0
16E:						
Graycalm--------	0-1	4.5-6.5	0.5-2.0	4.0-10	---	0
	1-5	4.5-7.3	0.0-0.5	2.0-4.0	---	0
	5-24	4.5-7.3	0.0-0.5	1.0-5.0	---	0
	24-80	5.6-7.3	0.0-0.5	0.0-2.0	---	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	*pH*	*Pct*	*meq/100 g*	*meq/100 g*	*Pct*
17A:						
Croswell--------	0-2	5.6-6.0	2.0-5.0	---	1.0-5.0	0
	2-3	4.5-5.5	0.5-2.0	---	1.0-5.0	0
	3-11	4.5-6.0	0.5-3.0	1.0-4.0	---	0
	11-24	5.6-6.5	0.0-0.5	1.0-3.0	---	0
	24-80	5.6-7.3	0.0-0.5	1.0-2.0	---	0
17B:						
Croswell--------	0-2	5.6-6.0	2.0-5.0	---	1.0-5.0	0
	2-3	4.5-5.5	0.5-2.0	---	1.0-5.0	0
	3-11	4.5-6.0	0.5-3.0	1.0-4.0	---	0
	11-24	5.6-6.5	0.0-0.5	1.0-3.0	---	0
	24-80	5.6-7.3	0.0-0.5	1.0-2.0	---	0
18A:						
Au Gres---------	0-1	3.5-7.3	70-90	140-180	---	0
	1-2	3.5-7.3	2.0-4.0	5.0-10	---	0
	2-10	4.5-7.3	0.5-2.0	2.0-5.0	---	0
	10-28	4.5-7.3	0.5-3.0	2.0-5.0	---	0
	28-32	4.5-7.3	0.0-0.5	2.0-5.0	---	0
	32-80	5.1-7.3	0.0-0.5	1.0-2.0	---	0
19:						
Leafriver-------	0-9	5.6-7.3	50-90	100-180	---	---
	9-21	5.6-7.3	5.0-20	10-50	---	0
	21-80	5.6-7.8	0.0-0.5	1.0-15	---	0-15
27A:						
Tacoda----------	0-3	3.5-5.0	2.0-4.0	---	5.0-10	0
	3-14	3.5-5.5	0.0-0.5	---	2.0-5.0	0
	14-27	4.5-5.5	0.6-1.0	---	2.0-5.0	0
	27-44	4.5-7.3	0.0-0.5	---	2.0-5.0	0
	44-80	7.9-8.4	0.0-0.5	20-50	---	10-30
28B:						
East Lake-------	0-1	5.6-7.3	2.0-5.0	1.0-5.0	---	0
	1-2	5.6-7.3	0.5-2.0	1.0-5.0	---	0
	2-11	5.6-7.3	0.5-3.0	1.0-5.0	---	0
	11-34	5.6-7.3	0.0-0.5	1.0-5.0	---	0
	34-80	7.4-8.4	0.0-0.5	1.0-2.0	---	10-25
28C:						
East Lake-------	0-1	5.6-7.3	2.0-5.0	1.0-5.0	---	0
	1-2	5.6-7.3	0.5-2.0	1.0-5.0	---	0
	2-11	5.6-7.3	0.5-3.0	1.0-5.0	---	0
	11-34	5.6-7.3	0.0-0.5	1.0-5.0	---	0
	34-80	7.4-8.4	0.0-0.5	1.0-2.0	---	10-25
29A:						
Battlefield-----	0-5	4.5-6.0	2.0-5.0	---	3.0-10	0
	5-7	4.5-6.0	0.5-2.0	---	3.0-10	0
	7-15	4.5-6.0	0.5-3.0	---	2.0-5.0	0
	15-23	7.4-7.8	0.0-0.5	1.0-5.0	---	0-10
	23-80	7.4-8.4	0.0-0.5	1.0-2.0	---	0-20
30:						
Wheatley--------	0-5	6.1-7.8	40-70	50-100	---	0
	5-34	6.1-7.8	---	1.0-15	---	0
	34-80	7.9-8.4	---	1.0-4.0	---	20-30

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	*pH*	*Pct*	*meq/100 g*	*meq/100 g*	*Pct*
31B:						
Klacking--------	0-4	4.5-6.0	2.0-5.0	---	2.0-14	0
	4-12	4.5-7.3	0.5-2.0	2.0-6.0	---	0
	12-25	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	25-33	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	33-64	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	64-80	7.4-7.8	0.0-0.5	2.0-6.0	---	10-25
31C:						
Klacking--------	0-4	4.5-6.0	2.0-5.0	---	2.0-14	0
	4-12	4.5-7.3	0.5-2.0	2.0-6.0	---	0
	12-25	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	25-33	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	33-64	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	64-80	7.4-7.8	0.0-0.5	2.0-6.0	---	10-25
31D:						
Klacking--------	0-4	4.5-6.0	2.0-5.0	---	2.0-14	0
	4-12	4.5-7.3	0.5-2.0	2.0-6.0	---	0
	12-25	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	25-33	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	33-64	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	64-80	7.4-7.8	0.0-0.5	2.0-6.0	---	10-25
31E:						
Klacking--------	0-4	4.5-6.0	2.0-5.0	---	2.0-14	0
	4-12	4.5-7.3	0.5-2.0	2.0-6.0	---	0
	12-25	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	25-33	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	33-64	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	64-80	7.4-7.8	0.0-0.5	2.0-6.0	---	10-25
35:						
Kinross---------	0-5	3.5-5.0	20-70	---	100-140	0
	5-9	3.5-6.0	0.5-2.0	---	1.0-10	0
	9-13	3.5-6.0	2.0-5.0	---	1.0-10	0
	13-19	3.5-6.0	0.5-3.0	---	1.0-10	0
	19-27	4.5-6.0	0.0-0.5	1.0-2.0	---	0
	27-80	4.5-6.5	0.0-0.5	1.0-2.0	---	0
36B:						
Annalake--------	0-4	4.5-7.3	1.0-3.0	3.0-20	---	0
	4-6	4.5-7.3	0.5-1.0	1.0-15	---	0
	6-16	4.5-6.0	1.0-2.0	---	3.0-15	0
	16-33	4.5-7.3	0.0-0.5	1.0-15	---	0
	33-42	4.5-7.3	0.0-0.5	2.0-15	---	0
	42-80	5.1-8.4	0.0-0.5	1.0-15	---	0-10
36C:						
Annalake--------	0-4	4.5-7.3	1.0-3.0	3.0-20	---	0
	4-6	4.5-7.3	0.5-1.0	1.0-15	---	0
	6-16	4.5-6.0	1.0-2.0	---	3.0-15	0
	16-33	4.5-7.3	0.0-0.5	1.0-15	---	0
	33-42	4.5-7.3	0.0-0.5	2.0-15	---	0
	42-80	5.1-8.4	0.0-0.5	1.0-15	---	0-10

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	*pH*	*Pct*	*meq/100 g*	*meq/100 g*	*Pct*
37A:						
Richter---------	0-8	5.1-7.3	2.0-4.0	5.0-10	---	0
	8-12	5.6-7.3	0.5-2.0	5.0-15	---	0
	12-18	5.6-7.3	0.5-3.0	5.0-15	---	0
	18-26	5.6-7.3	0.0-0.5	5.0-15	---	0
	26-37	5.6-7.3	0.0-0.5	1.0-10	---	0
	37-80	7.4-8.4	0.0-0.5	1.0-10	---	0-20
37B:						
Richter---------	0-8	5.1-7.3	2.0-4.0	5.0-10	---	0
	8-12	5.6-7.3	0.5-2.0	5.0-15	---	0
	12-18	5.6-7.3	0.5-3.0	5.0-15	---	0
	18-26	5.6-7.3	0.0-0.5	5.0-15	---	0
	26-37	5.6-7.3	0.0-0.5	1.0-10	---	0
	37-80	7.4-8.4	0.0-0.5	1.0-10	---	0-20
38:						
Tonkey----------	0-7	5.6-7.8	4.0-7.0	10-25	---	0
	7-22	5.6-7.8	0.0-0.5	2.0-10	---	0
	22-80	7.4-8.4	0.0-0.5	1.0-10	---	0-10
41B:						
McGinn----------	0-2	3.5-5.5	1.0-3.0	---	5.0-10	0
	2-3	4.5-5.5	0.0-0.5	---	1.0-3.0	0
	3-12	5.1-5.5	0.0-0.5	---	1.0-3.0	0
	12-22	4.5-6.0	0.0-0.5	1.0-10	---	0
	22-26	4.5-6.0	0.0-0.5	3.0-10	---	0
	26-80	7.4-8.4	0.0-0.5	1.0-5.0	---	10-30
41C:						
McGinn----------	0-2	3.5-5.5	1.0-3.0	---	5.0-10	0
	2-3	4.5-5.5	0.0-0.5	---	1.0-3.0	0
	3-12	5.1-5.5	0.0-0.5	---	1.0-3.0	0
	12-22	4.5-6.0	0.0-0.5	1.0-10	---	0
	22-26	4.5-6.0	0.0-0.5	3.0-10	---	0
	26-80	7.4-8.4	0.0-0.5	1.0-5.0	---	10-30
41D:						
McGinn----------	0-2	3.5-5.5	1.0-3.0	---	5.0-10	0
	2-3	4.5-5.5	0.0-0.5	---	1.0-3.0	0
	3-12	5.1-5.5	0.0-0.5	---	1.0-3.0	0
	12-22	4.5-6.0	0.0-0.5	1.0-10	---	0
	22-26	4.5-6.0	0.0-0.5	3.0-10	---	0
	26-80	7.4-8.4	0.0-0.5	1.0-5.0	---	10-30
41E:						
McGinn----------	0-2	3.5-5.5	1.0-3.0	---	5.0-10	0
	2-3	4.5-5.5	0.0-0.5	---	1.0-3.0	0
	3-12	5.1-5.5	0.0-0.5	---	1.0-3.0	0
	12-22	4.5-6.0	0.0-0.5	1.0-10	---	0
	22-26	4.5-6.0	0.0-0.5	3.0-10	---	0
	26-80	7.4-8.4	0.0-0.5	1.0-5.0	---	10-30
42A:						
Killmaster------	0-11	5.1-6.5	2.0-4.0	10-20	---	0
	11-12	5.6-6.5	---	2.0-6.0	---	0
	12-17	6.1-6.5	---	2.0-6.0	---	0
	17-22	6.6-7.8	---	3.0-9.0	---	0
	22-80	7.9-8.4	---	1.0-3.0	---	10-30

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	pH	Pct	meq/100 g	meq/100 g	Pct
43:						
Wakeley---------	0-3	5.6-7.8	10-15	20-30	---	0
	3-21	5.6-7.8	0.0-0.5	1.0-10	---	0
	21-80	7.4-8.4	0.0-0.5	5.0-25	---	10-30
44B:						
Ossineke--------	0-10	5.1-6.5	1.0-3.0	---	3.0-14	0
	10-15	5.1-6.0	0.0-0.5	1.0-8.0	---	0
	15-22	5.1-6.0	0.0-0.5	2.0-11	---	0
	22-35	5.6-6.5	0.0-0.5	3.0-14	---	0
	35-41	6.6-8.4	0.0-0.5	3.0-14	---	0-10
	41-80	7.4-8.4	0.0-0.5	2.0-14	---	10-30
44C:						
Ossineke--------	0-10	5.1-6.5	1.0-3.0	---	3.0-14	0
	10-15	5.1-6.0	0.0-0.5	1.0-8.0	---	0
	15-22	5.1-6.0	0.0-0.5	2.0-11	---	0
	22-35	5.6-6.5	0.0-0.5	3.0-14	---	0
	35-41	6.6-8.4	0.0-0.5	3.0-14	---	0-10
	41-80	7.4-8.4	0.0-0.5	2.0-14	---	10-30
45B:						
Hoist-----------	0-9	5.6-7.3	1.0-3.0	10-20	---	0
	9-10	5.6-7.3	0.0-0.5	2.0-6.0	---	0
	10-15	6.1-7.3	0.0-0.5	2.0-6.0	---	0
	15-21	6.6-7.8	0.0-0.5	3.0-9.0	---	0
	21-47	7.4-8.4	0.0-0.5	1.0-3.0	---	0-20
	47-80	7.4-8.4	0.0-0.5	1.0-3.0	---	10-30
45C:						
Hoist-----------	0-9	5.6-7.3	1.0-3.0	10-20	---	0
	9-10	5.6-7.3	0.0-0.5	2.0-6.0	---	0
	10-15	6.1-7.3	0.0-0.5	2.0-6.0	---	0
	15-21	6.6-7.8	0.0-0.5	3.0-9.0	---	0
	21-47	7.4-8.4	0.0-0.5	1.0-3.0	---	0-20
	47-80	7.4-8.4	0.0-0.5	1.0-3.0	---	10-30
46:						
Ensley----------	0-8	6.1-7.8	10-15	20-50	---	0
	8-29	6.6-8.4	0.0-0.5	4.0-8.0	---	0
	29-80	7.4-8.4	---	1.0-4.0	---	10-20
47D:						
Graycalm--------	0-1	4.5-6.5	0.5-2.0	4.0-10	---	0
	1-5	4.5-7.3	0.0-0.5	2.0-4.0	---	0
	5-24	4.5-7.3	0.0-0.5	1.0-5.0	---	0
	24-80	5.6-7.3	0.0-0.5	0.0-2.0	---	0
53B:						
Negwegon--------	0-9	6.1-7.8	1.0-3.0	10-25	---	0
	9-12	6.1-7.8	1.0-3.0	10-25	---	0
	12-14	6.1-7.8	0.0-0.5	10-20	---	0
	14-51	6.1-7.8	0.0-0.5	10-20	---	0
	51-80	7.9-8.4	0.0-0.5	10-20	---	20-30
53C:						
Negwegon--------	0-9	6.1-7.8	1.0-3.0	10-25	---	0
	9-12	6.1-7.8	1.0-3.0	10-25	---	0
	12-14	6.1-7.8	0.0-0.5	10-20	---	0
	14-51	6.1-7.8	0.0-0.5	10-20	---	0
	51-80	7.9-8.4	0.0-0.5	10-20	---	20-30

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	pH	Pct	meq/100 g	meq/100 g	Pct
54A:						
Algonquin-------	0-5	5.6-7.3	2.0-3.0	10-25	---	0
	5-7	5.6-7.3	0.5-2.0	10-25	---	0
	7-19	6.1-8.4	0.0-0.5	10-20	---	0-10
	19-55	7.9-8.4	0.0-0.5	10-20	---	10-30
	55-80	7.9-8.4	0.0-0.5	10-20	---	20-30
55:						
Springport------	0-9	6.6-7.8	2.0-5.0	10-30	---	0
	9-16	7.4-8.4	0.0-0.5	10-20	---	0-20
	16-23	7.4-8.4	0.0-0.5	10-20	---	10-20
	23-80	7.4-8.4	0.0-0.5	10-20	---	20-30
57B:						
Kawkawlin-------	0-10	5.1-7.3	2.0-4.0	5.0-20	---	0
	10-13	5.1-7.8	0.0-0.5	5.0-20	---	0
	13-16	5.1-7.8	0.0-0.5	5.0-20	---	0
	16-30	7.9-8.4	0.0-0.5	5.0-15	---	10-30
	30-80	7.9-8.4	0.0-0.5	5.0-15	---	20-30
59B:						
Algonquin-------	0-5	5.6-7.3	2.0-3.0	10-25	---	0
	5-7	5.6-7.3	0.5-2.0	10-25	---	0
	7-19	6.1-8.4	0.0-0.5	10-20	---	0-10
	19-55	7.9-8.4	0.0-0.5	10-20	---	10-30
	55-80	7.9-8.4	0.0-0.5	10-20	---	20-30
Springport------	0-9	6.6-7.8	2.0-5.0	10-30	---	0
	9-16	7.4-8.4	0.0-0.5	10-20	---	0-20
	16-23	7.4-8.4	0.0-0.5	10-20	---	10-20
	23-80	7.4-8.4	0.0-0.5	10-20	---	20-30
62A:						
Allendale-------	0-11	4.5-7.3	2.0-5.0	4.0-20	---	0
	11-13	4.5-7.3	0.5-2.0	1.0-5.0	---	0
	13-22	4.5-7.3	0.5-3.0	1.0-5.0	---	0
	22-25	4.5-7.3	0.0-0.5	1.0-5.0	---	0
	25-44	6.1-8.4	0.0-0.5	8.0-25	---	0-10
	44-80	6.1-8.4	0.0-0.5	8.0-25	---	0-10
63D:						
Bamfield--------	0-6	4.5-7.3	1.0-3.0	---	5.0-15	0
	6-8	5.1-6.5	0.0-0.5	---	2.0-10	0
	8-11	5.1-6.5	0.0-0.5	---	2.0-10	0
	11-14	5.1-6.5	0.0-0.5	---	2.0-10	0
	14-42	5.6-8.4	0.0-0.5	5.0-15	---	0-10
	42-80	7.9-8.4	0.0-0.5	5.0-15	---	10-30
63E:						
Bamfield--------	0-6	4.5-7.3	1.0-3.0	---	5.0-15	0
	6-8	5.1-6.5	0.0-0.5	---	2.0-10	0
	8-11	5.1-6.5	0.0-0.5	---	2.0-10	0
	11-14	5.1-6.5	0.0-0.5	---	2.0-10	0
	14-42	5.6-8.4	0.0-0.5	5.0-15	---	0-10
	42-80	7.9-8.4	0.0-0.5	5.0-15	---	10-30
68:						
Rondeau---------	0-27	5.1-7.8	25-95	0.0-0.0	---	0
	27-80	7.4-8.4	---	0.0-0.0	---	30-50

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	*pH*	*Pct*	*meq/100 g*	*meq/100 g*	*Pct*
69:						
Loxley----------	0-4	3.6-4.5	70-90	---	50-100	0
	4-80	3.6-4.5	70-90	---	50-120	0
70:						
Lupton----------	0-4	5.6-7.8	70-90	140-180	---	0
	4-80	5.6-7.8	70-90	140-180	---	0
71:						
Tawas-----------	0-3	4.5-7.8	40-60	80-120	---	0
	3-28	4.5-7.8	40-60	80-120	---	0
	28-80	5.6-8.4	---	1.0-3.0	---	0
72:						
Dorval----------	0-27	5.1-7.8	50-95	100-160	---	0
	27-80	6.1-8.4	0.0-8.0	18-30	---	0-10
74C2:						
Negwegon--------	0-9	6.1-7.8	0.5-2.0	10-25	---	0
	9-21	6.1-7.8	0.0-0.5	10-20	---	0
	21-51	6.1-7.8	0.0-0.5	10-20	---	0
	51-80	7.9-8.4	0.0-0.5	10-20	---	20-30
75B:						
Rubicon---------	0-2	4.5-6.0	2.0-5.0	---	1.0-6.0	0
	2-4	4.5-6.0	0.5-2.0	---	1.0-6.0	0
	4-29	4.5-6.0	0.5-3.0	---	1.0-4.0	0
	29-43	5.1-6.5	0.0-0.5	1.0-2.0	---	0
	43-80	5.6-7.3	0.0-0.5	1.0-2.0	---	0
75D:						
Rubicon---------	0-2	4.5-6.0	2.0-5.0	---	1.0-6.0	0
	2-4	4.5-6.0	0.5-2.0	---	1.0-6.0	0
	4-29	4.5-6.0	0.5-3.0	---	1.0-4.0	0
	29-43	5.1-6.5	0.0-0.5	1.0-2.0	---	0
	43-80	5.6-7.3	0.0-0.5	1.0-2.0	---	0
75E:						
Rubicon---------	0-2	4.5-6.0	2.0-5.0	---	1.0-6.0	0
	2-4	4.5-6.0	0.5-2.0	---	1.0-6.0	0
	4-29	4.5-6.0	0.5-3.0	---	1.0-4.0	0
	29-43	5.1-6.5	0.0-0.5	1.0-2.0	---	0
	43-80	5.6-7.3	0.0-0.5	1.0-2.0	---	0
77:						
Rollaway--------	0-10	5.6-7.3	40-70	80-140	---	0
	10-42	6.1-8.4	0.0-0.5	1.0-5.0	---	0
	42-80	7.9-8.4	0.0-0.5	10-25	---	5-20
78:						
Pits, borrow.						
82B:						
Udorthents------	0-80	---	---	---	---	---
82C:						
Udorthents------	0-80	---	---	---	---	---
83B:						
Udipsamments----	0-80	5.1-6.5	0.5-1.0	---	---	---

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	*pH*	*Pct*	*meq/100 g*	*meq/100 g*	*Pct*
83F:						
Udipsamments----	0-80	5.1-6.5	0.5-1.0	0.0-0.0	---	0
84B:						
Zimmerman-------	0-1	4.5-6.5	2.0-5.0	1.0-5.0	---	0
	1-3	6.1-7.3	0.5-2.0	1.0-5.0	---	0
	3-24	6.1-7.3	0.0-0.5	1.0-5.0	---	0
	24-80	6.1-7.3	0.0-0.5	1.0-5.0	---	0
84C:						
Zimmerman-------	0-1	4.5-6.5	2.0-5.0	1.0-5.0	---	0
	1-3	6.1-7.3	0.5-2.0	1.0-5.0	---	0
	3-24	6.1-7.3	0.0-0.5	1.0-5.0	---	0
	24-80	6.1-7.3	0.0-0.5	1.0-5.0	---	0
84E:						
Zimmerman-------	0-1	4.5-6.5	2.0-5.0	1.0-5.0	---	0
	1-3	6.1-7.3	0.5-2.0	1.0-5.0	---	0
	3-24	6.1-7.3	0.0-0.5	1.0-5.0	---	0
	24-80	6.1-7.3	0.0-0.5	1.0-5.0	---	0
85D:						
Zimmerman-------	0-1	4.5-6.5	2.0-5.0	1.0-5.0	---	0
	1-3	6.1-7.3	0.5-2.0	1.0-5.0	---	0
	3-24	6.1-7.3	0.0-0.5	1.0-5.0	---	0
	24-80	6.1-7.3	0.0-0.5	1.0-5.0	---	0
Annalake--------	0-4	4.5-7.3	1.0-3.0	3.0-20	---	0
	4-6	4.5-7.3	0.5-1.0	1.0-15	---	0
	6-16	4.5-6.0	1.0-2.0	---	3.0-15	0
	16-33	4.5-7.3	0.0-0.5	1.0-15	---	0
	33-42	4.5-7.3	0.0-0.5	2.0-15	---	0
	42-80	5.1-8.4	0.0-0.5	1.0-15	---	0-10
86:						
Histosols-------	0-51	---	50-70	---	---	---
	51-80	---	---	---	---	---
Aquents---------	0-80	---	---	---	---	---
87:						
Ausable---------	0-11	6.1-7.3	70-90	140-180	---	0
	11-24	6.1-7.8	5.0-10	5.0-25	---	0
	24-80	6.1-7.8	5.0-10	5.0-25	---	0
90B:						
Chinwhisker-----	0-3	4.5-6.5	2.0-5.0	4.0-10	---	0
	3-4	4.5-6.0	0.5-2.0	---	2.0-3.0	0
	4-18	4.5-6.5	0.5-3.0	1.0-2.0	---	0
	18-48	4.5-7.3	0.0-0.5	1.0-2.0	---	0
	48-80	4.5-8.4	0.0-0.5	2.0-4.0	---	0
92B:						
Klacking--------	0-4	4.5-6.0	2.0-5.0	---	2.0-14	0
	4-12	4.5-7.3	0.5-2.0	2.0-6.0	---	0
	12-25	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	25-33	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	33-64	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	64-80	7.4-7.8	0.0-0.5	2.0-6.0	---	10-25

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	pH	Pct	meq/100 g	meq/100 g	Pct
92B:						
McGinn----------	0-2	3.5-5.5	1.0-3.0	---	5.0-10	0
	2-3	4.5-5.5	0.0-0.5	---	1.0-3.0	0
	3-12	5.1-5.5	0.0-0.5	---	1.0-3.0	0
	12-22	4.5-6.0	0.0-0.5	1.0-10	---	0
	22-26	4.5-6.0	0.0-0.5	3.0-10	---	0
	26-80	7.4-8.4	0.0-0.5	1.0-5.0	---	10-30
92C:						
Klacking--------	0-4	4.5-6.0	2.0-5.0	---	2.0-14	0
	4-12	4.5-7.3	0.5-2.0	2.0-6.0	---	0
	12-25	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	25-33	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	33-64	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	64-80	7.4-7.8	0.0-0.5	2.0-6.0	---	10-25
McGinn----------	0-2	3.5-5.5	1.0-3.0	---	5.0-10	0
	2-3	4.5-5.5	0.0-0.5	---	1.0-3.0	0
	3-12	5.1-5.5	0.0-0.5	---	1.0-3.0	0
	12-22	4.5-6.0	0.0-0.5	1.0-10	---	0
	22-26	4.5-6.0	0.0-0.5	3.0-10	---	0
	26-80	7.4-8.4	0.0-0.5	1.0-5.0	---	10-30
93B:						
Tacoda----------	0-3	3.5-5.0	2.0-4.0	---	5.0-10	0
	3-14	3.5-5.5	0.0-0.5	---	2.0-5.0	0
	14-27	4.5-5.5	0.6-1.0	---	2.0-5.0	0
	27-44	4.5-7.3	0.0-0.5	---	2.0-5.0	0
	44-80	7.9-8.4	0.0-0.5	20-50	---	10-30
Wakeley---------	0-3	5.6-7.8	10-15	20-30	---	0
	3-21	5.6-7.8	0.0-0.5	1.0-10	---	0
	21-80	7.4-8.4	0.0-0.5	5.0-25	---	10-30
94F:						
Klacking--------	0-4	4.5-6.0	2.0-5.0	---	2.0-14	0
	4-12	4.5-7.3	0.5-2.0	2.0-6.0	---	0
	12-25	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	25-33	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	33-64	4.5-7.3	0.0-0.5	2.0-6.0	---	0
	64-80	7.4-7.8	0.0-0.5	2.0-6.0	---	10-25
McGinn----------	0-2	3.5-5.5	1.0-3.0	---	5.0-10	0
	2-3	4.5-5.5	0.0-0.5	---	1.0-3.0	0
	3-12	5.1-5.5	0.0-0.5	---	1.0-3.0	0
	12-22	4.5-6.0	0.0-0.5	1.0-10	---	0
	22-26	4.5-6.0	0.0-0.5	3.0-10	---	0
	26-80	7.4-8.4	0.0-0.5	1.0-5.0	---	10-30
97:						
Colonville------	0-19	6.6-8.4	2.0-4.0	5.0-15	---	0
	19-35	7.9-8.4	0.0-1.0	1.0-10	---	0
	35-80	7.9-8.4	0.0-1.0	1.0-10	---	0
113:						
Angelica--------	0-8	6.1-7.8	2.0-12	5.0-30	---	0
	8-29	6.1-8.4	0.0-0.5	3.0-15	---	0-15
	29-80	7.9-8.4	0.0-0.5	2.0-10	---	15-30

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	*pH*	*Pct*	*meq/100 g*	*meq/100 g*	*Pct*
116C:						
Mancelona-------	0-3	4.5-7.3	2.0-5.0	2.0-10	---	0
	3-6	4.5-7.8	0.5-2.0	1.0-10	---	0
	6-20	5.6-7.8	0.5-3.0	1.0-10	---	0
	20-29	6.1-7.8	0.0-0.5	4.0-15	---	0
	29-35	6.1-7.8	0.0-0.5	4.0-15	---	0
	35-80	7.4-8.4	0.0-0.5	1.0-4.0	---	10-25
127:						
Cathro----------	0-6	4.5-7.8	60-85	150-230	---	0
	6-28	4.5-7.8	60-85	150-230	---	0
	28-80	5.6-8.4	0.0-0.5	2.0-20	---	5-25
128:						
Dawson----------	0-6	3.6-4.4	65-85	---	80-120	0
	6-31	3.6-4.4	65-85	---	150-230	0
	31-80	4.5-6.5	0.0-0.5	1.0-2.0	---	0
145C:						
Rousseau--------	0-1	4.5-6.0	65-85	---	80-120	0
	1-3	4.5-6.0	1.0-2.0	---	3.0-10	0
	3-6	4.5-6.0	1.0-2.0	---	3.0-10	0
	6-23	4.5-6.5	0.6-1.0	1.0-5.0	---	0
	23-37	4.5-6.5	0.6-1.0	1.0-5.0	---	0
	37-80	5.1-7.3	0.0-0.5	1.0-2.0	---	0
145E:						
Rousseau--------	0-1	4.5-6.0	65-85	---	80-120	0
	1-3	4.5-6.0	1.0-2.0	---	3.0-10	0
	3-6	4.5-6.0	1.0-2.0	---	3.0-10	0
	6-23	4.5-6.5	0.6-1.0	1.0-5.0	---	0
	23-37	4.5-6.5	0.6-1.0	1.0-5.0	---	0
	37-80	5.1-7.3	0.0-0.5	1.0-2.0	---	0
159A:						
Finch-----------	0-1	4.5-5.0	70-90	140-180	---	0
	1-11	4.5-5.0	0.5-2.0	---	1.0-4.0	0
	11-16	5.1-5.5	0.5-3.0	1.0-4.0	---	0
	16-23	5.1-5.5	0.5-3.0	1.0-4.0	---	0
	23-80	5.6-6.0	0.0-0.5	1.0-4.0	---	0
166A:						
Slade-----------	0-5	5.6-6.5	2.0-5.0	5.0-25	---	0
	5-7	5.6-6.5	0.5-1.0	1.0-15	---	0
	7-9	5.6-7.3	0.1-0.8	2.0-20	---	0
	9-26	6.6-7.3	0.0-0.5	4.0-25	---	0
	26-60	7.9-8.4	0.0-0.5	2.0-15	---	1-10
	60-80	7.9-8.4	0.0-0.5	2.0-15	---	1-10
182:						
Pits, quarry.						
300A:						
Hagensville-----	0-7	6.1-7.8	2.0-3.0	5.0-15	---	0
	7-18	6.6-7.8	0.0-0.5	2.0-8.0	---	0-5
	18-80	7.4-8.4	0.0-0.5	2.0-8.0	---	15-25

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	*pH*	*Pct*	*meq/100 g*	*meq/100 g*	*Pct*
304A:						
Iosco-----------	0-10	5.1-7.3	2.0-5.0	4.0-10	---	0
	10-19	5.1-6.5	0.5-3.0	2.0-10	---	0
	19-24	5.1-6.5	0.5-2.0	2.0-10	---	0
	24-37	6.6-8.4	0.0-0.5	4.0-10	---	3-6
	37-52	7.9-8.4	0.0-0.5	8.0-20	---	15-30
	52-80	7.9-8.4	0.0-0.5	8.0-20	---	15-30
305B:						
Johnswood-------	0-5	6.1-7.8	1.0-3.0	5.0-15	---	0
	5-12	6.1-7.8	0.0-0.5	2.0-10	---	0
	12-80	7.9-8.4	0.0-0.5	2.0-10	---	10-25
308B:						
Krakow----------	0-3	6.6-7.8	2.0-5.0	3.0-15	---	0
	3-8	6.6-7.8	0.5-2.0	3.0-15	---	0
	8-15	6.6-7.8	0.0-0.5	2.0-10	---	0-10
	15-80	7.4-8.4	0.0-0.5	2.0-10	---	10-40
308C:						
Krakow----------	0-3	6.6-7.8	2.0-5.0	3.0-15	---	0
	3-8	6.6-7.8	0.5-2.0	3.0-15	---	0
	8-15	6.6-7.8	0.0-0.5	2.0-10	---	0-10
	15-80	7.4-8.4	0.0-0.5	2.0-10	---	10-40
308D:						
Krakow----------	0-3	6.6-7.8	2.0-5.0	3.0-15	---	0
	3-8	6.6-7.8	0.5-2.0	3.0-15	---	0
	8-15	6.6-7.8	0.0-0.5	2.0-10	---	0-10
	15-80	7.4-8.4	0.0-0.5	2.0-10	---	10-40
316:						
Ruse------------	0-8	6.1-7.3	4.0-8.0	8.0-20	---	0
	8-13	6.6-8.4	0.0-0.5	5.0-15	---	10-20
	13-17	---	---	---	---	---
350E:						
Blue Lake-------	0-3	5.1-6.5	2.0-5.0	1.0-5.0	---	0
	3-6	5.1-6.5	0.5-2.0	2.0-6.0	---	0
	6-25	5.1-6.5	0.5-3.0	2.0-6.0	---	0
	25-80	5.1-6.5	0.0-0.5	1.0-8.0	---	0
359C:						
Algonquin-------	0-5	6.6-7.3	2.0-3.0	10-25	---	0
	5-7	6.6-7.3	0.5-2.0	10-25	---	0
	7-19	7.4-8.4	0.0-0.5	10-20	---	0-10
	19-55	7.9-8.4	0.0-0.5	10-20	---	10-30
	55-80	7.9-8.4	0.0-0.5	10-20	---	20-30
Negwegon--------	0-9	6.1-7.8	1.0-3.0	10-25	---	0
	9-12	6.1-7.8	1.0-3.0	10-25	---	0
	12-14	6.1-7.8	0.0-0.5	10-20	---	0
	14-51	6.1-7.8	0.0-0.5	10-20	---	0
	51-80	7.9-8.4	0.0-0.5	10-20	---	20-30
Dorval----------	0-18	5.1-7.8	50-95	100-160	---	0
	18-80	6.1-8.4	0.0-8.0	18-30	---	0-10

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	*pH*	*Pct*	*meq/100 g*	*meq/100 g*	*Pct*
361B:						
Allendale-------	0-11	4.5-7.3	2.0-5.0	4.0-20	---	0
	11-13	4.5-7.3	0.5-2.0	1.0-5.0	---	0
	13-22	4.5-7.3	0.5-3.0	1.0-5.0	---	0
	22-25	4.5-7.3	0.0-0.5	1.0-5.0	---	0
	25-44	6.1-8.4	0.0-0.5	8.0-25	---	0-10
	44-80	6.1-8.4	0.0-0.5	8.0-25	---	0-10
Dorval----------	0-18	5.1-7.8	50-95	100-160	---	0
	18-80	6.1-8.4	0.0-8.0	18-30	---	0-10
Blue Lake-------	0-3	5.1-6.5	2.0-5.0	1.0-5.0	---	0
	3-6	5.1-6.5	0.5-2.0	2.0-6.0	---	0
	6-25	5.1-6.5	0.5-3.0	2.0-6.0	---	0
	25-80	5.1-6.5	0.0-0.5	1.0-8.0	---	0
362D:						
Millersburg-----	0-3	3.5-6.5	2.0-5.0	---	5.0-20	0
	3-5	4.5-7.3	0.5-2.0	1.0-5.0	---	0
	5-18	4.5-7.3	0.0-0.5	1.0-5.0	---	0
	18-27	4.5-7.3	0.0-0.5	1.0-5.0	---	0
	27-33	6.1-7.8	0.0-0.5	2.0-5.0	---	0-10
	33-80	7.4-8.4	0.0-0.5	2.0-5.0	---	10-30
362E:						
Millersburg-----	0-3	3.5-6.5	2.0-5.0	---	5.0-20	0
	3-5	4.5-7.3	0.5-2.0	1.0-5.0	---	0
	5-18	4.5-7.3	0.0-0.5	1.0-5.0	---	0
	18-27	4.5-7.3	0.0-0.5	1.0-5.0	---	0
	27-33	6.1-7.8	0.0-0.5	2.0-5.0	---	0-10
	33-80	7.4-8.4	0.0-0.5	2.0-5.0	---	10-30
368A:						
Au Gres---------	0-1	3.5-7.3	70-90	140-180	---	0
	1-2	3.5-7.3	2.0-4.0	5.0-10	---	0
	2-10	4.5-7.3	0.5-2.0	2.0-5.0	---	0
	10-28	4.5-7.3	0.5-3.0	2.0-5.0	---	0
	28-32	4.5-7.3	0.0-0.5	2.0-5.0	---	0
	32-80	5.1-7.3	0.0-0.5	1.0-2.0	---	0
Deford----------	0-4	5.6-7.8	40-60	80-120	---	---
	4-5	5.6-7.8	2.0-5.0	1.0-5.0	---	0
	5-80	5.6-7.8	0.0-0.5	1.0-5.0	---	0
369:						
Deford----------	0-4	5.6-7.8	40-60	80-120	---	---
	4-5	5.6-7.8	2.0-5.0	1.0-5.0	---	0
	5-80	5.6-7.8	0.0-0.5	1.0-5.0	---	0
371:						
Springport------	0-3	6.6-7.8	2.0-5.0	15-30	---	0
	3-9	7.4-8.4	0.0-0.5	10-20	---	0-20
	9-13	7.4-8.4	0.0-0.5	10-20	---	0-20
	13-35	7.4-8.4	0.0-0.5	10-20	---	10-20
	35-80	7.4-8.4	0.0-0.5	10-20	---	20-30
373B:						
Grayling--------	0-2	3.6-5.5	2.0-5.0	---	2.0-10	0
	2-3	3.6-5.5	0.5-2.0	---	2.0-10	0
	3-15	4.5-6.5	0.5-1.0	1.0-2.0	---	0
	15-80	4.5-6.5	0.0-0.5	1.0-2.0	---	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	pH	Pct	meq/100 g	meq/100 g	Pct
374:						
Thunderbay------	0-14	6.6-7.8	2.0-6.0	5.0-20	---	0-10
	14-19	7.4-7.8	1.0-3.0	5.0-15	---	0-10
	19-24	7.4-8.4	1.0-3.0	5.0-15	---	0-20
	24-80	7.4-8.4	0.0-1.0	2.0-5.0	---	0-20
376A:						
Urban land.						
Udipsamments----	0-4	5.6-8.4	0.5-1.0	0.0-0.0	---	0-25
	4-42	7.4-8.4	0.0-0.0	0.0-1.0	---	10-25
	42-80	7.4-8.4	0.0-0.0	0.0-1.0	---	10-25
380:						
Access denied.						
392:						
Caffey----------	0-9	6.6-7.3	10-20	20-45	---	0
	9-21	6.6-8.4	---	1.0-5.0	---	0-20
	21-80	7.4-8.4	---	2.0-10	---	15-30
393B:						
Morganlake------	0-2	3.5-7.3	0.5-1.0	---	2.0-7.0	0
	2-6	3.5-6.0	0.1-1.0	---	1.0-7.0	0
	6-34	3.5-6.0	0.1-0.5	---	1.0-4.0	0
	34-37	5.6-7.8	0.0-0.5	5.0-14	---	0
	37-43	5.6-7.8	0.0-0.5	5.0-14	---	0
	43-80	7.4-8.4	0.0-0.5	5.0-14	---	10-30
393C:						
Morganlake------	0-2	3.5-7.3	0.5-1.0	---	2.0-7.0	0
	2-6	3.5-6.0	0.1-1.0	---	1.0-7.0	0
	6-34	3.5-6.0	0.1-0.5	---	1.0-4.0	0
	34-37	5.6-7.8	0.0-0.5	5.0-14	---	0
	37-43	5.6-7.8	0.0-0.5	5.0-14	---	0
	43-80	7.4-8.4	0.0-0.5	5.0-14	---	10-30
396F:						
Proper----------	0-3	3.5-5.5	1.0-4.0	3.0-10	---	0
	3-11	3.5-5.5	0.5-2.0	1.0-2.0	---	0
	11-24	3.5-5.5	0.5-3.0	1.0-4.0	---	0
	24-41	4.5-6.5	0.0-0.5	1.0-2.0	---	0
	41-80	4.5-6.5	0.0-0.5	1.0-2.0	---	0
Deford----------	0-4	5.6-7.8	40-60	80-120	---	---
	4-5	5.6-7.8	2.0-5.0	1.0-5.0	---	0
	5-80	5.6-7.8	0.0-0.5	1.0-5.0	---	0
Rousseau--------	0-1	4.5-6.0	65-85	---	80-120	0
	1-3	4.5-6.0	1.0-2.0	---	3.0-10	0
	3-6	4.5-6.0	1.0-2.0	---	3.0-10	0
	6-23	4.5-6.5	0.6-1.0	1.0-5.0	---	0
	23-37	4.5-6.5	0.6-1.0	1.0-5.0	---	0
	37-80	5.1-7.3	0.0-0.5	1.0-2.0	---	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	*pH*	*Pct*	*meq/100 g*	*meq/100 g*	*Pct*
397:						
Spot------------	0-3	4.5-5.0	65-85	---	130-170	---
	3-6	4.5-5.0	65-85	---	130-170	---
	6-13	4.5-5.5	0.5-2.0	---	1.0-4.0	0
	13-15	4.5-5.5	0.5-3.0	---	1.0-4.0	0
	15-21	4.5-5.5	2.0-5.0	---	1.0-5.0	0
	21-28	5.1-6.0	0.5-2.0	---	1.0-4.0	0
	28-80	5.6-6.5	0.0-0.5	1.0-2.0	---	0
414B:						
Namur-----------	0-5	6.6-8.4	2.0-4.0	6.0-25	---	0-20
	5-9	---	---	---	---	---
415A:						
Potagannissing--	0-6	6.6-8.4	2.0-4.0	5.0-20	---	0-10
	6-9	7.9-8.4	0.1-1.0	5.0-20	---	10-20
	9-11	---	---	---	---	---
416B:						
Negwegon--------	0-9	6.1-7.8	1.0-3.0	10-25	---	0
	9-12	6.1-7.8	1.0-3.0	10-25	---	0
	12-14	6.1-7.8	0.0-0.5	10-20	---	0
	14-51	6.1-7.8	0.0-0.5	10-20	---	0
	51-62	7.9-8.4	0.0-0.5	10-20	---	20-30
	62-80	7.9-8.4	0.0-0.5	10-20	---	20-30
417B:						
Alpena----------	0-6	6.6-7.8	2.0-4.0	5.0-15	---	---
	6-80	7.4-8.4	0.0-0.5	0.0-2.0	---	10-25
417C:						
Alpena----------	0-6	6.6-7.8	2.0-4.0	5.0-15	---	---
	6-80	7.4-8.4	0.0-0.5	0.0-2.0	---	10-25
418E:						
Alpena----------	0-6	6.6-7.8	2.0-4.0	5.0-15	---	---
	6-80	7.4-8.4	0.0-0.5	0.0-2.0	---	10-25
419:						
Chippeny--------	0-19	6.1-7.8	55-75	110-150	---	0
	19-24	6.6-8.4	---	1.0-18	---	1-20
	24-26	---	---	---	---	---
420A:						
Otisco----------	0-5	4.5-6.5	10-15	20-30	---	0
	5-10	5.1-6.5	0.0-0.5	1.0-5.0	---	0
	10-25	5.1-6.5	0.0-0.5	1.0-5.0	---	0
	25-45	5.6-7.8	0.0-0.5	1.0-10	---	0
	45-60	5.6-7.8	0.0-0.5	1.0-5.0	---	0
	60-80	5.6-8.4	0.0-0.5	1.0-5.0	---	0
424B:						
Morganlake------	0-4	6.1-7.3	70-90	140-180	---	0
	4-8	3.5-6.0	0.5-2.0	---	1.0-7.0	0
	8-17	3.5-6.0	0.5-3.0	---	1.0-4.0	0
	17-32	5.6-7.8	0.0-0.5	5.0-14	---	0
	32-36	5.6-7.8	0.0-0.5	5.0-14	---	0
	36-46	5.6-7.8	0.0-0.5	5.0-14	---	0
	46-66	7.4-8.4	0.0-0.5	5.0-14	---	10-30
	66-80	7.4-8.4	0.0-0.5	5.0-14	---	10-30

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	pH	Pct	meq/100 g	meq/100 g	Pct
424B:						
Ossineke--------	0-8	5.1-6.5	1.0-3.0	---	3.0-14	0
	8-13	5.1-6.0	0.0-0.5	1.0-8.0	---	0
	13-21	5.1-6.0	0.0-0.5	2.0-11	---	0
	21-38	5.6-6.5	0.0-0.5	3.0-14	---	0
	38-51	6.6-8.4	0.0-0.5	3.0-14	---	0-10
	51-77	7.4-8.4	0.0-0.5	2.0-14	---	10-30
	77-80	7.4-8.4	0.1-1.0	1.0-7.0	---	10-30
Blue Lake-------	0-3	5.1-6.5	2.0-5.0	1.0-5.0	---	0
	3-6	5.1-6.5	0.5-2.0	2.0-6.0	---	0
	6-25	5.1-6.5	0.5-3.0	2.0-6.0	---	0
	25-80	5.1-6.5	0.0-0.5	1.0-8.0	---	0
424C:						
Morganlake------	0-4	6.1-7.3	70-90	140-180	---	0
	4-8	3.5-6.0	0.5-2.0	---	1.0-7.0	0
	8-17	3.5-6.0	0.5-3.0	---	1.0-4.0	0
	17-32	5.6-7.8	0.0-0.5	5.0-14	---	0
	32-36	5.6-7.8	0.0-0.5	5.0-14	---	0
	36-46	5.6-7.8	0.0-0.5	5.0-14	---	0
	46-66	7.4-8.4	0.0-0.5	5.0-14	---	10-30
	66-80	7.4-8.4	0.0-0.5	5.0-14	---	10-30
Ossineke--------	0-8	4.5-6.0	1.0-3.0	---	3.0-14	0
	8-13	5.1-6.0	0.0-0.5	1.0-8.0	---	0
	13-21	5.1-6.0	0.0-0.5	2.0-11	---	0
	21-38	5.6-6.5	0.0-0.5	3.0-14	---	0
	38-51	6.6-8.4	0.0-0.5	3.0-14	---	0-10
	51-77	7.4-8.4	0.0-0.5	2.0-14	---	10-30
	77-80	7.4-8.4	0.1-1.0	1.0-7.0	---	10-30
Blue Lake-------	0-3	5.1-6.5	2.0-5.0	1.0-5.0	---	0
	3-6	5.1-6.5	0.5-2.0	2.0-6.0	---	0
	6-25	5.1-6.5	0.5-3.0	2.0-6.0	---	0
	25-80	5.1-6.5	0.0-0.5	1.0-8.0	---	0
426B:						
Coppler---------	0-3	4.5-7.3	0.5-3.0	---	2.0-10	0
	3-4	4.5-7.3	0.0-0.5	1.0-6.0	---	0
	4-14	4.5-7.3	0.0-0.5	1.0-6.0	---	0
	14-21	4.5-7.3	0.0-0.5	1.0-6.0	---	0
	21-26	6.6-7.3	0.0-0.5	2.0-10	---	0
	26-80	7.4-8.4	0.0-0.5	1.0-2.0	---	10-25
426C:						
Coppler---------	0-3	4.5-7.3	0.5-3.0	---	2.0-10	0
	3-4	4.5-7.3	0.0-0.5	1.0-6.0	---	0
	4-14	4.5-7.3	0.0-0.5	1.0-6.0	---	0
	14-21	4.5-7.3	0.0-0.5	1.0-6.0	---	0
	21-26	6.6-7.3	0.0-0.5	2.0-10	---	0
	26-80	7.4-8.4	0.0-0.5	1.0-2.0	---	10-25
426D:						
Coppler---------	0-3	4.5-7.3	0.5-3.0	---	2.0-10	0
	3-4	4.5-7.3	0.0-0.5	1.0-6.0	---	0
	4-14	4.5-7.3	0.0-0.5	1.0-6.0	---	0
	14-21	4.5-7.3	0.0-0.5	1.0-6.0	---	0
	21-26	6.6-7.3	0.0-0.5	2.0-10	---	0
	26-80	7.4-8.4	0.0-0.5	1.0-2.0	---	10-25

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	*pH*	*Pct*	*meq/100 g*	*meq/100 g*	*Pct*
451C:						
Annalake--------	0-9	4.5-7.3	1.0-3.0	3.0-20	---	0
	9-11	4.5-7.3	0.5-1.0	1.0-15	---	0
	11-16	4.5-6.0	1.0-2.0	---	3.0-15	0
	16-30	4.5-7.3	0.0-0.5	1.0-15	---	0
	30-37	4.5-7.3	0.0-0.5	2.0-15	---	0
	37-46	4.5-7.3	0.0-0.5	2.0-15	---	0
	46-80	5.1-8.4	0.0-0.5	1.0-15	---	0-10
477B:						
Algonquin-------	0-5	5.6-7.3	2.0-3.0	10-25	---	0
	5-7	5.6-7.3	0.5-2.0	10-25	---	0
	7-19	6.1-8.4	0.0-0.5	10-20	---	0-10
	19-55	7.9-8.4	0.0-0.5	10-20	---	10-30
	55-65	7.9-8.4	0.0-0.5	10-20	---	20-30
	65-80	7.9-8.4	0.0-0.5	2.0-10	---	15-30
Springport------	0-9	6.6-7.8	2.0-5.0	10-30	---	0
	9-16	7.4-8.4	0.0-0.5	10-20	---	0-20
	16-23	7.4-8.4	0.0-0.5	10-20	---	10-20
	23-67	7.4-8.4	0.0-0.5	10-20	---	20-30
	67-80	7.8-8.4	0.0-0.5	2.0-15	---	1-10
478:						
Springport------	0-9	6.6-7.8	2.0-5.0	10-30	---	0
	9-16	7.4-8.4	0.0-0.5	10-20	---	0-20
	16-23	7.4-8.4	0.0-0.5	10-20	---	10-20
	23-67	7.4-8.4	0.0-0.5	10-20	---	20-30
	67-80	7.8-8.4	0.0-0.5	2.0-15	---	1-10
479A:						
Algonquin-------	0-5	5.6-7.3	2.0-3.0	10-25	---	0
	5-7	5.6-7.3	0.5-2.0	10-25	---	0
	7-19	6.1-8.4	0.0-0.5	10-20	---	0-10
	19-55	7.9-8.4	0.0-0.5	10-20	---	10-30
	55-65	7.9-8.4	0.0-0.5	10-20	---	20-30
	65-80	7.9-8.4	0.0-0.5	2.0-10	---	15-30
480B:						
Negwegon--------	0-9	6.1-7.8	1.0-3.0	10-25	---	0
	9-12	6.1-7.8	1.0-3.0	10-25	---	0
	12-14	6.1-7.8	0.0-0.5	10-20	---	0
	14-51	6.1-7.8	0.0-0.5	10-20	---	0
	51-80	7.9-8.4	0.0-0.5	10-20	---	20-30
Algonquin-------	0-5	5.6-7.3	2.0-3.0	10-25	---	0
	5-7	5.6-7.3	0.5-2.0	10-25	---	0
	7-19	6.1-8.4	0.0-0.5	10-20	---	0-10
	19-55	7.9-8.4	0.0-0.5	10-20	---	10-30
	55-80	7.9-8.4	0.0-0.5	10-20	---	20-30
Lupton----------	0-4	5.6-7.8	70-90	140-180	---	0
	4-80	5.6-7.8	70-90	140-180	---	0
481C:						
Negwegon--------	0-9	6.1-7.8	1.0-3.0	10-25	---	0
	9-12	6.1-7.8	1.0-3.0	10-25	---	0
	12-14	6.1-7.8	0.0-0.5	10-20	---	0
	14-51	6.1-7.8	0.0-0.5	10-20	---	0
	51-80	7.9-8.4	0.0-0.5	10-20	---	20-30

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	*pH*	*Pct*	*meq/100 g*	*meq/100 g*	*Pct*
481C:						
Lupton----------	0-4	5.6-7.8	70-90	140-180	---	0
	4-80	5.6-7.8	70-90	140-180	---	0
482B:						
Summerville-----	0-5	6.1-7.8	1.0-2.0	5.0-15	---	0
	5-16	6.1-8.4	0.0-0.5	2.0-15	---	0-30
	16-18	---	---	---	---	---
482C:						
Summerville-----	0-5	6.1-7.8	1.0-2.0	5.0-15	---	0
	5-16	6.1-8.4	0.0-0.5	2.0-15	---	0-30
	16-18	---	---	---	---	---
483A:						
Lachine---------	0-9	7.4-7.8	1.0-3.0	4.0-15	---	0-15
	9-13	7.4-7.8	0.0-0.5	2.0-10	---	0-15
	13-16	7.4-7.8	0.0-0.0	2.0-10	---	10-30
	16-20	---	---	---	---	---
484A:						
Elcajon---------	0-6	6.6-7.8	1.0-3.0	3.0-15	---	0
	6-12	6.6-7.8	0.0-0.5	1.0-10	---	0
	12-29	6.6-7.8	0.0-0.0	5.0-15	---	0
	29-37	7.3-8.4	0.0-0.0	1.0-10	---	10-30
	37-41	---	---	---	---	---
485A:						
Bowers----------	0-10	5.6-7.3	1.0-3.0	5.0-20	---	0
	10-14	5.6-7.3	0.0-0.5	5.0-15	---	0
	14-27	6.1-7.3	0.0-0.5	5.0-20	---	0-20
	27-80	7.4-8.4	0.0-0.5	5.0-20	---	20-40
486B:						
Tonkey----------	0-7	5.6-7.8	4.0-7.0	10-25	---	0
	7-22	5.6-7.8	0.0-0.5	2.0-10	---	0
	22-80	7.4-8.4	0.0-0.5	1.0-10	---	0-10
Bowers----------	0-10	5.6-7.3	1.0-3.0	5.0-20	---	0
	10-14	5.6-7.3	0.0-0.5	5.0-15	---	0
	14-27	6.1-7.3	0.0-0.5	5.0-20	---	0-20
	27-80	7.4-8.4	0.0-0.5	5.0-20	---	20-40
487B:						
Slade-----------	0-5	5.6-6.5	2.0-5.0	5.0-25	---	0
	5-7	5.6-6.5	0.5-1.0	1.0-15	---	0
	7-9	5.6-7.3	0.1-0.8	2.0-20	---	0
	9-26	6.6-7.3	0.0-0.5	4.0-25	---	0
	26-60	7.9-8.4	0.0-0.5	2.0-15	---	1-10
	60-80	7.9-8.4	0.0-0.5	2.0-15	---	1-10
Angelica--------	0-8	6.1-7.8	2.0-12	5.0-30	---	0
	8-29	6.1-8.4	0.0-0.5	3.0-15	---	0-15
	29-80	7.9-8.4	0.0-0.5	2.0-10	---	15-30

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Effective cation-exchange capacity	Calcium carbonate equivalent
	In	*pH*	*Pct*	*meq/100 g*	*meq/100 g*	*Pct*
489F:						
Crowell---------	0-2	5.6-6.0	2.0-5.0	---	2.0-5.0	0
	2-5	5.1-5.5	0.5-2.0	---	2.0-5.0	0
	5-10	5.1-6.0	0.5-3.0	---	1.0-4.0	0
	10-29	5.1-6.0	0.5-3.0	---	1.0-2.0	0
	29-80	5.6-6.5	0.0-0.5	1.0-2.0	---	0
Proper----------	0-3	3.5-5.5	1.0-4.0	3.0-10	---	0
	3-11	3.5-5.5	0.5-2.0	1.0-2.0	---	0
	11-24	3.5-5.5	0.5-3.0	1.0-4.0	---	0
	24-41	4.5-6.5	0.0-0.5	1.0-2.0	---	0
	41-80	4.5-6.5	0.0-0.5	1.0-2.0	---	0

Table 21.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Restrictive layer			Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Initial	Total		Uncoated steel	Concrete
		In	In	In	In			
11B:								
Eastport	---	---	---	0	---	Low	Low	Moderate
12B:								
Tawas	---	---	---	4-15	25-30	High	High	Moderate
Au Gres	---	---	---	0	---	Moderate	Low	Moderate
13:								
Tawas	---	---	---	4-15	25-30	High	High	Moderate
Lupton	---	---	---	6-18	50-55	High	High	Low
14:								
Dawson	---	---	---	0	30-36	High	High	High
Loxley	---	---	---	6-18	50-55	High	High	High
16B:								
Graycalm	---	---	---	0	---	Low	Low	Moderate
16C:								
Graycalm	---	---	---	0	---	Low	Low	Moderate
16D:								
Graycalm	---	---	---	0	---	Low	Low	Moderate
16E:								
Graycalm	---	---	---	0	---	Low	Low	Moderate
17A:								
Croswell	---	---	---	0	---	Low	Low	Moderate
17B:								
Croswell	---	---	---	0	---	Low	Low	Moderate
18A:								
Au Gres	---	---	---	0	---	Moderate	Low	Moderate
19:								
Leafriver	---	---	---	0	5-10	High	High	High
27A:								
Tacoda	---	---	---	0	---	Moderate	Low	Moderate
28B:								
East Lake	---	---	---	0	---	Low	Low	Moderate
28C:								
East Lake	---	---	---	0	---	Low	Low	Moderate
29A:								
Battlefield	---	---	---	0	---	Moderate	High	High
30:								
Wheatley	---	---	---	0	---	Moderate	High	Low

Table 21.--Soil Features--Continued

Map symbol and soil name	Restrictive layer			Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Initial	Total		Uncoated steel	Concrete
		In	*In*	*In*	*In*			
31B:								
Klacking------	---	---	---	0	---	Low	Low	Moderate
31C:								
Klacking------	---	---	---	0	---	Low	Low	Moderate
31D:								
Klacking------	---	---	---	0	---	Low	Low	Moderate
31E:								
Klacking------	---	---	---	0	---	Low	Low	Moderate
35:								
Kinross-------	---	---	---	0	---	Moderate	High	Moderate
36B:								
Annalake------	---	---	---	0	---	Moderate	Moderate	Low
36C:								
Annalake------	---	---	---	0	---	Moderate	Moderate	Low
37A:								
Richter-------	---	---	---	0	---	High	High	Moderate
37B:								
Richter-------	---	---	---	0	---	High	High	Moderate
38:								
Tonkey--------	---	---	---	0	---	High	High	Low
41B:								
McGinn--------	---	---	---	0	---	Moderate	Low	Moderate
41C:								
McGinn--------	---	---	---	0	---	Moderate	Low	Moderate
41D:								
McGinn--------	---	---	---	0	---	Moderate	Low	Moderate
41E:								
McGinn--------	---	---	---	0	---	Moderate	Low	Moderate
42A:								
Killmaster----	---	---	---	0	---	High	Low	Low
43:								
Wakeley-------	---	---	---	0	---	Moderate	High	Moderate
44B:								
Ossineke------	---	---	---	0	---	Moderate	Moderate	Moderate
44C:								
Ossineke------	---	---	---	0	---	Moderate	Moderate	Moderate
45B:								
Hoist---------	---	---	---	0	---	Moderate	Low	Low
45C:								
Hoist---------	---	---	---	0	---	Moderate	Low	Low
46:								
Ensley--------	---	---	---	0	---	High	High	Low

Table 21.--Soil Features--Continued

Map symbol and soil name	Restrictive layer			Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Initial	Total		Uncoated steel	Concrete
		In	*In*	*In*	*In*			
47D:								
Graycalm------	---	---	---	0	---	Low	Low	Moderate
53B:								
Negwegon------	---	---	---	0	---	Moderate	High	Low
53C:								
Negwegon------	---	---	---	0	---	Moderate	High	Low
54A:								
Algonquin-----	---	---	---	0	---	High	High	Low
55:								
Springport----	---	---	---	0	---	High	High	Low
57B:								
Kawkawlin-----	---	---	---	0	---	High	High	Low
59B:								
Algonquin-----	---	---	---	0	---	High	High	Low
Springport----	---	---	---	0	---	High	High	Low
62A:								
Allendale-----	---	---	---	0	---	Moderate	High	Moderate
63D:								
Bamfield------	---	---	---	0	---	Moderate	Moderate	Moderate
63E:								
Bamfield------	---	---	---	0	---	Moderate	Moderate	Moderate
68:								
Rondeau-------	---	---	---	0	35	High	High	Low
69:								
Loxley--------	---	---	---	6-18	50-55	High	High	High
70:								
Lupton--------	---	---	---	6-18	50-55	High	High	Low
71:								
Tawas---------	---	---	---	4-15	25-30	High	High	Moderate
72:								
Dorval--------	---	---	---	4-12	25-30	High	High	Moderate
74C2:								
Negwegon------	---	---	---	0	---	Moderate	High	Low
75B:								
Rubicon-------	---	---	---	0	---	Low	Low	High
75D:								
Rubicon-------	---	---	---	0	---	Low	Low	High
75E:								
Rubicon-------	---	---	---	0	---	Low	Low	High
77:								
Rollaway------	---	---	---	0	---	High	Moderate	Low

Table 21.--Soil Features--Continued

Map symbol and soil name	Restrictive layer			Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Initial	Total		Uncoated steel	Concrete
		In	*In*	*In*	*In*			
78:								
Pits, borrow.								
82B:								
Udorthents.								
82C:								
Udorthents.								
83B:								
Udipsamments--	---	---	---	0	---	Low	Low	Moderate
83F:								
Udipsamments--	---	---	---	0	---	Low	Low	Moderate
84B:								
Zimmerman-----	---	---	---	0	---	Low	Low	High
84C:								
Zimmerman-----	---	---	---	0	---	Low	Low	High
84E:								
Zimmerman-----	---	---	---	0	---	Low	Low	High
85D:								
Zimmerman-----	---	---	---	0	---	Low	Low	High
Annalake------	---	---	---	0	---	Moderate	Moderate	Low
86:								
Histosols-----	---	---	---	0	---	High	---	---
Aquents-------	---	---	---	0	---	High	---	---
87:								
Ausable-------	---	---	---	0	---	Moderate	High	Low
90B:								
Chinwhisker---	---	---	---	0	---	Low	Low	Moderate
92B:								
Klacking------	---	---	---	0	---	Low	Low	Moderate
McGinn--------	---	---	---	0	---	Moderate	Low	Moderate
92C:								
Klacking------	---	---	---	0	---	Low	Low	Moderate
McGinn--------	---	---	---	0	---	Moderate	Low	Moderate
93B:								
Tacoda--------	---	---	---	0	---	Moderate	Low	Moderate
Wakeley-------	---	---	---	0	---	Moderate	High	Moderate
94F:								
Klacking------	---	---	---	0	---	Low	Low	Moderate
McGinn--------	---	---	---	0	---	Moderate	Low	Moderate
97:								
Colonville----	---	---	---	0	---	High	Low	Low

Table 21.--Soil Features--Continued

Map symbol and soil name	Restrictive layer			Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Initial	Total		Uncoated steel	Concrete
		In	In	In	In			
113:								
Angelica------	---	---	---	0	---	High	High	Low
116C:								
Mancelona-----	---	---	---	0	---	Low	Low	Low
127:								
Cathro--------	---	---	---	4-12	19-22	High	High	Low
128:								
Dawson--------	---	---	---	0	30-36	High	High	High
145C:								
Rousseau------	---	---	---	0	---	Low	Low	Moderate
145E:								
Rousseau------	---	---	---	0	---	Low	Low	Moderate
159A:								
Finch---------	Ortstein	10-16	0-3	0	---	Moderate	High	Moderate
166A:								
Slade---------	---	---	---	0	---	High	Moderate	Moderate
182:								
Pits, quarry--	Bedrock (lithic)	0-4	---	---	---	---	---	---
300A:								
Hagensville---	---	---	---	0	---	High	Moderate	Low
304A:								
Iosco---------	---	---	---	0	---	Moderate	High	Low
305B:								
Johnswood-----	---	---	---	0	---	Moderate	Moderate	Low
308B:								
Krakow--------	---	---	---	0	---	Moderate	Low	Low
308C:								
Krakow--------	---	---	---	0	---	Moderate	Low	Low
308D:								
Krakow--------	---	---	---	0	---	Moderate	Low	Low
316:								
Ruse----------	Bedrock (lithic)	10-20	---	0	---	High	High	Low
350E:								
Blue Lake-----	---	---	---	0	---	Low	Low	Moderate
359C:								
Algonquin-----	---	---	---	0	---	High	High	Low
Negwegon------	---	---	---	0	---	Moderate	High	Low
Dorval--------	---	---	---	4-12	25-30	High	High	Moderate
361B:								
Allendale-----	---	---	---	0	---	Moderate	High	Moderate
Dorval--------	---	---	---	4-12	25-30	High	High	Moderate

Table 21.--Soil Features--Continued

Map symbol and soil name	Restrictive layer			Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Initial	Total		Uncoated steel	Concrete
		In	*In*	*In*	*In*			
361B:								
Blue Lake	---	---	---	0	---	Low	Low	Moderate
362D:								
Millersburg	---	---	---	0	---	Moderate	Low	Moderate
362E:								
Millersburg	---	---	---	0	---	Moderate	Low	Moderate
368A:								
Au Gres	---	---	---	0	---	Moderate	Low	Moderate
Deford	---	---	---	0	---	Moderate	Low	Moderate
369:								
Deford	---	---	---	0	---	Moderate	Low	Moderate
371:								
Springport	---	---	---	0	---	High	High	Low
373B:								
Grayling	---	---	---	0	---	Low	Low	Moderate
374:								
Thunderbay	---	---	---	0	---	High	High	Low
376A:								
Urban land.								
Udipsamments	---	---	---	0	---	Low	Moderate	Low
380:								
Access denied.								
392:								
Caffey	---	---	---	0	---	Moderate	High	Low
393B:								
Morganlake	---	---	---	0	---	Low	Low	Moderate
393C:								
Morganlake	---	---	---	0	---	Low	Low	Moderate
396F:								
Proper	Ortstein	6-15	0-3	0	---	Low	Low	Moderate
Deford	---	---	---	0	---	Moderate	Low	Moderate
Rousseau	---	---	---	0	---	Low	Low	Moderate
397:								
Spot	Ortstein	6-15	0-3	0	---	Moderate	High	Moderate
414B:								
Namur	Bedrock (lithic)	4-10	---	0	---	Moderate	Moderate	Low
415A:								
Potagannissing	Bedrock (lithic)	5-10	---	0	---	High	High	Low
416B:								
Negwegon	---	---	---	0	---	Moderate	High	Low

Table 21.--Soil Features--Continued

Map symbol and soil name	Restrictive layer: Kind	Restrictive layer: Depth to top	Restrictive layer: Thickness	Subsidence: Initial	Subsidence: Total	Potential for frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
		In	*In*	*In*	*In*			
417B:								
Alpena--------	---	---	---	0	---	Low	Low	Low
417C:								
Alpena--------	---	---	---	0	---	Low	Low	Low
418E:								
Alpena--------	---	---	---	0	---	Low	Low	Low
419:								
Chippeny------	Bedrock (lithic)	20-51	---	4-10	15-18	High	High	Moderate
420A:								
Otisco--------	---	---	---	0	---	Moderate	Low	Moderate
424B:								
Morganlake----	---	---	---	0	---	Low	Low	Moderate
Ossineke------	---	---	---	0	---	Moderate	Moderate	Moderate
Blue Lake-----	---	---	---	0	---	Low	Low	Moderate
424C:								
Morganlake----	---	---	---	0	---	Low	Low	Moderate
Ossineke------	---	---	---	0	---	Moderate	Moderate	Moderate
Blue Lake-----	---	---	---	0	---	Low	Low	Moderate
426B:								
Coppler-------	---	---	---	0	---	Low	Low	Low
426C:								
Coppler-------	---	---	---	0	---	Low	Low	Low
426D:								
Coppler-------	---	---	---	0	---	Low	Low	Low
451C:								
Annalake------	---	---	---	0	---	Moderate	Moderate	Low
477B:								
Algonquin-----	---	---	---	0	---	High	High	Low
Springport----	---	---	---	0	---	High	High	Low
478:								
Springport----	---	---	---	0	---	High	High	Low
479A:								
Algonquin-----	---	---	---	0	---	High	High	Low
480B:								
Negwegon------	---	---	---	0	---	Moderate	High	Low
Algonquin-----	---	---	---	0	---	High	High	Low
Lupton--------	---	---	---	6-18	50-55	High	High	Low
481C:								
Negwegon------	---	---	---	0	---	Moderate	High	Low

Table 21.--Soil Features--Continued

Map symbol and soil name	Restrictive layer			Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Initial	Total		Uncoated steel	Concrete
		In	*In*	*In*	*In*			
481C:								
Lupton--------	---	---	---	6-18	50-55	High	High	Low
482B:								
Summerville---	Bedrock (lithic)	10-20	---	0	---	Moderate	Low	Low
482C:								
Summerville---	Bedrock (lithic)	10-20	---	0	---	Moderate	Low	Low
483A:								
Lachine-------	Bedrock (lithic)	10-20	---	0	---	High	High	Low
484A:								
Elcajon-------	Bedrock (lithic)	20-40	---	0	---	High	High	Low
485A:								
Bowers--------	---	---	---	0	---	High	High	Low
486B:								
Tonkey--------	---	---	---	0	---	High	High	Low
Bowers--------	---	---	---	0	---	High	High	Low
487B:								
Slade---------	---	---	---	0	---	High	Moderate	Moderate
Angelica------	---	---	---	0	---	High	High	Low
489F:								
Crowell-------	Ortstein	10-20	0-3	0	---	Low	Low	High
Proper--------	Ortstein	6-15	0-3	0	---	Low	Low	Moderate

Table 22.--Water Features

(See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydrologic group	Month	Water table: Upper limit	Water table: Lower limit	Water table: Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	*Ft*		*Ft*				
11B:										
Eastport	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
12B:										
Tawas	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
Au Gres	B	Jan-Feb	1.5	>6.0	Apparent	---	---	---	---	None
		Mar	1.0	>6.0	Apparent	---	---	---	---	None
		Apr-May	0.5	>6.0	Apparent	---	---	---	---	None
		Jun	1.0	>6.0	Apparent	---	---	---	---	None
		Jul	2.0	>6.0	Apparent	---	---	---	---	None
		Aug	3.0	>6.0	Apparent	---	---	---	---	None
		Sep	2.0	>6.0	Apparent	---	---	---	---	None
		Oct-Nov	1.0	>6.0	Apparent	---	---	---	---	None
		Dec	1.5	>6.0	Apparent	---	---	---	---	None
13:										
Tawas	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
Lupton	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
14:										
Dawson	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
Loxley	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
16B:										
Graycalm	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
16C:										
Graycalm	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
16D:										
Graycalm	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft		Ft				
16E:										
Graycalm	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
17A:										
Croswell	A	Jan-Feb	5.0	>6.0	Apparent	---	---	---	---	None
		Mar	2.5	>6.0	Apparent	---	---	---	---	None
		Apr-May	2.0	>6.0	Apparent	---	---	---	---	None
		Jun	3.5	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	4.5	>6.0	Apparent	---	---	---	---	None
		Oct	3.0	>6.0	Apparent	---	---	---	---	None
		Nov	2.5	>6.0	Apparent	---	---	---	---	None
		Dec	2.0	>6.0	Apparent	---	---	---	---	None
17B:										
Croswell	A	Jan-Feb	5.0	>6.0	Apparent	---	---	---	---	None
		Mar	2.5	>6.0	Apparent	---	---	---	---	None
		Apr-May	2.0	>6.0	Apparent	---	---	---	---	None
		Jun	3.5	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	4.5	>6.0	Apparent	---	---	---	---	None
		Oct	3.0	>6.0	Apparent	---	---	---	---	None
		Nov	2.5	>6.0	Apparent	---	---	---	---	None
		Dec	2.0	>6.0	Apparent	---	---	---	---	None
18A:										
Au Gres	B	Jan-Feb	1.5	>6.0	Apparent	---	---	---	---	None
		Mar	1.0	>6.0	Apparent	---	---	---	---	None
		Apr-May	0.5	>6.0	Apparent	---	---	---	---	None
		Jun	1.0	>6.0	Apparent	---	---	---	---	None
		Jul	2.0	>6.0	Apparent	---	---	---	---	None
		Aug	3.0	>6.0	Apparent	---	---	---	---	None
		Sep	2.0	>6.0	Apparent	---	---	---	---	None
		Oct-Nov	1.0	>6.0	Apparent	---	---	---	---	None
		Dec	1.5	>6.0	Apparent	---	---	---	---	None
19:										
Leafriver	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
27A:										
Tacoda	C	Jan-Mar	1.0	3.0	Perched	---	---	---	---	None
		Apr-May	0.5	3.0	Perched	---	---	---	---	None
		Jun	1.0	3.0	Perched	---	---	---	---	None
		Jul-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep-Dec	1.0	3.0	Perched	---	---	---	---	None
28B:										
East Lake	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
28C:										
East Lake	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Water table: Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	*Ft*		*Ft*				
29A:										
Battlefield-----------	A/D	Jan-Feb	1.5	>6.0	Apparent	---	---	---	---	None
		Mar	1.0	>6.0	Apparent	---	---	---	---	None
		Apr-May	0.5	>6.0	Apparent	---	---	---	---	None
		Jun	1.0	>6.0	Apparent	---	---	---	---	None
		Jul	2.0	>6.0	Apparent	---	---	---	---	None
		Aug	3.0	>6.0	Apparent	---	---	---	---	None
		Sep	2.0	>6.0	Apparent	---	---	---	---	None
		Oct-Nov	1.0	>6.0	Apparent	---	---	---	---	None
		Dec	1.5	>6.0	Apparent	---	---	---	---	None
30:										
Wheatley--------------	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
31B:										
Klacking--------------	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
31C:										
Klacking--------------	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
31D:										
Klacking--------------	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
31E:										
Klacking--------------	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
35:										
Kinross---------------	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
36B:										
Annalake--------------	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	>6.0	Apparent	---	---	---	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep-Nov	2.5	>6.0	Apparent	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
36C:										
Annalake--------------	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	>6.0	Apparent	---	---	---	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep-Nov	2.5	>6.0	Apparent	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
37A:										
Richter---------------	B	Jan-Feb	1.5	>6.0	Apparent	---	---	---	---	None
		Mar	1.0	>6.0	Apparent	---	---	---	---	None
		Apr-May	0.5	>6.0	Apparent	---	---	---	---	None
		Jun	1.0	>6.0	Apparent	---	---	---	---	None
		Jul	2.0	>6.0	Apparent	---	---	---	---	None
		Aug	3.0	>6.0	Apparent	---	---	---	---	None
		Sep	2.0	>6.0	Apparent	---	---	---	---	None
		Oct-Nov	1.0	>6.0	Apparent	---	---	---	---	None
		Dec	1.5	>6.0	Apparent	---	---	---	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Water table: Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft		Ft				
37B:										
Richter	B	Jan-Feb	1.5	>6.0	Apparent	---	---	---	---	None
		Mar	1.0	>6.0	Apparent	---	---	---	---	None
		Apr-May	0.5	>6.0	Apparent	---	---	---	---	None
		Jun	1.0	>6.0	Apparent	---	---	---	---	None
		Jul	2.0	>6.0	Apparent	---	---	---	---	None
		Aug	3.0	>6.0	Apparent	---	---	---	---	None
		Sep	2.0	>6.0	Apparent	---	---	---	---	None
		Oct-Nov	1.0	>6.0	Apparent	---	---	---	---	None
		Dec	1.5	>6.0	Apparent	---	---	---	---	None
38:										
Tonkey	B/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.5	>6.0	Apparent	---	---	---	---	None
		Jul	1.5	>6.0	Apparent	---	---	---	---	None
		Aug	2.0	>6.0	Apparent	---	---	---	---	None
		Sep	1.0	>6.0	Apparent	---	---	---	---	None
		Oct-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
41B:										
McGinn	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
41C:										
McGinn	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
41D:										
McGinn	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
41E:										
McGinn	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
42A:										
Killmaster	C	Jan-Apr	1.0	3.0	Perched	---	---	---	---	None
		May	1.0	1.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Dec	1.0	3.0	Perched	---	---	---	---	None
43:										
Wakeley	D	Jan-May	0.0	2.0	Perched	0.0-1.0	Long	Frequent	---	None
		Jun	0.0	2.0	Perched	---	---	---	---	None
		Jul-Aug	0.5	2.0	Perched	---	---	---	---	None
		Sep-Oct	0.0	2.0	Perched	---	---	---	---	None
		Nov-Dec	0.0	2.0	Perched	0.0-1.0	Long	Frequent	---	None
44B:										
Ossineke	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	1.5	3.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Nov	1.5	3.5	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
44C:										
Ossineke	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	1.5	3.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Nov	1.5	3.5	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Water table: Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	*Ft*		*Ft*				
45B:										
Hoist	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar	2.5	3.5	Perched	---	---	---	---	None
		Apr	2.5	3.0	Perched	---	---	---	---	None
		May	2.5	3.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Nov	2.5	3.5	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
45C:										
Hoist	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	3.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Nov	2.5	3.5	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
46:										
Ensley	B/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.5	>6.0	Apparent	---	---	---	---	None
		Jul	1.5	>6.0	Apparent	---	---	---	---	None
		Aug	2.0	>6.0	Apparent	---	---	---	---	None
		Sep	1.0	>6.0	Apparent	---	---	---	---	None
		Oct-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
47D:										
Graycalm	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
53B:										
Negwegon	C	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	3.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Nov	2.5	3.5	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
53C:										
Negwegon	C	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	3.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct	2.5	3.5	Perched	---	---	---	---	None
		Nov	2.5	3.0	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
54A:										
Algonquin	D	Jan-Mar	1.0	1.5	Perched	---	---	---	---	None
		Apr-May	0.5	1.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Dec	1.0	1.5	Perched	---	---	---	---	None
55:										
Springport	D	Jan-May	0.0	1.5	Perched	0.0-1.0	Long	Frequent	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	0.0	1.5	Perched	---	---	---	---	None
		Oct-Dec	0.0	1.5	Perched	0.0-1.0	Long	Frequent	---	None
57B:										
Kawkawlin	C	Jan-May	1.0	1.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Dec	1.0	1.5	Perched	---	---	---	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft		Ft				
59B:										
Algonquin	D	Jan-Mar	1.0	1.5	Perched	---	---	---	---	None
		Apr-May	0.5	1.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Dec	1.0	1.5	Perched	---	---	---	---	None
Springport	D	Jan-May	0.0	1.5	Perched	0.0-1.0	Long	Frequent	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	0.0	1.5	Perched	---	---	---	---	None
		Oct-Dec	0.0	1.5	Perched	0.0-1.0	Long	Frequent	---	None
62A:										
Allendale	C	Jan-Mar	1.0	2.5	Perched	---	---	---	---	None
		Apr-May	0.5	2.5	Perched	---	---	---	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep-Dec	1.0	2.5	Perched	---	---	---	---	None
63D:										
Bamfield	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
63E:										
Bamfield	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
68:										
Rondeau	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
69:										
Loxley	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
70:										
Lupton	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
71:										
Tawas	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
72:										
Dorval	A/D	Jan-May	0.0	2.5	Perched	0.0-1.0	Long	Frequent	---	None
		Jun	0.0	2.5	Perched	---	---	---	---	None
		Jul-Aug	0.5	2.5	Perched	---	---	---	---	None
		Sep-Oct	0.0	2.5	Perched	---	---	---	---	None
		Nov-Dec	0.0	2.5	Perched	0.0-1.0	Long	Frequent	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Water table: Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft		Ft				
74C2:										
Negwegon	C	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	3.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Nov	2.5	3.5	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
75B:										
Rubicon	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
75D:										
Rubicon	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
75E:										
Rubicon	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
77:										
Rollaway	D	Jan-Feb	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Mar-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	Very long	Frequent
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep	0.0	>6.0	Apparent	---	---	---	---	None
		Oct	0.0	>6.0	Apparent	---	Long	Frequent	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
78:										
Pits, borrow	---	Jan-Dec	>6.0	>6.0	---	---	---	---	---	---
82B:										
Udorthents	---	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
82C:										
Udorthents	---	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
83B:										
Udipsamments	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
83F:										
Udipsamments	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
84B:										
Zimmerman	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
84C:										
Zimmerman	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
84E:										
Zimmerman	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
85D:										
Zimmerman	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
Annalake	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	>6.0	Apparent	---	---	---	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep-Nov	2.5	>6.0	Apparent	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
86:										
Histosols	D	Jan-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Water table: Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft		Ft				
86:										
Aquents	D	Jan-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
87:										
Ausable	D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	Long	Frequent
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	Long	Frequent
90B:										
Chinwhisker	A	Jan-Feb	4.0	>6.0	Apparent	---	---	---	---	None
		Mar	2.5	>6.0	Apparent	---	---	---	---	None
		Apr-May	2.0	>6.0	Apparent	---	---	---	---	None
		Jun	3.5	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	4.5	>6.0	Apparent	---	---	---	---	None
		Oct	3.0	>6.0	Apparent	---	---	---	---	None
		Nov	2.5	>6.0	Apparent	---	---	---	---	None
		Dec	2.0	>6.0	Apparent	---	---	---	---	None
92B:										
Klacking	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
McGinn	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
92C:										
Klacking	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
McGinn	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
93B:										
Tacoda	C	Jan-Mar	1.0	3.0	Perched	---	---	---	---	None
		Apr-May	0.5	3.0	Perched	---	---	---	---	None
		Jun	1.0	3.0	Perched	---	---	---	---	None
		Jul-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep-Dec	1.0	3.0	Perched	---	---	---	---	None
Wakeley	D	Jan-May	0.0	2.0	Perched	0.0-1.0	Long	Frequent	---	None
		Jun	0.0	2.0	Perched	---	---	---	---	None
		Jul-Aug	0.5	2.0	Perched	---	---	---	---	None
		Sep-Oct	0.0	2.0	Perched	---	---	---	---	None
		Nov-Dec	0.0	2.0	Perched	0.0-1.0	Long	Frequent	---	None
94F:										
Klacking	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
McGinn	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
97:										
Colonville	C	Jan	2.0	>6.0	Apparent	---	---	---	Brief	Occasional
		Feb	1.5	>6.0	Apparent	---	---	---	Brief	Occasional
		Mar-May	1.0	>6.0	Apparent	---	---	---	Brief	Occasional
		Jun-Jul	2.5	>6.0	Apparent	---	---	---	---	None
		Aug	3.0	>6.0	Apparent	---	---	---	---	None
		Sep-Nov	1.5	>6.0	Apparent	---	---	---	---	None
		Dec	1.5	>6.0	Apparent	---	---	---	Brief	Occasional

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table			Ponding			Flooding	
			Upper limit	Lower limit	Water table kind	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	*Ft*		*Ft*				
113:										
Angelica	B/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.5	>6.0	Apparent	---	---	---	---	None
		Jul	1.5	>6.0	Apparent	---	---	---	---	None
		Aug	2.0	>6.0	Apparent	---	---	---	---	None
		Sep	1.0	>6.0	Apparent	---	---	---	---	None
		Oct-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
116C:										
Mancelona	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
127:										
Cathro	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
128:										
Dawson	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
145C:										
Rousseau	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
145E:										
Rousseau	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
159A:										
Finch	C	Jan-Feb	1.5	>6.0	Apparent	---	---	---	---	None
		Mar	1.0	>6.0	Apparent	---	---	---	---	None
		Apr-May	0.5	>6.0	Apparent	---	---	---	---	None
		Jun	1.0	>6.0	Apparent	---	---	---	---	None
		Jul	2.0	>6.0	Apparent	---	---	---	---	None
		Aug	3.0	>6.0	Apparent	---	---	---	---	None
		Sep	2.0	>6.0	Apparent	---	---	---	---	None
		Oct-Nov	1.0	>6.0	Apparent	---	---	---	---	None
		Dec	1.5	>6.0	Apparent	---	---	---	---	None
166A:										
Slade	C	Jan-Mar	1.5	3.0	Perched	---	---	---	---	None
		Apr-May	0.5	3.0	Perched	---	---	---	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	1.5	3.0	Perched	---	---	---	---	None
		Oct-Nov	1.0	3.0	Perched	---	---	---	---	None
		Dec	1.5	3.0	Perched	---	---	---	---	None
182:										
Pits, quarry	---	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
300A:										
Hagensville	C	Jan-Mar	1.0	2.0	Perched	---	---	---	---	None
		Apr-May	0.5	1.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Dec	1.0	2.0	Perched	---	---	---	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table			Ponding			Flooding	
			Upper limit	Lower limit	Water table kind	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	*Ft*		*Ft*				
304A:										
Iosco	B	Jan-Mar	1.0	>6.0	Apparent	---	---	---	---	None
		Apr-May	0.5	>6.0	Apparent	---	---	---	---	None
		Jun	1.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	1.5	>6.0	Apparent	---	---	---	---	None
		Oct-Dec	1.0	>6.0	Apparent	---	---	---	---	None
305B:										
Johnswood	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	1.0	2.0	Perched	---	---	---	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	2.5	3.0	Perched	---	---	---	---	None
		Oct-Nov	1.0	2.0	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
308B:										
Krakow	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
308C:										
Krakow	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
308D:										
Krakow	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
316:										
Ruse	D	Jan-May	0.0	1.1	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.5	1.1	Apparent	---	---	---	---	None
		Jul-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	0.0	1.1	Apparent	---	---	---	---	None
		Oct-Dec	0.0	1.1	Apparent	0.0-1.0	Long	Frequent	---	None
350E:										
Blue Lake	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
359C:										
Algonquin	D	Jan-Mar	1.0	1.5	Perched	---	---	---	---	None
		Apr-May	0.5	1.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Dec	1.0	1.5	Perched	---	---	---	---	None
Negwegon	C	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	3.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct	2.5	3.5	Perched	---	---	---	---	None
		Nov	2.5	3.0	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
Dorval	A/D	Jan-Apr	0.0	2.5	Perched	0.0-1.0	Long	Frequent	---	None
		May	0.0	2.5	Perched	0.0-1.0	Long	---	---	None
		Jun	0.0	2.5	Perched	---	---	---	---	None
		Jul-Aug	0.5	2.5	Perched	---	---	---	---	None
		Sep-Oct	0.0	2.5	Perched	---	---	---	---	None
		Nov-Dec	0.0	2.5	Perched	0.0-1.0	Long	Frequent	---	None
361B:										
Allendale	C	Jan-Mar	1.0	2.5	Perched	---	---	---	---	None
		Apr-May	0.5	2.5	Perched	---	---	---	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep-Dec	1.0	2.5	Perched	---	---	---	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Water table: Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft		Ft				
361B:										
Dorval	A/D	Jan-May	0.0	2.5	Perched	0.0-1.0	Long	Frequent	---	None
		Jun	0.0	2.5	Perched	---	---	---	---	None
		Jul-Aug	0.5	2.5	Perched	---	---	---	---	None
		Sep-Oct	0.0	2.5	Perched	---	---	---	---	None
		Nov-Dec	0.0	2.5	Perched	0.0-1.0	Long	Frequent	---	None
Blue Lake	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
362D:										
Millersburg	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
362E:										
Millersburg	B	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
368A:										
Au Gres	B	Jan-Feb	1.5	>6.0	Apparent	---	---	---	---	None
		Mar	1.0	>6.0	Apparent	---	---	---	---	None
		Apr-May	0.5	>6.0	Apparent	---	---	---	---	None
		Jun	1.0	>6.0	Apparent	---	---	---	---	None
		Jul	2.0	>6.0	Apparent	---	---	---	---	None
		Aug	3.0	>6.0	Apparent	---	---	---	---	None
		Sep	2.0	>6.0	Apparent	---	---	---	---	None
		Oct-Nov	1.0	>6.0	Apparent	---	---	---	---	None
		Dec	1.5	>6.0	Apparent	---	---	---	---	None
Deford	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.5	>6.0	Apparent	---	---	---	---	None
		Jul	1.5	>6.0	Apparent	---	---	---	---	None
		Aug	2.0	>6.0	Apparent	---	---	---	---	None
		Sep	1.0	>6.0	Apparent	---	---	---	---	None
		Oct-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
369:										
Deford	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.5	>6.0	Apparent	---	---	---	---	None
		Jul	1.5	>6.0	Apparent	---	---	---	---	None
		Aug	2.0	>6.0	Apparent	---	---	---	---	None
		Sep	1.0	>6.0	Apparent	---	---	---	---	None
		Oct-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
371:										
Springport	D	Jan-May	0.0	1.5	Perched	0.0-1.0	Long	Frequent	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	0.0	1.5	Perched	---	---	---	---	None
		Oct-Dec	0.0	1.5	Perched	0.0-1.0	Long	Frequent	---	None
373B:										
Grayling	A	Jan-Dec	6.0	>6.0	Apparent	---	---	---	---	None
374:										
Thunderbay	D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	Long	Frequent
		Jun-Aug	1.0	>6.0	Apparent	---	---	---	---	None
		Sep-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	Long	Frequent
376A:										
Urban land	---	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
Udipsamments	A	Jan-Dec	3.5	>6.0	Apparent	---	---	---	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Water table: Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	*Ft*		*Ft*				
380:										
Access denied.										
392:										
Caffey----------------	C	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.5	>6.0	Apparent	---	---	---	---	None
		Jul	1.5	>6.0	Apparent	---	---	---	---	None
		Aug	2.0	>6.0	Apparent	---	---	---	---	None
		Sep	1.0	>6.0	Apparent	---	---	---	---	None
		Oct-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
393B:										
Morganlake------------	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	3.0	Perched	---	---	---	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep-Nov	2.5	3.0	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
393C:										
Morganlake------------	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	3.0	Perched	---	---	---	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep-Nov	2.5	3.0	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
396F:										
Proper----------------	A	Jan-Feb	5.0	>6.0	Apparent	---	---	---	---	None
		Mar	2.5	>6.0	Apparent	---	---	---	---	None
		Apr-May	2.0	>6.0	Apparent	---	---	---	---	None
		Jun	3.5	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	4.5	>6.0	Apparent	---	---	---	---	None
		Oct	3.0	>6.0	Apparent	---	---	---	---	None
		Nov	2.5	>6.0	Apparent	---	---	---	---	None
		Dec	2.0	>6.0	Apparent	---	---	---	---	None
Deford----------------	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.5	>6.0	Apparent	---	---	---	---	None
		Jul	1.5	>6.0	Apparent	---	---	---	---	None
		Aug	2.0	>6.0	Apparent	---	---	---	---	None
		Sep	1.0	>6.0	Apparent	---	---	---	---	None
		Oct-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
Rousseau--------------	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
397:										
Spot------------------	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.5	>6.0	Apparent	---	---	---	---	None
		Jul	1.5	>6.0	Apparent	---	---	---	---	None
		Aug	2.0	>6.0	Apparent	---	---	---	---	None
		Sep	1.0	>6.0	Apparent	---	---	---	---	None
		Oct-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
414B:										
Namur-----------------	C	Jan-Dec	>6.0	>6.0	---	---	---	None	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Water table: Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	*Ft*		*Ft*				
415A:										
Potagannissing	D	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	0.0	0.7	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Nov	0.0	0.7	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
416B:										
Negwegon	C	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	3.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Nov	2.5	3.5	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
417B:										
Alpena	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
417C:										
Alpena	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
418E:										
Alpena	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
419:										
Chippeny	D	Jan-May	0.0	1.5	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	1.5	Apparent	---	---	---	---	None
		Jul-Aug	0.5	1.5	Apparent	---	---	---	---	None
		Sep-Oct	0.0	1.5	Apparent	---	---	---	---	None
		Nov-Dec	0.0	1.5	Apparent	0.0-1.0	Very long	Frequent	---	None
420A:										
Otisco	A	Jan-Mar	1.0	>6.0	Apparent	---	---	---	---	None
		Apr-May	0.5	>6.0	Apparent	---	---	---	---	None
		Jun	2.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	2.0	>6.0	Apparent	---	---	---	---	None
		Oct-Dec	1.0	>6.0	Apparent	---	---	---	---	None
424B:										
Morganlake	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	3.0	Perched	---	---	---	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep-Nov	2.5	3.0	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
Ossineke	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	1.5	3.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Nov	1.5	3.5	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
Blue Lake	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
424C:										
Morganlake	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	3.0	Perched	---	---	---	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep-Nov	2.5	3.0	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Water table: Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	*Ft*		*Ft*				
424C:										
Ossineke	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	1.5	3.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Nov	1.5	3.5	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
Blue Lake	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
426B:										
Coppler	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
426C:										
Coppler	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
426D:										
Coppler	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
451C:										
Annalake	B	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	>6.0	Apparent	---	---	---	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep-Nov	2.5	>6.0	Apparent	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
477B:										
Algonquin	D	Jan-Mar	1.0	1.5	Perched	---	---	---	---	None
		Apr-May	0.5	1.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Dec	1.0	1.5	Perched	---	---	---	---	None
Springport	D	Jan-May	0.0	1.5	Perched	0.0-1.0	Long	Frequent	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	0.0	1.5	Perched	---	---	---	---	None
		Oct-Dec	0.0	1.5	Perched	0.0-1.0	Long	Frequent	---	None
478:										
Springport	D	Jan-May	0.0	1.5	Perched	0.0-1.0	Long	Frequent	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	0.0	1.5	Perched	---	---	---	---	None
		Oct-Dec	0.0	1.5	Perched	0.0-1.0	Long	Frequent	---	None
479A:										
Algonquin	D	Jan-Mar	1.0	1.5	Perched	---	---	---	---	None
		Apr-May	0.5	1.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Dec	1.0	1.5	Perched	---	---	---	---	None
480B:										
Negwegon	C	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	3.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Nov	2.5	3.5	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
Algonquin	D	Jan-Mar	1.0	1.5	Perched	---	---	---	---	None
		Apr-May	0.5	1.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Dec	1.0	1.5	Perched	---	---	---	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Water table: Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft		Ft				
480B:										
Lupton	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
481C:										
Negwegon	C	Jan-Feb	>6.0	>6.0	---	---	---	---	---	None
		Mar-May	2.5	3.5	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Nov	2.5	3.5	Perched	---	---	---	---	None
		Dec	>6.0	>6.0	---	---	---	---	---	None
Lupton	A/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
		Jun	0.0	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	0.5	>6.0	Apparent	---	---	---	---	None
		Sep-Oct	0.0	>6.0	Apparent	---	---	---	---	None
		Nov-Dec	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	None
482B:										
Summerville	D	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
482C:										
Summerville	D	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
483A:										
Lachine	C	Jan-May	1.0	1.5	Apparent	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Dec	1.0	1.5	Apparent	---	---	---	---	None
484A:										
Elcajon	C	Jan	1.0	3.1	Apparent	---	---	---	---	None
		Feb-Mar	1.0	1.5	Apparent	---	---	---	---	None
		Apr-May	0.5	1.5	Apparent	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Dec	1.0	1.5	Apparent	---	---	---	---	None
485A:										
Bowers	C	Jan-May	1.0	2.0	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Dec	1.0	2.0	Perched	---	---	---	---	None
486B:										
Tonkey	B/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.5	>6.0	Apparent	---	---	---	---	None
		Jul	1.5	>6.0	Apparent	---	---	---	---	None
		Aug	2.0	>6.0	Apparent	---	---	---	---	None
		Sep	1.0	>6.0	Apparent	---	---	---	---	None
		Oct-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
Bowers	C	Jan-May	1.0	2.0	Perched	---	---	---	---	None
		Jun-Sep	>6.0	>6.0	---	---	---	---	---	None
		Oct-Dec	1.0	2.0	Perched	---	---	---	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Water table: Water table kind	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft		Ft				
487B:										
Slade-----------------	C	Jan-Mar	1.5	3.0	Perched	---	---	---	---	None
		Apr-May	0.5	3.0	Perched	---	---	---	---	None
		Jun-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	1.5	3.0	Perched	---	---	---	---	None
		Oct-Nov	1.0	3.0	Perched	---	---	---	---	None
		Dec	1.5	3.0	Perched	---	---	---	---	None
Angelica--------------	B/D	Jan-May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
		Jun	0.5	>6.0	Apparent	---	---	---	---	None
		Jul	1.5	>6.0	Apparent	---	---	---	---	None
		Aug	2.0	>6.0	Apparent	---	---	---	---	None
		Sep	1.0	>6.0	Apparent	---	---	---	---	None
		Oct-Dec	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	None
489F:										
Crowell---------------	A	Jan-Dec	>6.0	>6.0	---	---	---	---	---	None
Proper----------------	A	Jan-Feb	5.0	>6.0	Apparent	---	---	---	---	None
		Mar	2.5	>6.0	Apparent	---	---	---	---	None
		Apr-May	2.0	>6.0	Apparent	---	---	---	---	None
		Jun	3.5	>6.0	Apparent	---	---	---	---	None
		Jul-Aug	>6.0	>6.0	---	---	---	---	---	None
		Sep	4.5	>6.0	Apparent	---	---	---	---	None
		Oct	3.0	>6.0	Apparent	---	---	---	---	None
		Nov	2.5	>6.0	Apparent	---	---	---	---	None
		Dec	2.0	>6.0	Apparent	---	---	---	---	None

Table 23.--Soil Moisture Status by Depth

(Depth of layers is in feet. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
11B:													
Eastport------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
12B:													
Tawas---------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
Au Gres-------	B	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Dry 1.0-3.0: Moist 3.0-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---
13:													
Tawas---------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
Lupton--------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
14:													
Dawson--------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
Loxley--------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
16B: Graycalm------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
16C: Graycalm------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
16D: Graycalm------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
16E: Graycalm------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
17A: Croswell------	A	0.0-5.0: Moist 5.0-6.5: Wet	0.0-5.0: Moist 5.0-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-3.5: Moist 3.5-6.5: Wet	0.0-2.0: Dry 2.0-6.5: Moist	0.0-3.0: Dry 3.0-6.5: Moist	0.0-4.5: Moist 4.5-6.5: Wet	0.0-3.0: Moist 3.0-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet
17B: Croswell------	A	0.0-5.0: Moist 5.0-6.5: Wet	0.0-5.0: Moist 5.0-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-3.5: Moist 3.5-6.5: Wet	0.0-2.0: Dry 2.0-6.5: Moist	0.0-3.0: Dry 3.0-6.5: Moist	0.0-4.5: Moist 4.5-6.5: Wet	0.0-3.0: Moist 3.0-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet
18A: Au Gres-------	B	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Dry 1.0-3.0: Moist 3.0-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
19: Leafriver-----	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
27A: Tacoda--------	C	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-0.5: Moist 0.5-3.0: Wet 3.0-6.5: Moist	0.0-0.5: Moist 0.5-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist
28B: East Lake-----	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
28C: East Lake-----	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
29A: Battlefield---	A/D	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Dry 1.0-3.0: Moist 3.0-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---
30: Wheatley------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
31B: Klacking------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
31C: Klacking------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
31D: Klacking------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
31E: Klacking------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
35: Kinross-------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
36B: Annalake------	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist ---	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-6.5: Moist --- ---
36C: Annalake------	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist ---	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-6.5: Moist --- ---
37A: Richter-------	B	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Dry 1.0-3.0: Moist 3.0-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
37B:													
Richter--------	B	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Dry 1.0-3.0: Moist 3.0-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---
38:													
Tonkey---------	B/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-1.5: Moist 1.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
41B:													
McGinn---------	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
41C:													
McGinn---------	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
41D:													
McGinn---------	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
41E:													
McGinn---------	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
42A:													
Killmaster-----	C	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-0.5: Dry 0.5-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
43: Wakeley-------	D	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-0.5: Moist 0.5-2.0: Wet 2.0-6.5: Moist	0.0-0.5: Moist 0.5-2.0: Wet 2.0-6.5: Moist	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---
44B: Ossineke------	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---
44C: Ossineke------	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---
45B: Hoist---------	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-3.5: Moist 2.5-3.0: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---
45C: Hoist---------	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---
46: Ensley--------	B/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-1.5: Moist 1.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
47D:													
Graycalm------	A	0.0-6.5: Moist	0.0-6.5: Moist	0.0-6.5: Moist	0.0-6.5: Moist	0.0-6.5: Moist	0.0-6.5: Moist	0.0-2.0: Dry	0.0-2.0: Dry	0.0-6.5: Moist	0.0-6.5: Moist	0.0-6.5: Moist	0.0-6.5: Moist
		---	---	---	---	---	---	2.0-6.5: Moist	2.0-6.5: Moist	---	---	---	---
53B:													
Negwegon------	C	0.0-6.5: Moist	0.0-6.5: Moist	0.0-2.5: Moist	0.0-2.5: Moist	0.0-2.5: Moist	0.0-6.5: Moist	0.0-1.0: Dry	0.0-6.5: Moist	0.0-6.5: Moist	0.0-2.5: Moist	0.0-2.5: Moist	0.0-6.5: Moist
		---	---	2.5-3.5: Wet	2.5-3.5: Wet	2.5-3.5: Wet	---	1.0-6.5: Moist	---	---	2.5-3.5: Wet	2.5-3.5: Wet	---
		---	---	3.5-6.5: Moist	3.5-6.5: Moist	3.5-6.5: Moist	---	---	---	---	3.5-6.5: Moist	3.5-6.5: Moist	---
53C:													
Negwegon------	C	0.0-6.5: Moist	0.0-6.5: Moist	0.0-2.5: Moist	0.0-2.5: Moist	0.0-2.5: Moist	0.0-6.5: Moist	0.0-1.0: Dry	0.0-6.5: Moist	0.0-6.5: Moist	0.0-2.5: Moist	0.0-2.5: Moist	0.0-6.5: Moist
		---	---	2.5-3.5: Wet	2.5-3.5: Wet	2.5-3.5: Wet	---	1.0-6.5: Moist	---	---	2.5-3.5: Wet	2.5-3.0: Wet	---
		---	---	3.5-6.5: Moist	3.5-6.5: Moist	3.5-6.5: Moist	---	---	---	---	3.5-6.5: Moist	3.0-6.5: Moist	---
54A:													
Algonquin-----	D	0.0-1.0: Moist	0.0-1.0: Moist	0.0-1.0: Moist	0.0-0.5: Moist	0.0-0.5: Moist	0.0-6.5: Moist	0.0-6.5: Moist	0.0-0.5: Dry	0.0-6.5: Moist	0.0-1.0: Moist	0.0-1.0: Moist	0.0-1.0: Moist
		1.0-1.5: Wet	1.0-1.5: Wet	1.0-1.5: Wet	0.5-1.5: Wet	0.5-1.5: Wet	---	---	0.5-6.5: Moist	---	1.0-1.5: Wet	1.0-1.5: Wet	1.0-1.5: Wet
		1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist	---	---	---	---	1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist
55:													
Springport----	D	0.0-1.5: Wet	0.0-1.5: Wet	0.0-1.5: Wet	0.0-1.5: Wet	0.0-1.5: Wet	0.0-6.5: Moist	0.0-6.5: Moist	0.0-6.5: Moist	0.0-1.5: Wet	0.0-1.5: Wet	0.0-1.5: Wet	0.0-1.5: Wet
		1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist	---	---	---	1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist
57B:													
Kawkawlin-----	C	0.0-1.0: Moist	0.0-1.0: Moist	0.0-1.0: Moist	0.0-1.0: Moist	0.0-1.0: Moist	0.0-6.5: Moist	0.0-6.5: Moist	0.0-0.5: Dry	0.0-6.5: Moist	0.0-1.0: Moist	0.0-1.0: Moist	0.0-1.0: Moist
		1.0-1.5: Wet	1.0-1.5: Wet	1.0-1.5: Wet	1.0-1.5: Wet	1.0-1.5: Wet	---	---	0.5-6.5: Moist	---	1.0-1.5: Wet	1.0-1.5: Wet	1.0-1.5: Wet
		1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist	---	---	---	---	1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
59B:													
Algonquin-----	D	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-0.5: Moist 0.5-1.5: Wet 1.5-6.5: Moist	0.0-0.5: Moist 0.5-1.5: Wet 1.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-0.5: Dry 0.5-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist
Springport----	D	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist
62A:													
Allendale-----	C	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist	0.0-0.5: Moist 0.5-2.5: Wet 2.5-6.5: Moist	0.0-0.5: Moist 0.5-2.5: Wet 2.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist
63D:													
Bamfield------	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
63E:													
Bamfield------	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
68:													
Rondeau-------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
69:													
Loxley--------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
70:													
Lupton--------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
71:													
Tawas---------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
72:													
Dorval--------	A/D	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-0.5: Moist 0.5-2.5: Wet 2.5-6.5: Moist	0.0-0.5: Moist 0.5-2.5: Wet 2.5-6.5: Moist	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---
74C2:													
Negwegon------	C	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---
75B:													
Rubicon-------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
75D:													
Rubicon-------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
75E:													
Rubicon-------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
77:													
Rollaway------	D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5:	0.0-0.5: Moist 0.5-6.5:	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
78:													
Pits, borrow.													
82B:													
Udorthents----	---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
82C:													
Udorthents----	---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
83B:													
Udipsamments--	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
83F:													
Udipsamments--	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
84B:													
Zimmerman-----	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
84C:													
Zimmerman-----	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
84E:													
Zimmerman-----	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
85D:													
Zimmerman-----	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
Annalake------	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist ---	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-2.5: Moist 2.5-6.0: Wet 6.0-6.5: Moist	0.0-6.5: Moist --- ---
86:													
Histosols-----	D	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet
Aquents-------	D	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet
87:													
Ausable-------	D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
90B:													
Chinwhisker---	A	0.0-4.0: Moist 4.0-6.5: Wet	0.0-4.0: Moist 4.0-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-3.5: Moist 3.5-6.5: Wet	0.0-2.0: Dry 2.0-6.5: Moist	0.0-3.0: Dry 3.0-6.5: Moist	0.0-4.5: Moist 4.5-6.5: Wet	0.0-3.0: Moist 3.0-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet
92B:													
Klacking------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
92B:													
McGinn--------	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
92C:													
Klacking------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
McGinn--------	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
93B:													
Tacoda--------	C	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-0.5: Moist 0.5-3.0: Wet 3.0-6.5: Moist	0.0-0.5: Moist 0.5-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist
Wakeley-------	D	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-0.5: Moist 0.5-2.0: Wet 2.0-6.5: Moist	0.0-0.5: Moist 0.5-2.0: Wet 2.0-6.5: Moist	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---	0.0-2.0: Wet 2.0-6.5: Moist ---
94F:													
Klacking------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
McGinn--------	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
97: Colonville----	C	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-2.5: Moist 2.5-6.5: Wet ---	0.0-2.5: Moist 2.5-6.5: Wet ---	0.0-1.0: Dry 1.0-3.0: Moist 3.0-6.5: Wet	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---
113: Angelica------	B/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-1.5: Moist 1.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
116C: Mancelona-----	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
127: Cathro--------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
128: Dawson--------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
145C: Rousseau------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
145E: Rousseau------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
159A:													
Finch---------	C	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Dry 1.0-3.0: Moist 3.0-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---
166A:													
Slade---------	C	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist	0.0-0.5: Moist 0.5-3.0: Wet 3.0-6.5: Moist	0.0-0.5: Moist 0.5-3.0: Wet 3.0-6.5: Moist	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-0.5: Dry 0.5-6.5: Moist ---	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist
182:													
Pits, quarry.													
300A:													
Hagensville---	C	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-0.5: Moist 0.5-1.5: Wet 1.5-6.5: Moist	0.0-0.5: Moist 0.5-1.5: Wet 1.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-0.5: Dry 0.5-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist
304A:													
Iosco---------	B	0.0-1.0: Moist 1.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-1.0: Dry 1.0-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-1.5: Moist 1.5-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet
305B:													
Johnswood-----	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist ---	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 3.0-6.5: Moist	0.0-6.5: Moist --- ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
308B:													
Krakow--------	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
308C:													
Krakow--------	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
308D:													
Krakow--------	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
316:													
Ruse----------	D	0.0-1.1: Wet ---	0.0-1.1: Wet ---	0.0-1.1: Wet ---	0.0-1.1: Wet ---	0.0-1.1: Wet ---	0.0-0.5: Moist 0.5-1.1: Wet	0.0-1.1: Moist ---	0.0-1.1: Moist ---	0.0-1.1: Wet ---	0.0-1.1: Wet ---	0.0-1.1: Wet ---	0.0-1.1: Wet ---
350E:													
Blue Lake-----	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
359C:													
Algonquin-----	D	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-0.5: Moist 0.5-1.5: Wet 1.5-6.5: Moist	0.0-0.5: Moist 0.5-1.5: Wet 1.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-0.5: Dry 0.5-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist
Negwegon------	C	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-6.5: Moist --- ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
359C:													
Dorval--------	A/D	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-0.5: Moist 0.5-2.5: Wet 2.5-6.5: Moist	0.0-0.5: Moist 0.5-2.5: Wet 2.5-6.5: Moist	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---
361B:													
Allendale-----	C	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist	0.0-0.5: Moist 0.5-2.5: Wet 2.5-6.5: Moist	0.0-0.5: Moist 0.5-2.5: Wet 2.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist	0.0-1.0: Moist 1.0-2.5: Wet 2.5-6.5: Moist
Dorval--------	A/D	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-0.5: Moist 0.5-2.5: Wet 2.5-6.5: Moist	0.0-0.5: Moist 0.5-2.5: Wet 2.5-6.5: Moist	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---	0.0-2.5: Wet 2.5-6.5: Moist ---
Blue Lake-----	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
362D:													
Millersburg---	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
362E:													
Millersburg---	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
368A:													
Au Gres-------	B	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Dry 1.0-3.0: Moist 3.0-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet ---	0.0-1.5: Moist 1.5-6.5: Wet ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
368A:													
Deford--------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-1.5: Moist 1.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
369:													
Deford--------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-1.5: Moist 1.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
371:													
Springport----	D	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist
373B:													
Grayling------	A	0.0-6.0: Moist 6.0-15.0: Wet ---	0.0-6.0: Moist 6.0-15.0: Wet ---	0.0-6.0: Moist 6.0-15.0: Wet ---	0.0-6.0: Moist 6.0-15.0: Wet ---	0.0-6.0: Moist 6.0-15.0: Wet ---	0.0-6.0: Moist 6.0-15.0: Wet ---	0.0-2.0: Dry 2.0-6.0: Moist 6.0-15.0: Wet	0.0-2.0: Dry 2.0-6.0: Moist 6.0-15.0: Wet	0.0-6.0: Moist 6.0-15.0: Wet ---	0.0-6.0: Moist 6.0-15.0: Wet ---	0.0-6.0: Moist 6.0-15.0: Wet ---	0.0-6.0: Moist 6.0-15.0: Wet ---
374:													
Thunderbay----	D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-1.0: Moist 1.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
376A: Urban land.													
Udipsamments--	A	0.0-3.5: Moist 3.5-6.5: Wet ---	0.0-3.5: Moist 3.5-6.5: Wet ---	0.0-3.5: Moist 3.5-6.5: Wet ---	0.0-3.5: Moist 3.5-6.5: Wet ---	0.0-3.5: Moist 3.5-6.5: Wet ---	0.0-3.5: Moist 3.5-6.5: Wet ---	0.0-2.0: Dry 2.0-3.5: Moist 3.5-6.5: Wet	0.0-2.0: Dry 2.0-3.5: Moist 3.5-6.5: Wet	0.0-3.5: Moist 3.5-6.5: Wet ---	0.0-3.5: Moist 3.5-6.5: Wet ---	0.0-3.5: Moist 3.5-6.5: Wet ---	0.0-3.5: Moist 3.5-6.5: Wet ---
380: Access denied.													

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
392:													
Caffey--------	C	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-1.5: Moist 1.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
393B:													
Morganlake----	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist ---	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-6.5: Moist --- ---
393C:													
Morganlake----	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist ---	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-6.5: Moist --- ---
396F:													
Proper--------	A	0.0-5.0: Moist 5.0-6.5: Wet	0.0-5.0: Moist 5.0-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-3.5: Moist 3.5-6.5: Wet	0.0-2.0: Dry 2.0-6.5: Moist	0.0-3.0: Dry 3.0-6.5: Moist	0.0-4.5: Moist 4.5-6.5: Wet	0.0-3.0: Moist 3.0-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet
Deford--------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-1.5: Moist 1.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
Rousseau------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
397:													
Spot----------	A/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-1.5: Moist 1.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydrologic group	January	February	March	April	May	June	July	August	September	October	November	December
414B:													
Namur---------	C	0.0-0.4: Moist	0.0-0.4: Moist	0.0-0.4: Moist	0.0-0.4: Moist	0.0-0.4: Moist	0.0-0.4: Moist	0.0-0.4: Dry	0.0-0.4: Dry	0.0-0.4: Moist	0.0-0.4: Moist	0.0-0.4: Moist	0.0-0.4: Moist
415A:													
Potagannissing	D	0.0-0.7: Moist	0.0-0.7: Moist	0.0-0.7: Wet	0.0-0.7: Wet	0.0-0.7: Wet	0.0-0.7: Moist	0.0-0.7: Dry	0.0-0.7: Dry	0.0-0.7: Moist	0.0-0.7: Wet	0.0-0.7: Wet	0.0-0.7: Moist
416B:													
Negwegon------	C	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---
417B:													
Alpena--------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
417C:													
Alpena--------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
418E:													
Alpena--------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
419:													
Chippeny------	D	0.0-1.5: Wet ---	0.0-1.5: Wet ---	0.0-1.5: Wet ---	0.0-1.5: Wet ---	0.0-1.5: Wet ---	0.0-1.5: Wet ---	0.0-0.5: Moist 0.5-1.5: Wet	0.0-0.5: Moist 0.5-1.5: Wet	0.0-1.5: Wet ---	0.0-1.5: Wet ---	0.0-1.5: Wet ---	0.0-1.5: Wet ---
420A:													
Otisco--------	A	0.0-1.0: Moist 1.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-0.5: Moist 0.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-1.0: Dry 1.0-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-2.0: Moist 2.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro- logic group	January	February	March	April	May	June	July	August	September	October	November	December
424B:													
Morganlake----	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist ---	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-6.5: Moist --- ---
Ossineke------	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---
Blue Lake-----	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
424C:													
Morganlake----	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist ---	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-2.5: Moist 2.5-3.0: Wet 3.0-6.5: Moist	0.0-6.5: Moist --- ---
Ossineke------	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-1.5: Moist 1.5-3.5: Wet 3.5-6.5: Moist	0.0-6.5: Moist --- ---
Blue Lake-----	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
426B:													
Coppler-------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
426C:													
Coppler-------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
426D:													
Coppler-------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
451C:													
Annalake------	B	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-6.5: Moist ---	0.0-1.0: Dry 1.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-6.5: Moist ---
477B:													
Algonquin-----	D	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-0.5: Moist 0.5-1.5: Wet 1.5-6.5: Moist	0.0-0.5: Moist 0.5-1.5: Wet 1.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-0.5: Dry 0.5-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist
Springport----	D	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist
478:													
Springport----	D	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist	0.0-1.5: Wet 1.5-6.5: Moist
479A:													
Algonquin-----	D	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-0.5: Moist 0.5-1.5: Wet 1.5-6.5: Moist	0.0-0.5: Moist 0.5-1.5: Wet 1.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-0.5: Dry 0.5-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-6.5: Moist

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
480B:													
Negwegon------	C	0.0-6.5: Moist	0.0-6.5: Moist	0.0-2.5: Moist	0.0-2.5: Moist	0.0-2.5: Moist	0.0-6.5: Moist	0.0-1.0: Dry	0.0-6.5: Moist	0.0-6.5: Moist	0.0-2.5: Moist	0.0-2.5: Moist	0.0-6.5: Moist
		---	---	2.5-3.5: Wet	2.5-3.5: Wet	2.5-3.5: Wet	---	1.0-6.5: Moist	---	---	2.5-3.5: Wet	2.5-3.5: Wet	---
		---	---	3.5-6.5: Moist	3.5-6.5: Moist	3.5-6.5: Moist	---	---	---	---	3.5-6.5: Moist	3.5-6.5: Moist	---
Algonquin-----	D	0.0-1.0: Moist	0.0-1.0: Moist	0.0-1.0: Moist	0.0-0.5: Moist	0.0-0.5: Moist	0.0-6.5: Moist	0.0-6.5: Moist	0.0-0.5: Dry	0.0-6.5: Moist	0.0-1.0: Moist	0.0-1.0: Moist	0.0-1.0: Moist
		1.0-1.5: Wet	1.0-1.5: Wet	1.0-1.5: Wet	0.5-1.5: Wet	0.5-1.5: Wet	---	---	0.5-6.5: Moist	---	1.0-1.5: Wet	1.0-1.5: Wet	1.0-1.5: Wet
		1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist	---	---	---	---	1.5-6.5: Moist	1.5-6.5: Moist	1.5-6.5: Moist
Lupton--------	A/D	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-0.5: Moist	0.0-0.5: Moist	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet
		---	---	---	---	---	---	0.5-6.5: Wet	0.5-6.5: Wet	---	---	---	---
481C:													
Negwegon------	C	0.0-6.5: Moist	0.0-6.5: Moist	0.0-2.5: Moist	0.0-2.5: Moist	0.0-2.5: Moist	0.0-6.5: Moist	0.0-1.0: Dry	0.0-6.5: Moist	0.0-6.5: Moist	0.0-2.5: Moist	0.0-2.5: Moist	0.0-6.5: Moist
		---	---	2.5-3.5: Wet	2.5-3.5: Wet	2.5-3.5: Wet	---	1.0-6.5: Moist	---	---	2.5-3.5: Wet	2.5-3.5: Wet	---
		---	---	3.5-6.5: Moist	3.5-6.5: Moist	3.5-6.5: Moist	---	---	---	---	3.5-6.5: Moist	3.5-6.5: Moist	---
Lupton--------	A/D	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-0.5: Moist	0.0-0.5: Moist	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet	0.0-6.5: Wet
		---	---	---	---	---	---	0.5-6.5: Wet	0.5-6.5: Wet	---	---	---	---
482B:													
Summerville---	D	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Dry	0.0-1.3: Dry	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Moist
482C:													
Summerville---	D	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Dry	0.0-1.3: Dry	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Moist	0.0-1.3: Moist
483A:													
Lachine-------	C	0.0-1.0: Moist	0.0-1.0: Moist	0.0-1.0: Moist	0.0-1.0: Moist	0.0-1.0: Moist	0.0-1.5: Moist	0.0-1.5: Moist	0.0-0.5: Dry	0.0-1.5: Moist	0.0-1.0: Moist	0.0-1.0: Moist	0.0-1.0: Moist
		1.0-1.5: Wet	1.0-1.5: Wet	1.0-1.5: Wet	1.0-1.5: Wet	1.0-1.5: Wet	---	---	0.5-1.5: Moist	---	1.0-1.5: Wet	1.0-1.5: Wet	1.0-1.5: Wet

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro- logic group	January	February	March	April	May	June	July	August	September	October	November	December
484A:													
Elcajon-------	C	0.0-1.0: Moist 1.0-3.1: Wet ---	0.0-1.0: Moist 1.0-1.5: Wet 1.5-3.1: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-3.1: Moist	0.0-0.5: Moist 0.5-1.5: Wet 1.5-3.1: Moist	0.0-0.5: Moist 0.5-1.5: Wet 1.5-3.1: Moist	0.0-3.1: Moist --- ---	0.0-3.1: Moist --- ---	0.0-0.5: Dry 0.5-3.1: Moist ---	0.0-3.1: Moist --- ---	0.0-1.0: Moist 1.0-1.5: Wet 1.5-3.1: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-3.1: Moist	0.0-1.0: Moist 1.0-1.5: Wet 1.5-3.1: Moist
485A:													
Bowers--------	C	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-0.5: Dry 0.5-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist
486B:													
Tonkey--------	B/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-1.5: Moist 1.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---
Bowers--------	C	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-0.5: Dry 0.5-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist	0.0-1.0: Moist 1.0-2.0: Wet 2.0-6.5: Moist
487B:													
Slade---------	C	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist	0.0-0.5: Moist 0.5-3.0: Wet 3.0-6.5: Moist	0.0-0.5: Moist 0.5-3.0: Wet 3.0-6.5: Moist	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-0.5: Dry 0.5-6.5: Moist ---	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.0: Moist 1.0-3.0: Wet 3.0-6.5: Moist	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist
Angelica------	B/D	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-1.5: Moist 1.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-1.0: Moist 1.0-6.5: Wet	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---

Table 23.--Soil Moisture Status by Depth--Continued

Map symbol and soil name	Hydro-logic group	January	February	March	April	May	June	July	August	September	October	November	December
489F:													
Crowell-------	A	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-2.0: Dry 2.0-6.5: Moist	0.0-2.0: Dry 2.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
Proper--------	A	0.0-5.0: Moist 5.0-6.5: Wet	0.0-5.0: Moist 5.0-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet	0.0-3.5: Moist 3.5-6.5: Wet	0.0-2.0: Dry 2.0-6.5: Moist	0.0-3.0: Dry 3.0-6.5: Moist	0.0-4.5: Moist 4.5-6.5: Wet	0.0-3.0: Moist 3.0-6.5: Wet	0.0-2.5: Moist 2.5-6.5: Wet	0.0-2.0: Moist 2.0-6.5: Wet

Table 24.--Classification of the Soils

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See notes for a description of those characteristics of this taxadjunct that are outside the range of the series.)

Soil name	Family or higher taxonomic class
Algonquin	Fine, mixed, semiactive, frigid Aquic Hapludalfs
Allendale	Sandy over clayey, mixed, semiactive, frigid Alfic Epiaquods
Alpena	Sandy-skeletal, mixed, frigid Entic Hapludolls
Angelica	Fine-loamy, mixed, active, nonacid, frigid Aeric Endoaquepts
Annalake	Coarse-loamy, mixed, superactive, frigid Alfic Oxyaquic Haplorthods
Aquents	Mixed, frigid Aquents
Au Gres	Sandy, mixed, frigid Typic Endoaquods
Ausable	Sandy, mixed, frigid Histic Humaquepts
Bamfield	Fine-loamy, mixed, active, frigid Haplic Glossudalfs
Battlefield	Sandy, mixed, frigid Typic Endoaquods
Blue Lake	Sandy, mixed, frigid Lamellic Haplorthods
Bowers	Fine, mixed, semiactive, frigid Aquic Glossudalfs
Caffey	Sandy over loamy, mixed, semiactive, nonacid, frigid Aeric Endoaquents
Cathro	Loamy, mixed, euic, frigid Terric Haplosaprists
Chinwhisker	Sandy, mixed, frigid Lamellic Haplorthods
Chippeny	Euic, frigid Lithic Haplosaprists
Colonville	Coarse-loamy, mixed, calcareous, active, frigid Fluvaquentic Endoaquolls
Coppler	Loamy-skeletal, mixed, semiactive, frigid Arenic Hapludalfs
Croswell	Sandy, mixed, frigid Oxyaquic Haplorthods
Crowell	Sandy, mixed, frigid, ortstein Entic Haplorthods
Dawson	Sandy or sandy-skeletal, mixed, dysic, frigid Terric Haplosaprists
Deford	Mixed, frigid Typic Psammaquents
Dorval	Clayey, mixed, euic, frigid Terric Haplosaprists
East Lake	Sandy, mixed, frigid Entic Haplorthods
Eastport	Mixed, frigid Spodic Udipsamments
Elcajon	Fine-loamy, mixed, active, frigid Aquic Glossudalfs
Ensley	Coarse-loamy, mixed, active, nonacid, frigid Aeric Endoaquents
Finch	Sandy, mixed, frigid, shallow, ortstein Typic Duraquods
Graycalm	Mixed, frigid Lamellic Udipsamments
Grayling	Mixed, frigid Typic Udipsamments
Hagensville	Coarse-loamy, mixed, semiactive, frigid Aquic Hapludolls
Histosols	Mixed, frigid Histosols
Hoist	Coarse-loamy, mixed, semiactive, frigid Oxyaquic Glossudalfs
Iosco	Sandy over loamy, mixed, active, frigid Argic Endoaquods
Johnswood	Loamy-skeletal, mixed, semiactive, frigid Oxyaquic Argiudolls
Kawkawlin	Fine, mixed, semiactive, frigid Aquic Glossudalfs
Killmaster	Coarse-loamy, mixed, semiactive, frigid Aquic Glossudalfs
Kinross	Sandy, mixed, frigid Typic Endoaquods
Klacking	Loamy, mixed, semiactive, frigid Arenic Glossudalfs
Krakow	Loamy-skeletal, mixed, semiactive, frigid Inceptic Hapludalfs
Lachine	Loamy, mixed, superactive, frigid Lithic Hapludolls
Leafriver	Sandy, mixed, frigid Histic Humaquepts
Loxley	Dysic, frigid Typic Haplosaprists
Lupton	Euic, frigid Typic Haplosaprists
Mancelona	Sandy, mixed, frigid Alfic Haplorthods
McGinn	Coarse-loamy, mixed, semiactive, frigid Haplic Glossudalfs
Millersburg	Coarse-loamy, mixed, active, frigid Haplic Glossudalfs
Morganlake	Sandy over loamy, mixed, active, frigid Alfic Oxyaquic Haplorthods
Namur	Loamy, mixed, semiactive, frigid Lithic Hapludolls
Negwegon	Fine, mixed, semiactive, frigid Oxyaquic Glossudalfs
Ossineke	Fine-loamy, mixed, semiactive, frigid Oxyaquic Glossudalfs
Otisco	Sandy, mixed, frigid Argic Endoaquods
Potagannissing	Loamy, mixed, superactive, frigid Lithic Hapludolls
Proper	Sandy, mixed, frigid, ortstein Oxyaquic Haplorthods
Richter	Coarse-loamy, mixed, semiactive, frigid Argic Endoaquods
Rollaway	Coarse-loamy, mixed, semiactive, nonacid, frigid Histic Humaquepts
Rondeau	Marly, euic, frigid Limnic Haplosaprists
Rousseau	Sandy, mixed, frigid Entic Haplorthods
Rubicon	Sandy, mixed, frigid Entic Haplorthods
Ruse	Loamy, mixed, active, frigid Lithic Endoaquolls

Table 24.--Classification of the Soils

Soil name	Family or higher taxonomic class
Slade	Fine-loamy, mixed, active, frigid Aquic Glossudalfs
Spot	Sandy, mixed, frigid, shallow, ortstein Typic Duraquods
Springport	Fine, mixed, semiactive, frigid Typic Epiaquolls
Summerville	Loamy, mixed, active, frigid Lithic Eutrudepts
Tacoda	Sandy, mixed, frigid Typic Epiaquods
Tawas	Sandy or sandy-skeletal, mixed, euic, frigid Terric Haplosaprists
Thunderbay	Coarse-loamy, mixed, semiactive, frigid Fluvaquentic Endoaquolls
Tonkey	Coarse-loamy, mixed, semiactive, nonacid, frigid Mollic Endoaquepts
Udipsamments	Mixed, frigid Udipsamments
Udorthents	Mixed, frigid Udorthents
Wakeley	Sandy over clayey, mixed, semiactive, nonacid, frigid Aeric Epiaquents
*Wheatley	Mixed, frigid Mollic Psammaquents
Zimmerman	Mixed, frigid Lamellic Udipsamments

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