United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Michigan Department of Agriculture, Michigan Agricultural Experiment Station, Michigan State University Extension, Michigan Technological University, Soil Classifiers Association of Michigan, and Montmorency County Board of Commissioners

Soil Survey of Montmorency County, Michigan

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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.

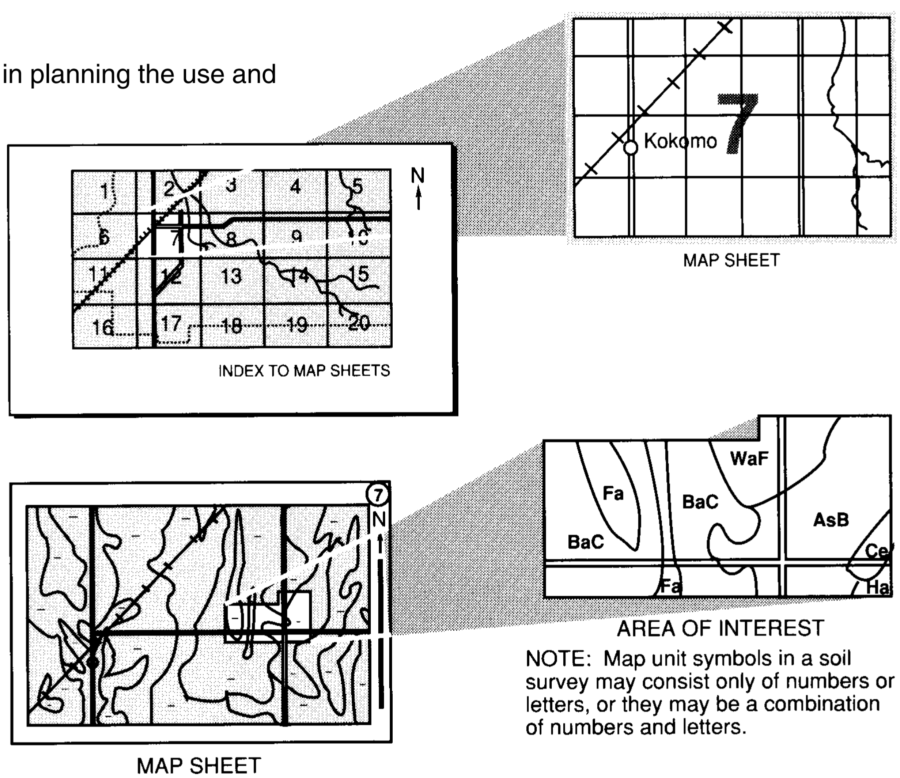
Detailed Soil Maps

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.



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

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

Major fieldwork for this soil survey was completed in 1995. Soil names and descriptions were approved in 1996. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1995. This survey was made cooperatively by the Natural Resources Conservation Service, the Michigan Department of Agriculture, the Michigan Agricultural Experiment Station, the Michigan State University Extension Service, and Michigan Technological University. The survey is part of the technical assistance furnished to the Montmorency County Soil Conservation District. The Montmorency County Board of Commissioners and the Montmorency County Road Commission provided financial assistance for the survey.

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

Cover: The Rubicon soil in the foreground is part of an outwash plain. Tawas and Lupton soils in the center are in an old glacial drainageway. The background is a moraine.

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

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Issued 2002

Foreword

This soil survey contains information that can be used in land-planning programs in Montmorency County. 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.

The soil survey of Montmorency County, Michigan, is a subset of the soil survey of Major Land Resource Area (MLRA) 94A.

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, and information on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Ronald C. Williams
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Montmorency County, Michigan

By Thomas H. Purkey, Natural Resources Conservation Service

Fieldwork by Gordon R. Green, Susan B. Hart, James G. Marshall III, William L. Mitchell, Thomas H. Purkey, and Jon M. Quisler, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
Michigan Department of Agriculture, Michigan Agricultural Experiment Station, Michigan State University Extension, Michigan Technological University, Soil Classifiers Association of Michigan, and Montmorency County Board of Commissioners

MONTMORENCY COUNTY is in the northeastern part of the lower peninsula of Michigan (fig. 1). The county is bordered on the northwest by Cheboygan County, on the northeast by Presque Isle County, on the west by Otsego County, on the south by Oscoda County, and on the east by Alpena County. The total area of the county is 359,764 acres, or about 562 square miles. Atlanta is the county seat. The population of the county was 8,936 in 1990 (U.S. Department of Commerce, 1990).

Most of the county (about 86 percent) is forested. About 5 percent is used for agricultural purposes, 3 percent is upland brush, 3 percent is lowland brush, 2 percent is water, and 1 percent is used for urban development.

This survey updates the soil survey of Montmorency County published in 1930 (Veatch and others, 1930). It provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section provides general information about Montmorency County. It describes climate, history and development, physiography and relief, lakes and streams, native vegetation, and agriculture.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Gaylord, Michigan, 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 19.5 degrees F and the average daily minimum temperature is 11.3 degrees. The lowest temperature on record, which occurred on February 17, 1979, is -37 degrees. In summer, the average temperature is 65.5 degrees and the average daily maximum temperature is 78.2 degrees. The highest recorded temperature, which occurred on August 21, 1955, is 99 degrees.

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

The total annual precipitation is 35.63 inches. Of this total, 13.63 inches, or about 38 percent, usually falls during the period from June through mid-

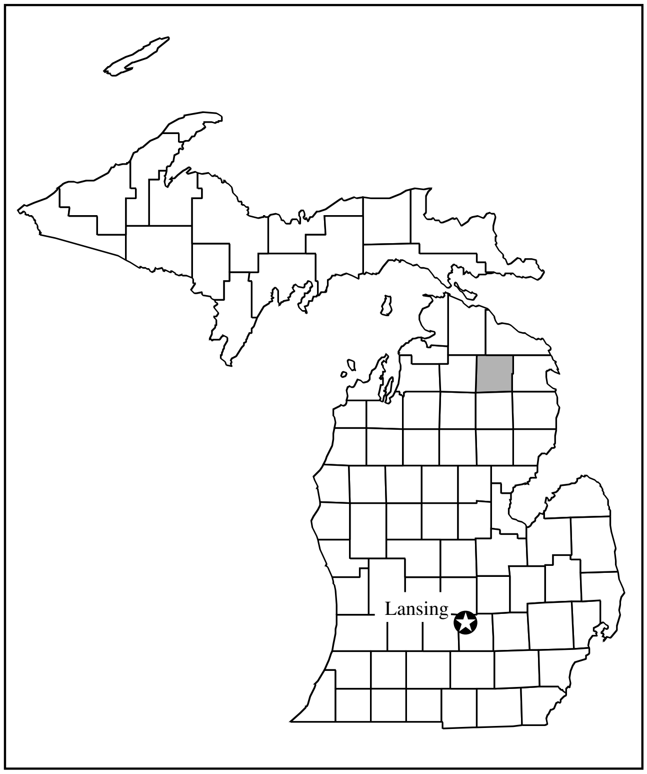


Figure 1.—Location of Montmorency County in Michigan.

September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 10.3 inches. The heaviest 1-day rainfall during the period of record was 5 inches on August 17, 1995. Thunderstorms occur on about 35 days each year, and most occur in July.

The average seasonal snowfall is 150.1 inches. The greatest snow depth at any one time during the period of record was 50 inches. On the average, 129 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 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, 9.5 miles per hour, in April.

History and Development

As glacial ice retreated from the county about 12,000 years ago, the Ojibwa Indians, also known as Chippewa, moved into the area that is now known as Montmorency County. These people lived as nomadic tribes, spending the summer months along the Great Lakes and migrating into the interior in smaller family units during the winter.

The arrival of French traders and missionaries in 1644 was well received by the Ojibwa because of the technology the Europeans brought in trade for furs.

In 1840, Cheonoquet County was established by the State of Michigan. The name is from the Ojibwa “Cheonoquet,” or “Big Cloud.” In 1843, the name was changed to Montmorency County. At first, Montmorency County was a “set-off” county with services provided by Cheboygan County and, later, by Alpena County. On May 21, 1881, Montmorency County became an independent unit with Hillman as its county seat. In 1893, the county seat was moved to a more centralized location in Atlanta.

The first families started to homestead in Montmorency County in the 1880’s. They were lured to the area by land speculators who promised good agricultural land and thick forests. A few settlers homesteaded north of Hillman and established profitable farms, many of which are still in operation today.

Most families worked their lands in the summer and sent the men to work in the lumber camps in the winter.

At first the only lumber that could be profitably harvested was lightweight wood that could be floated downriver to the mills. Later, when railroad spurs were laid into logging camps, heavier wood could be harvested. By 1900, there were nine towns with post offices in the county. By 1910, most of the upland forests had been harvested and the swamps felled for the remaining wood. By 1920, Montmorency County was exhausted of all its marketable timber.

After World War II, people in the cities, tired of the noise and pollution, started to head to the north woods of Michigan for summer and fall vacations. Many returned after retirement and made permanent homes in the area. As a result, recreation became the biggest industry in Montmorency County.

Much of the denuded forestland reverted from the lumber companies back to State ownership. In the 1930’s, the Civilian Conservation Corps was called in to build the facilities at Clear Lake State Park and other State-owned campgrounds (Jacobson, 1981). Today, recreation is still the biggest industry in the county, followed by agriculture and forestry.

Physiography and Relief

There are four distinct kinds of surface features in Montmorency County. These features are moraines, outwash plains, deltas, and lake plains, all of which formed as a result of the complex action of glaciers and glacial lakes (fig. 2).

The morainic areas are characterized by rolling to steep, uneven, knoblike hills and pothole depressions. The largest morainic area is the end moraine of the Port Huron lobe, the Johannesburg Moraine, which crosses the county diagonally from the southern part of Vienna Township to the eastern edge of Albert Township.

The deltas are characterized by broad, nearly level plains dissected at widely spaced intervals by river and stream channels. The largest delta in the county is the Brush Creek Delta, which is primarily in East Hillman Township. The Brush Creek Delta formed at the outlet of the Thunder Bay River as it flowed on to the Hillman Lake Plain.

The outwash plains include small morainic and lacustrine areas. They are characterized by nearly level to sloping areas that are pitted in some places. The largest outwash plain is in the Lewiston area of Albert Township.

The lacustrine plains are associated with ancient

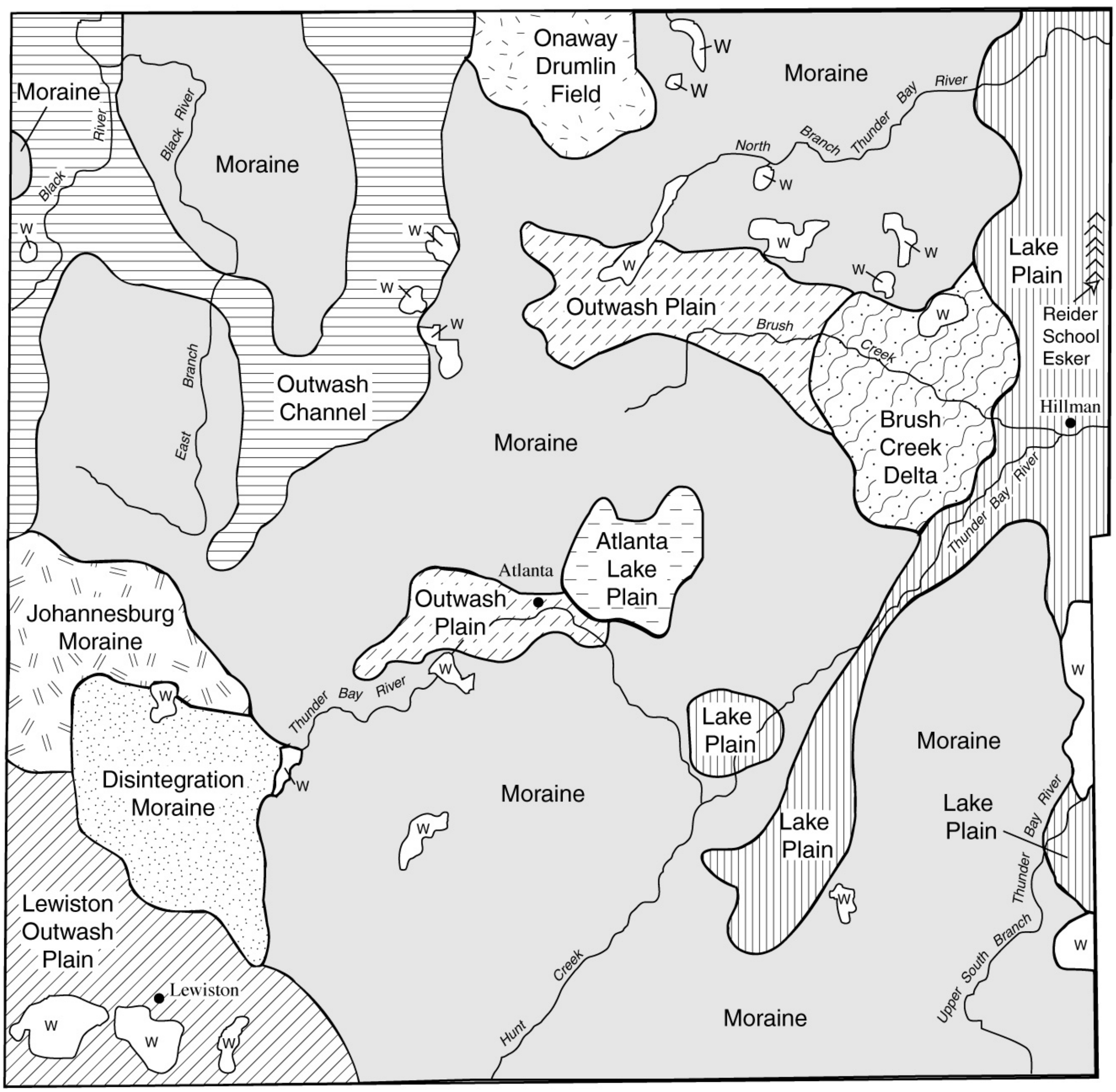


Figure 2.—Physiography of Montmorency County, Michigan.

glacial lakes. They are nearly level to undulating. The largest lacustrine plain in the county Is along the eastern edge of Hillman and Montmorency Townships.

The highest elevation in the county, about 1,440 feet above mean sea level, is in the southern part of Vienna Township. The lowest elevation, about 730 feet above mean sea level, is at the point where the Thunder Bay River flows out of the county at the eastern edge of Hillman Township.

Lakes and Streams

Numerous lakes and swamps are scattered throughout Montmorency County. In addition to these larger bodies of water, there are a great number of small ponds, kettle holes, and marshes. These smaller bodies of water are characterized by moderate seasonal fluctuations in water level and various stages of vegetational encroachment. Many of the lakes and smaller bodies of water are interconnected by streams through bordering swamps and marshes.

Montmorency County has 89 lakes covering more than 8,000 acres. Forty-five of these lakes are more than 50 acres in size, and three are larger than 600 acres. Fletchers Pond, on the eastern border of the county, is the largest of these lakes. Its total acreage, part of which is in Alpena County, is 8,970 acres. Other large lakes in the county include East and West Twin Lakes, which cover about 2,300 acres; Grass Lake, which covers about 950 acres; Avalon Lake, which covers about 375 acres; Rush Lake, which covers about 310 acres; Long Lake, which covers about 300 acres; Avery Lake, which covers about 180 acres; and Clear Lake, which covers about 140 acres.

The county has five watersheds, all of which are part of the Lake Huron drainage basin (fig. 3). The principal rivers in the county are the North, South, and Main branches of the Thunder Bay River; the Black River; and the AuSable River. Floods or long periods of high water along the five main rivers are not a serious problem in the county.

There are comparatively few large streams and very few tributary streams in proportion to the area of the county, owing to the comparative youth of the land surface and because of the large area of land underlain by rapidly permeable sand and gravel. The direction of stream flow, locally, appears to be without system, as the stream courses are determined by obstructions and constructional valleys left by the ice sheet, although the general direction of flow is northward, in conformity with the preglacial slope of the land.

Native Vegetation

The pre-settlement forests of Montmorency County consisted predominantly of vast stands of white pine and red pine and smaller areas of northern hardwoods, such as red oak, hard maple, beech, and yellow birch, and swamp forests containing white cedar, tamarack, spruce, and fir.

These distinct types of forest associations that made up the virgin forests grew and flourished in response to the different types of soils in the county. The northern hardwood forest, in which sugar maple, beech, yellow birch, and hemlock were the dominant species and elm, basswood, and white pine were subordinate species, grew on the moraine soils. The mixed deciduous-coniferous forest, in which such species as elm, ash, red maple, aspen, and yellow birch were intimately associated with white pine, hemlock, spruce, and fir, grew on the more clayey soils. The pine forests, in which white pine, red pine, and jack pine were dominant, grew on the sandy outwash soils. The peat and muck swamp forests, in which the dominant species were white cedar, white spruce, black spruce, balsam fir, and tamarack, grew on poorly drained organic and mineral soils in wet areas.

The bogs are covered with a dense growth of heath shrubs, such as blueberries, leatherleaf, and Labrador tea, and some scattered black spruce and tamarack. Marsh growth consists of various sedges and bluejoint.

Agriculture

Grant Sork, district conservationist, Natural Resources Conservation Service, helped prepare this section.

Although farming is not the primary land use in Montmorency County, it does play a significant role in the economy of the Hillman and Vienna Corners area. About 5 percent of the county, or 17,600 acres, is classified as farmland. The average size of farms in the county is 223 acres. In 1990, a total of 108 farms covered a total of 24,000 acres of cropland, pasture, and forestland. Of this total, approximately 15,000 acres was cropland and another 5,300 was used for the production of forage crops. Corn is the most common row crop produced in the county. Average yields of corn are 80 to 85 bushels per acre. Small grain crops include oats, wheat, and rye. The production of dry beans, such as kidney beans, is established in the county and is increasing. Several

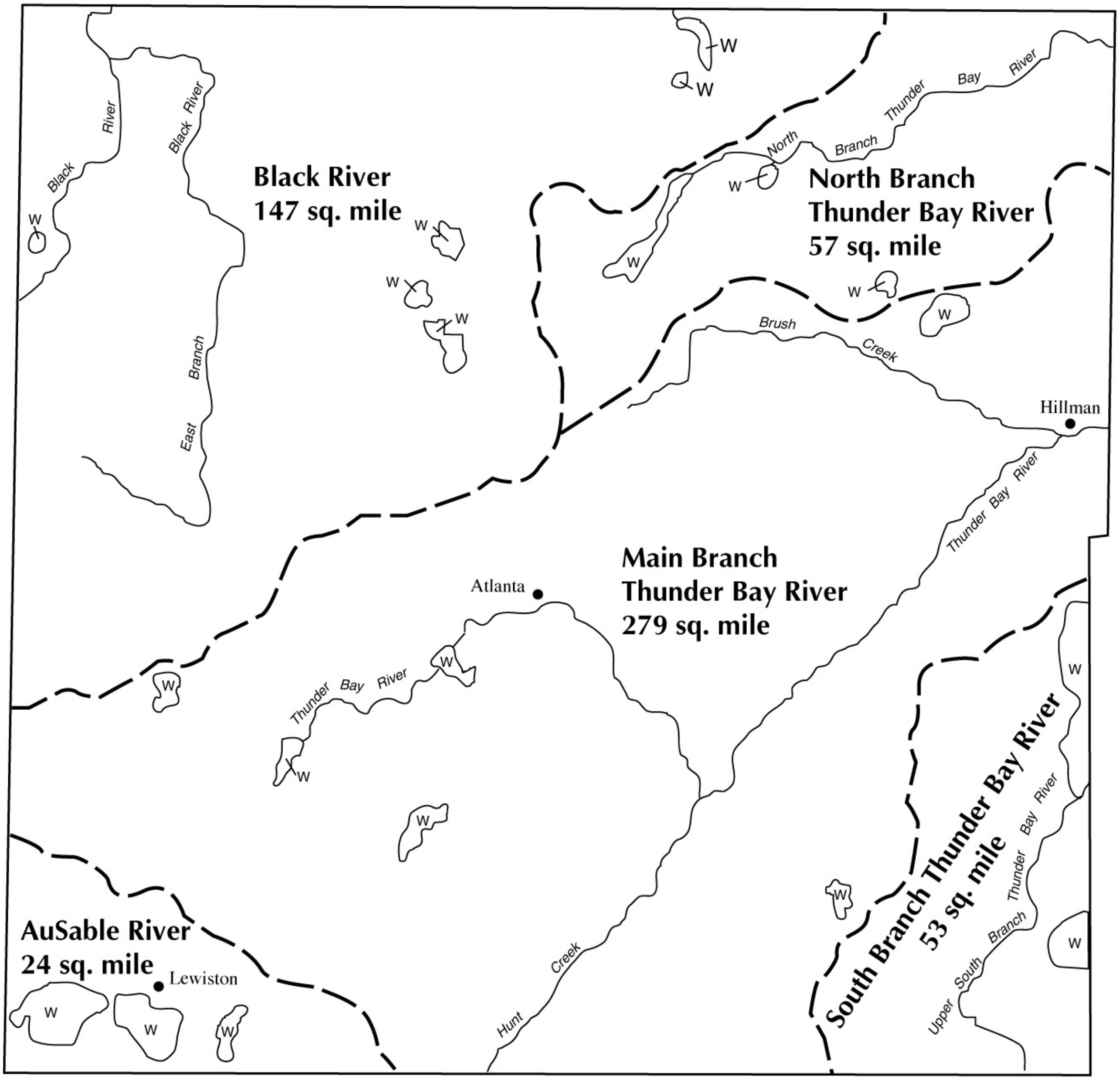


Figure 3.—Location, approximate size, and approximate boundaries of the five major watersheds in Montmorency County.

farmers in the county have developed a market for sunflower seed used as bird seed. Many acres of pumpkins, sugar beets, and other crops are planted for use as deer feed by many of the hunt clubs in the county. Hunt clubs also serve as a major market for the hay that is produced in the county.

How This Survey Was Made

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

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

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

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

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

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

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

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. These areas are called associations. Each association on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils and some minor soils or miscellaneous areas. It is named for the major soils. The soils making up 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 a 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.

1. Rubicon-Grayling-Tawas Association

Level to rolling, excessively drained to very poorly drained, sandy and organic soils on outwash plains and in outwash channels

Setting

Landform: Outwash plains and channels
Slope range: 0 to 18 percent

Composition

Extent of the association in the survey area: 17 percent
Extent of the soils in the association (fig. 4):
Rubicon soils—35 percent
Grayling soils—20 percent
Tawas soils—20 percent
Minor soils—25 percent

Soil Properties and Qualities

Rubicon

Drainage class: Excessively drained
Position on the landform: Flat uplands, low knolls, ridges, and hillslopes
Parent material: Outwash sand
Texture of the surface layer: Sand
Slope class: Level to rolling

Grayling

Drainage class: Excessively drained
Position on the landform: Flat uplands, low knolls, ridges, and hillslopes
Parent material: Outwash sand
Texture of the surface layer: Sand
Slope class: Level to rolling

Tawas

Drainage class: Very poorly drained
Position on the landform: Depressions and drainageways
Parent material: Organic deposits over outwash sand
Texture of the surface layer: Muck
Slope class: Level and nearly level

Minor Soils

- The moderately well drained Croswell soils in positions on the landform slightly lower than those of the Rubicon and Grayling soils
- The poorly drained Deford soils in positions below those of the Rubicon and Grayling soils; in drainageways and depressions
- The very poorly drained Lupton soils in positions on the landform similar to those of the Tawas soils

Use and Management

Major use: Woodland
Management concerns: Equipment limitation, seedling mortality, windthrow hazard

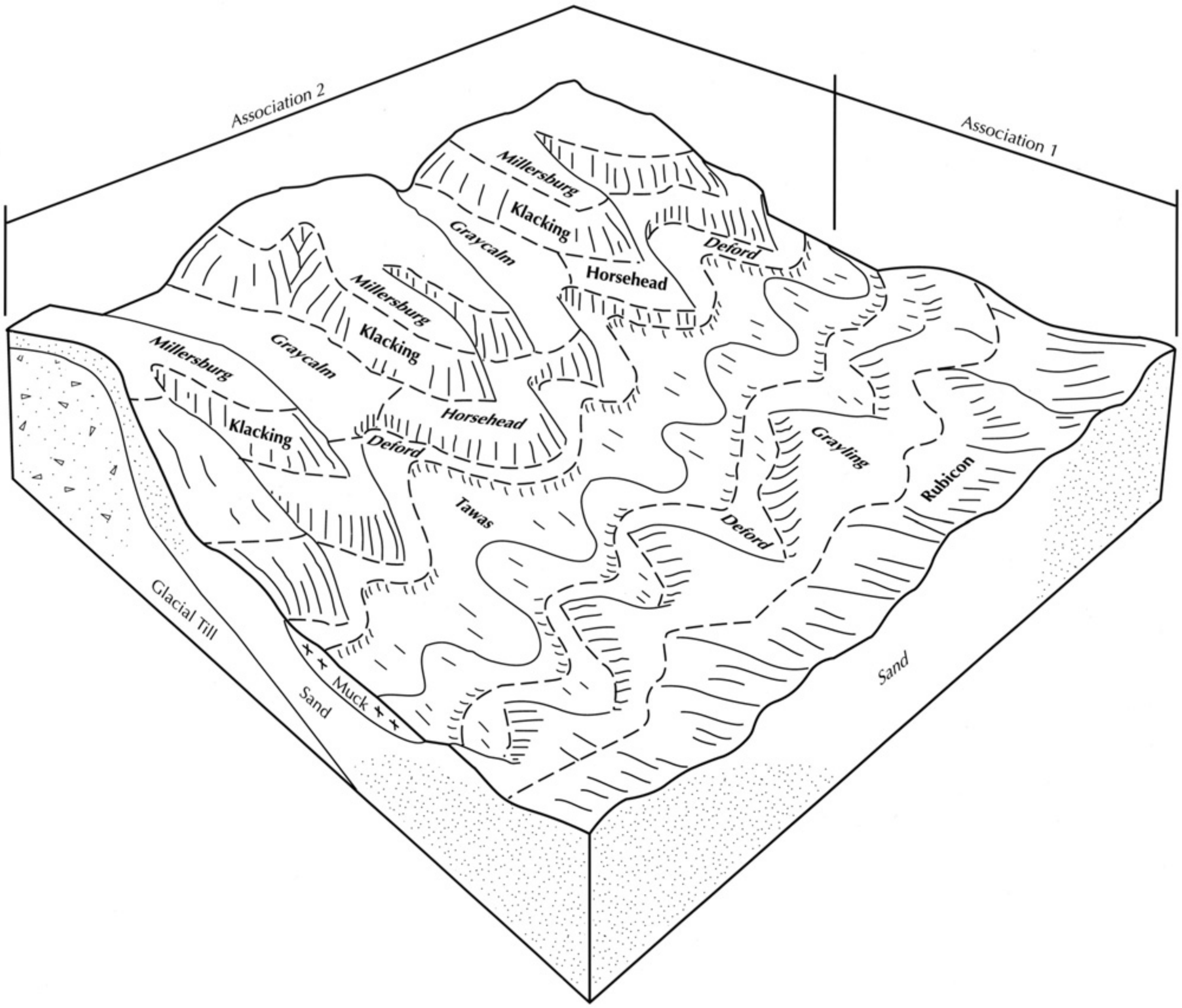


Figure 4.—Typical pattern of soils and underlying material in the Rubicon-Grayling-Tawas and Millersburg-Klacking-Horsehead associations.

2. Millersburg-Klacking-Horsehead Association

Level to very hilly, well drained, sandy and loamy soils on moraines

Setting

Landform: Moraines
Slope range: 0 to 35 percent

Composition

Extent of the association in the survey area: 34 percent

Extent of the soils in the association (fig. 4):
Millersburg soils—30 percent
Klacking soils—20 percent
Horsehead soils—20 percent
Minor soils—30 percent

Soil Properties and Qualities

Millersburg

Drainage class: Well drained
Position on the landform: Flats and hillslopes
Parent material: Coarse-loamy till
Texture of the surface layer: Loamy sand
Slope class: Level to very hilly

Klacking

Drainage class: Well drained
Position on the landform: Flats and hillslopes
Parent material: Sandy till and outwash deposits
Texture of the surface layer: Sand
Slope class: Level to very hilly

Horsehead

Drainage class: Somewhat excessively drained
Position on the landform: Upland flats and hillslopes
Parent material: Outwash sand and gravel deposits
Texture of the surface layer: Sand
Slope class: Level to very hilly

Minor Soils

- The somewhat excessively drained Mancelona and Graycalm soils in positions on the landform similar to those of the Millersburg, Klacking, and Horsehead soils
- The excessively drained Grayling and Rubicon soils on the small, lower outwash flats between moraines
- The poorly drained Deford soils in depressions
- The very poorly drained Tawas and Lupton soils in drainageways and depressions

Use and Management

Major use: Woodland
Management concerns: Equipment limitation, seedling mortality, plant competition

3. Grayling Association

Level to rolling, excessively drained, sandy soils on outwash plains

Setting

Landform: Outwash plains
Slope range: 0 to 18 percent

Composition

Extent of the association in the survey area: 6 percent
Extent of the soils in the association:
Grayling soils—80 percent
Minor soils—20 percent

Soil Properties and Qualities

Grayling

Drainage class: Excessively drained
Position on the landform: Flat uplands and hillslopes
Parent material: Outwash sand
Texture of the surface layer: Sand
Slope class: Level to rolling

Minor Soils

- The somewhat excessively drained Graycalm soils in positions on the landform similar to those of the Grayling soils
- The moderately well drained Croswell soils in the slightly lower positions near drainageways and depressions
- The very poorly drained Tawas soils in depressions and drainageways

Use and Management

Major use: Woodland
Management concerns: Equipment limitation, seedling mortality

4. Graycalm-Horsehead Association

Level to gently rolling, somewhat excessively drained, sandy soils on outwash plains

Setting

Landform: Outwash plains
Slope range: 0 to 18 percent

Composition

Extent of the association in the survey area: 7 percent
Extent of the soils in the association:
Graycalm soils—50 percent
Horsehead soils—30 percent
Minor soils—20 percent

Soil Properties and Qualities

Graycalm

Drainage class: Somewhat excessively drained
Position on the landform: Upland flats and hillslopes
Parent material: Outwash sand
Texture of the surface layer: Sand
Slope class: Level to rolling

Horsehead

Drainage class: Somewhat excessively drained
Position on the landform: Upland flats and hillslopes
Parent material: Outwash sand and gravel
Texture of the surface layer: Sand
Slope class: Level to rolling

Minor Soils

- The moderately well drained Croswell soils in slight depressions and between upland flats and drainageways

• The very poorly drained Tawas soils in the lower positions in depressions and drainageways

Use and Management

Major use: Woodland
Management concerns: Equipment limitation; seedling mortality and plant competition on the Horsehead soils

5. Algonquin-Negwegon-Springport Association

Level to gently rolling, well drained to poorly drained, clayey soils on lake plains

Setting

Landform: Lake plains
Slope range: 0 to 12 percent

Composition

Extent of the association in the survey area: 10 percent
Extent of the soils in the association (fig. 5):
Algonquin and similar soils—25 percent
Negwegon and similar soils—21 percent
Springport and similar soils—21 percent
Contrasting minor soils—33 percent

Soil Properties and Qualities

Algonquin

Drainage class: Somewhat poorly drained
Position on the landform: Slight depressions, slight swales, flats, and drainageways
Parent material: Lacustrine sediments
Texture of the surface layer: Silt loam
Slope class: Level to undulating

Negwegon

Drainage class: Moderately well drained
Position on the landform: Low knolls, low ridges, and flats
Parent material: Lacustrine sediments
Texture of the surface layer: Silt loam
Slope class: Nearly level to undulating

Springport

Drainage class: Poorly drained
Position on the landform: Depressions and swales
Parent material: Lacustrine sediments
Texture of the surface layer: Silt loam
Slope class: Level and nearly level

Minor Soils

• The well drained Blue Lake soils on low knolls and low ridges
• The somewhat poorly drained Allendale soils in positions on the landform similar to those of the Algonquin soils
• The poorly drained Wakeley soils in positions on the landform similar to those of the Springport soils
• The very poorly drained Dorval soils in the lowest positions in depressions

Use and Management

Major uses: Cropland and pasture
Management concerns: Seasonal wetness, restricted permeability, tilth of the surface layer, compaction, ponding, water erosion

6. Deford-Au Gres-Croswell Association

Level to undulating, moderately well drained to poorly drained, sandy soils on old beach ridges and outwash plains

Setting

Landform: Outwash plains and old beach ridges
Slope range: 0 to 6 percent

Composition

Extent of the association in the survey area: 3 percent
Extent of the soils in the association (fig. 6):
Deford soils—30 percent
Au Gres soils—25 percent
Croswell soils—20 percent
Minor soils—25 percent

Soil Properties and Qualities

Deford

Drainage class: Poorly drained
Position on the landform: Depressions, drainageways, and swales
Parent material: Outwash sand
Texture of the surface layer: Muck
Slope class: Level and nearly level

Au Gres

Drainage class: Somewhat poorly drained
Position on the landform: Footslopes, depressions, and swales
Parent material: Outwash sand

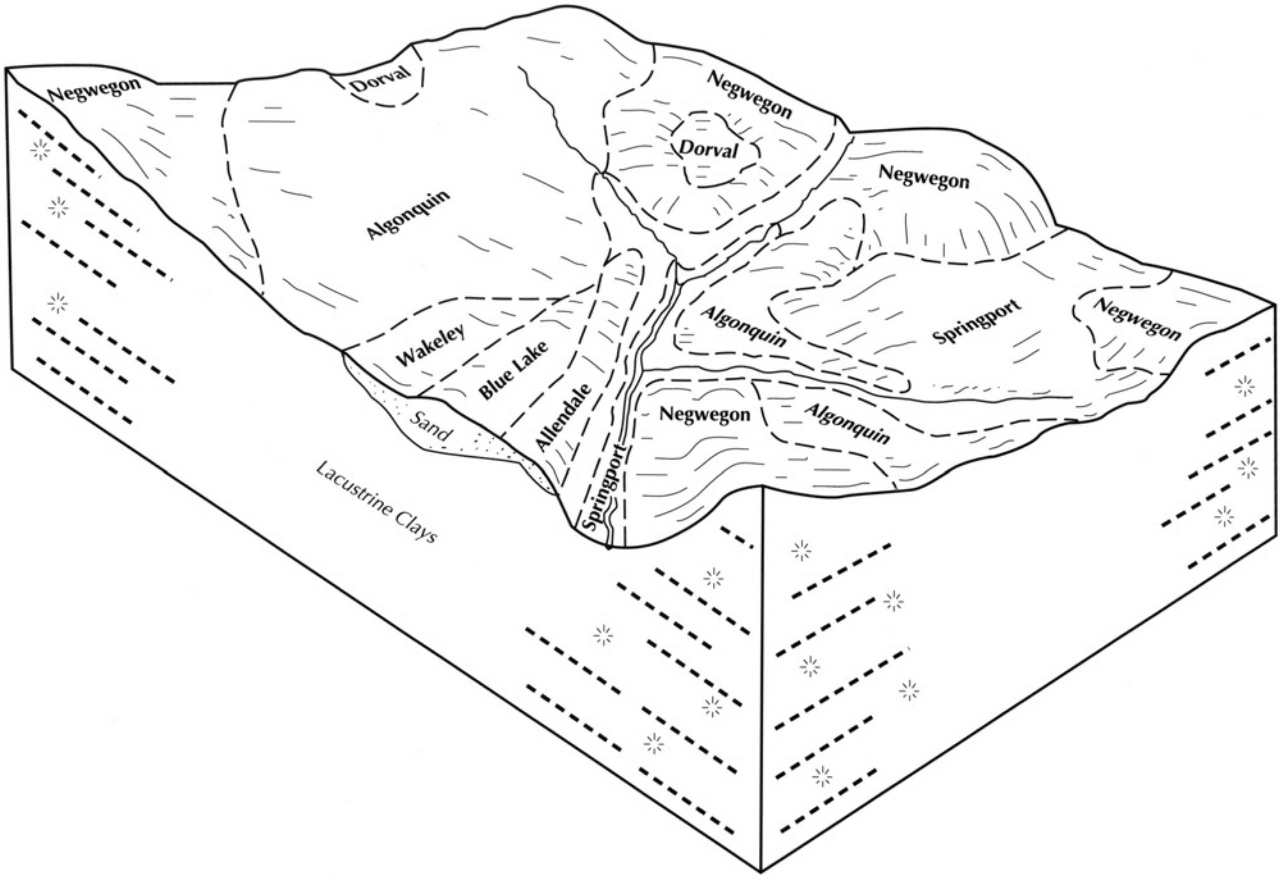


Figure 5.—Typical pattern of soils and underlying material in the Algonquin-Negwegon-Springport association.

Texture of the surface layer: Sand
Slope class: Level and nearly level

Croswell

Drainage class: Moderately well drained
Position on the landform: Flats and low ridges
Parent material: Outwash sand
Texture of the surface layer: Sand
Slope class: Level to undulating

Minor Soils

- The moderately well drained Chinwhisker soils in positions on the landform similar to those of the Croswell soils
- The very poorly drained Tawas and Lupton soils in the lowest positions in depressions, drainageways, and swales

Use and Management

Major use: Woodland
Management concerns: Equipment limitation, seasonal wetness, windthrow hazard, seedling mortality

7. Bamfield-Menominee-Lupton Association

Level to very hilly, well drained to very poorly drained, loamy, sandy, and organic soils on moraines

Setting

Landform: Moraines
Slope range: 0 to 35 percent

Composition

Extent of the association in the survey area: 8 percent
Extent of the soils in the association (fig. 7):
Bamfield and similar soils—40 percent
Menominee and similar soils—20 percent
Lupton and similar soils—25 percent
Contrasting minor soils—15 percent

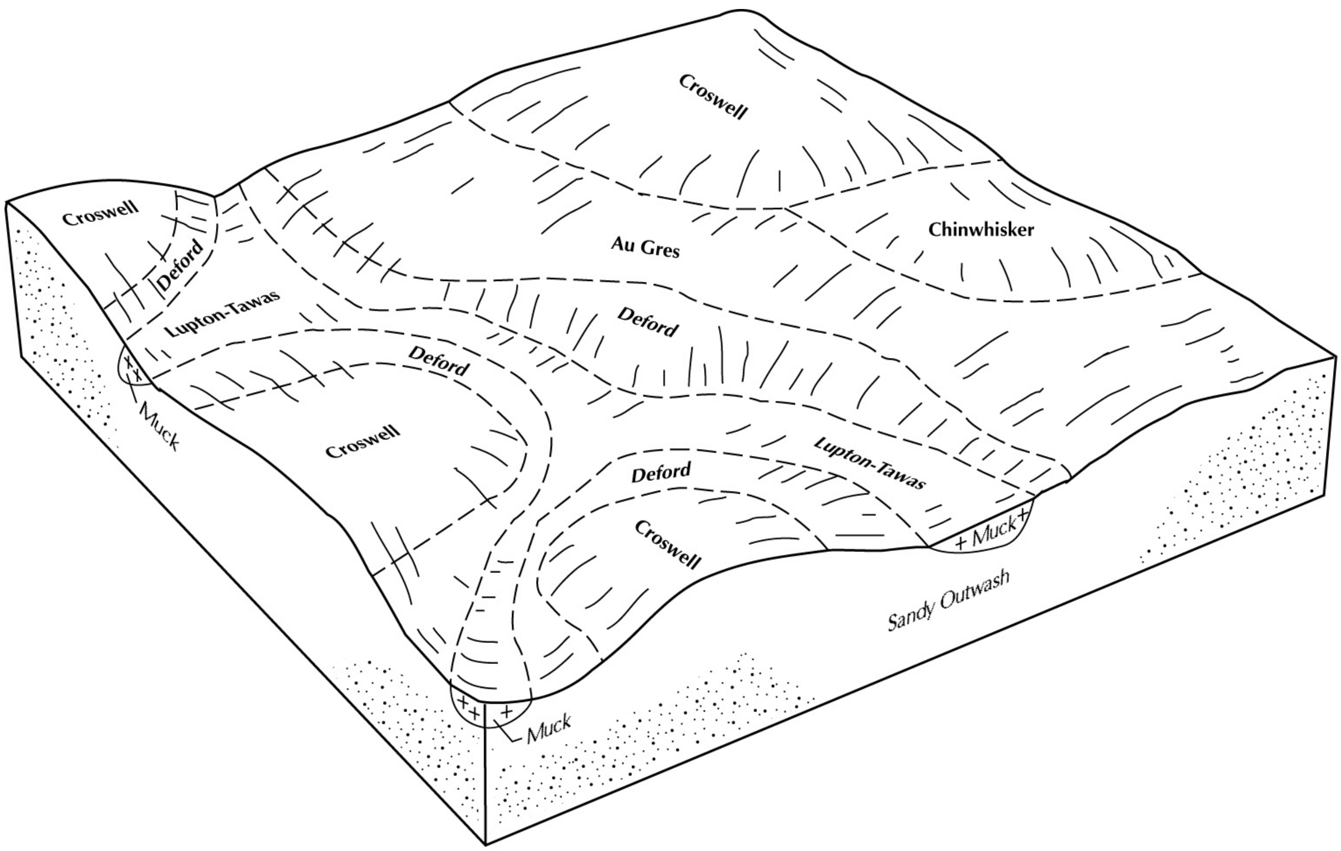


Figure 6.—Typical pattern of soils and underlying material in the Deford-Au Gres-Croswell association.

Soil Properties and Qualities

Bamfield

Drainage class: Well drained
Position on the landform: Flats and hillslopes
Parent material: Loamy till
Texture of the surface layer: Fine sandy loam
Slope class: Nearly level to very hilly

Menominee

Drainage class: Well drained
Position on the landform: Flats and hillslopes
Parent material: Sandy outwash over loamy till
Texture of the surface layer: Loamy sand
Slope class: Level to rolling

Lupton

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

Minor Soils

Contrasting soils

- The excessively drained Rubicon soils in positions on the landform similar to those of the Bamfield and Menominee soils

Similar soils

- The moderately well drained Ossineke soils in positions on the landform similar to and less sloping than those of the Bamfield and Menominee soils
- The moderately well drained Morganlake soils in positions on the landform similar to and less sloping than those of the Bamfield and Menominee soils
- The very poorly drained Tawas soils in positions on the landform similar to those of the Lupton soils

Use and Management

Major uses: Woodland and cropland
Management concerns: Bamfield and Menominee—erosion hazard, equipment limitation, plant competition; Lupton—erosion hazard, equipment

limitation, plant competition, seedling mortality, windthrow hazard

8. Lupton-Tawas Association

Level and nearly level, very poorly drained, organic soils on outwash plains and in glacial drainageways

Setting

Landform: Drainageways
Slope range: 0 to 2 percent

Composition

Extent of the association in the survey area: 3 percent
Extent of the soils in the association (fig. 8):
Lupton soils—50 percent
Tawas soils—40 percent
Minor soils—10 percent

Soil Properties and Qualities

Lupton

Drainage class: Very poorly drained
Position on the landform: Glacial drainageways
Parent material: Organic deposits
Texture of the surface layer: Muck
Slope class: Level and nearly level

Tawas

Drainage class: Very poorly drained
Position on the landform: Glacial drainageways
Parent material: Organic deposits
Texture of the surface layer: Muck
Slope class: Level and nearly level

Minor Soils

- The moderately well drained Croswell soils in the highest positions on low ridges and knolls
- The very poorly drained Ausable soils in positions on the landform similar to those of the Lupton and Tawas soils

Use and Management

Major use: Woodland
Management concerns: Equipment limitation, seedling mortality, windthrow hazard, plant competition

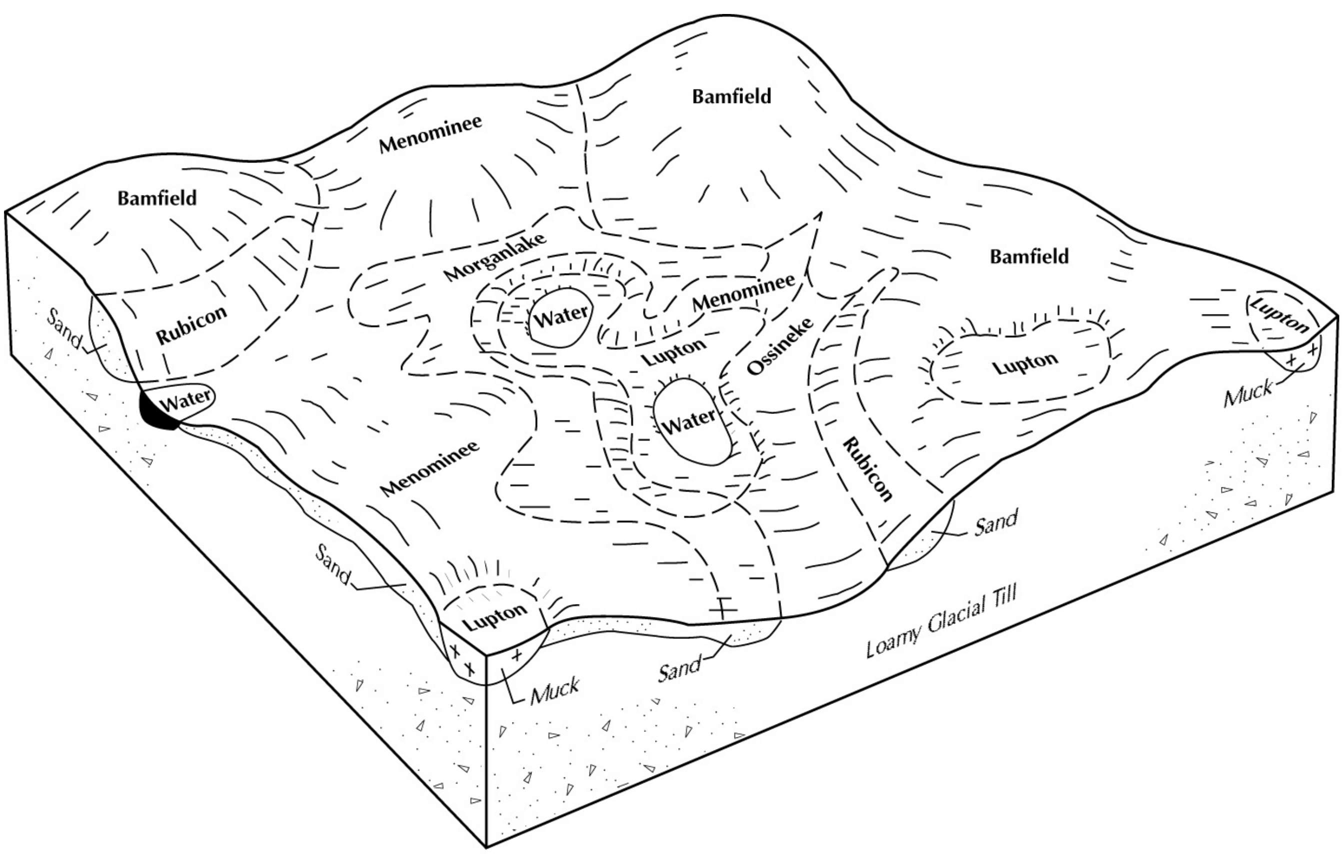


Figure 7.—Typical pattern of soils and underlying material in the Bamfield-Menominee-Lupton association.

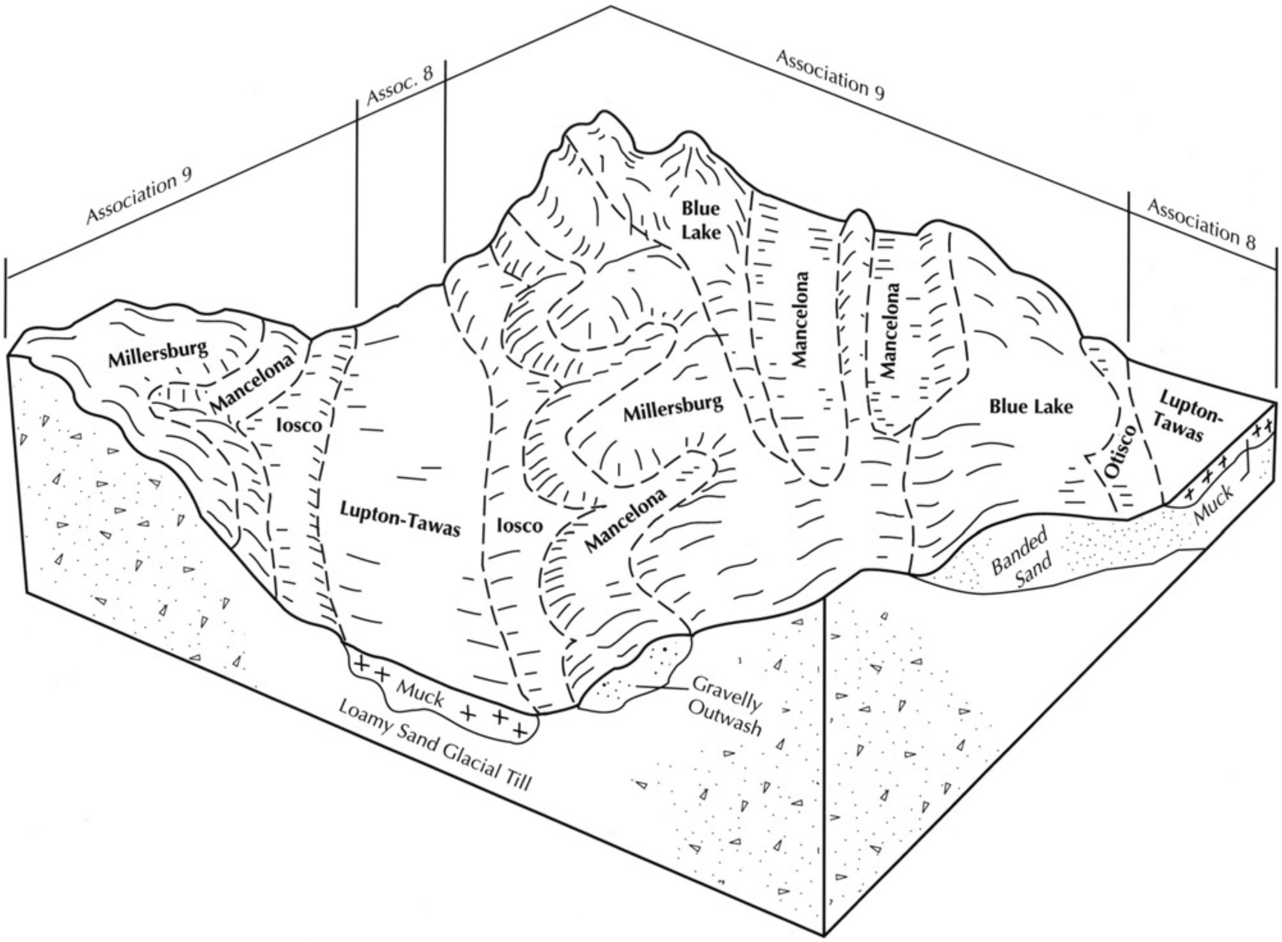


Figure 8.—Typical pattern of soils and underlying material in the Lupton-Tawas and Mancelona-Millersburg-Blue Lake associations.

9. Mancelona-Millersburg-Blue Lake Association

Level to very steep, well drained and somewhat excessively drained, sandy and loamy soils on moraines

Setting

Landform: Moraines
Slope range: 0 to 70 percent

Composition

Extent of the association in the survey area: 12 percent
Extent of the soils in the association (fig. 8):
Mancelona soils—25 percent
Millersburg soils—20 percent
Blue Lake soils—25 percent
Minor soils—30 percent

Soil Properties and Qualities

Mancelona

Drainage class: Somewhat excessively drained
Position on the landform: Hillslopes
Parent material: Outwash sand and gravel
Texture of the surface layer: Sand
Slope class: Level to very steep

Millersburg

Drainage class: Well drained
Position on the landform: Hillslopes
Parent material: Coarse-loamy till
Texture of the surface layer: Loamy sand
Slope class: Level to very steep

Blue Lake

Drainage class: Well drained
Position on the landform: Hillslopes
Parent material: Sandy outwash and till deposits

Texture of the surface layer: Sand
Slope class: Level to very steep

Minor Soils

- The well drained Bamfield soils in positions on the landform similar to those of the Millersburg soils
- The somewhat poorly drained Otisco and Iosco soils in depressions and drainageways
- The very poorly drained Lupton soils in depressions and drainageways

Use and Management

Major use: Woodland
Management concerns: Equipment limitation, seedling mortality, plant competition

Detailed Soil Map Units

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

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

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

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

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

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

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

The various interpretive groups listed in the descriptions are described under the heading "Use and Management of the Soils."

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see Contents) 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.

13—Tawas-Lupton mucks

Setting

Landform: Low flats, depressions, and drainageways on moraines, outwash plains, and lake plains
Slope range: 0 to 2 percent
Shape of areas: Irregular, linear, or oval
Size of areas: 3 to 1,200 acres

Typical Profile

Tawas

Surface layer:
0 to 10 inches—black muck

Subsurface layer:
10 to 22 inches—black muck

Substratum:
22 to 80 inches—pale brown sand

Lupton

Surface layer:
0 to 8 inches—dark reddish brown muck

Subsurface layer:
8 to 48 inches—black muck

Substratum:
48 to 80 inches—black muck

Soil Properties and Qualities

Permeability: Tawas—moderately slow to moderately rapid in the organic material and rapid in the underlying sand; Lupton—moderately slow to moderately rapid
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Perched, 1 foot above to 1 foot below the surface from October through May
Potential 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

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

Inclusions

Contrasting inclusions:
- The poorly drained Deford soils, which have a surface layer of mucky sand; at the extreme edges of the unit
- The moderately well drained Croswell soils on slight rises
- The somewhat poorly drained Au Gres soils in the slightly higher landscape positions
- Small areas of open water

Similar inclusions:
- Soils that have less than 16 inches of muck over sand
- Soils that are poorly drained
- Soils that have bands of loamy sand in the subsoil and substratum
- Soils in areas of the Tawas soil that have thin layers of loamy material in the substratum
- Soils that are very strongly acid in parts of the profile

Use and Management

Land use: Dominant use—woodland

Woodland

Major management concerns: Equipment limitation, 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.
- Log landings should be located in areas of the drier, more suitable 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.
- Because of wetness, severe seedling mortality, and plant competition, trees are generally not planted on these soils.
- Special harvest methods may be needed to control undesirable plants.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

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

Interpretive Groups

Land capability classification: 6w
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 moraines, outwash plains, and lake plains
Slope range: 0 to 2 percent
Shape of areas: Irregular or oval
Size of areas: 3 to 80 acres

Typical Profile

Dawson

Surface layer:
0 to 4 inches—yellow peat

Subsoil:
4 to 8 inches—very dusky red mucky peat
8 to 28 inches—very dusky red muck

Substratum:
28 to 80 inches—dark yellowish brown sand

Loxley

Surface layer:
0 to 5 inches—yellow peat

Subsurface layer:
5 to 10 inches—very dusky red mucky peat

Substratum:
10 to 80 inches—dusky red and dark reddish brown muck

Soil Properties and Qualities

Permeability: Dawson—moderately slow to moderately rapid in the organic material and rapid in the underlying sand; Loxley—moderately slow to moderately rapid
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 October through May
Potential 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 and similar soils: 10 to 95 percent
Loxley and similar soils: 10 to 95 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils in the slightly higher landscape positions
- Small areas of open water

Similar inclusions:
- Soils in areas of the Dawson soil that have organic layers less than 16 inches thick
- Soils that are less acid in parts of the profile

Use and Management

Land use: Dominant use—woodland

Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard, plant competition
Management considerations:
- These soils are generally unsuited to woodland because of extreme acidity, the low strength of the organic material, and the wetness. Overcoming these limitations is not practical.
- Tree cover is sparse and includes some spruce and tamarack around the edges of the unit. Shrubs are the most common vegetation (fig. 9).

Figure 9.—An area of Dawson-Loxley peats. The vegetation is mainly leatherleaf, sphagnum, and lowbush blueberry.

Building sites

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

Interpretive Groups

Land capability classification: 7w
Woodland ordination symbol: Dawson—2W; Loxley—2W
Michigan soil management group: Dawson—Mc-a; Loxley—Mc-a

16B—Graycalm sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, moraines, and stream terraces
Shape of areas: Irregular
Size of areas: 50 to 1,000 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 16 inches—strong brown sand
16 to 27 inches—reddish yellow sand
27 to 80 inches—yellow sand that has bands of yellowish red loamy sand

Soil Properties and Qualities

Permeability: Rapid

Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential 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 and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Mancelona soils, which have very gravelly sand in the substratum; in landscape positions similar to those of the Graycalm soil
- The somewhat excessively drained Horsehead soils, which have very gravelly sand in the subsoil and substratum; in landscape positions similar to those of the Graycalm soil
- The moderately well drained Croswell soils, which do not have bands of loamy sand in the substratum; in the slightly lower landscape positions

Similar inclusions:
- Sandy soils that do not have bands of loamy sand in the substratum
- Sandy soils that have more than 6 inches of bands of loamy sand in the substratum
- Soils that have a redder subsoil

Use and Management

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

Woodland

Major management concerns: Equipment limitation, 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 can reduce the seedling mortality rate.
- Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.

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.
- Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

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

Interpretive Groups

Land capability classification: 4s
Woodland ordination symbol: 6S
Michigan soil management group: 5a

17B—Croswell sand, 0 to 6 percent slopes

Setting

Landform: Stream terraces, outwash plains, ground moraines, lake plains, and lake terraces
Shape of areas: Elongated and irregular
Size of areas: 5 to 410 acres

Typical Profile

Organic mat:
0 to 2 inches—forest litter

Surface layer:
2 to 5 inches—black sand

Subsurface layer:
5 to 11 inches—grayish brown sand

Subsoil:
11 to 27 inches—strong brown sand
27 to 33 inches—brownish yellow sand

Substratum:
33 to 49 inches—yellow, mottled sand
49 to 80 inches—pale brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Apparent, at a depth of 2.0 to 3.5 feet at some time from November through May
Potential 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 and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils on the lower slopes and in depressions
- The excessively drained Rubicon soils on rises
- The poorly drained Deford soils, which have a lighter colored subsoil than the Graycalm soil; in depressions
- The very poorly drained Tawas soils, which have 16 to 50 inches of muck over sand; in depressions

Similar inclusions:
- Soils that have thin bands of loamy sand in the subsoil
- Soils that have a surface layer of loamy sand
- Soils that have carbonates in the substratum

Use and Management

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

Woodland

Major management concerns: Equipment limitation, 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.
- 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 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 by mechanical or chemical means is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Wetness can be reduced by installing 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, seasonal 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.
- On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 4s
Woodland ordination symbol: 5S
Michigan soil management group: 5a

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

Setting

Landform: Stream terraces, outwash plains, lake plains, ground moraines, and lake terraces
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Organic mat:
0 to 2 inches—partially decomposed forest litter

Surface layer:
2 to 8 inches—pinkish gray sand

Subsoil:
8 to 18 inches—dark reddish brown, mottled sand
18 to 35 inches—dark brown, mottled sand

Substratum:
35 to 50 inches—light yellowish brown, mottled sand
50 to 80 inches—brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, at a depth of 0.5 foot to 1.5 feet from November through May
Potential 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 and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The excessively drained Rubicon soils on low knolls and ridges
• The poorly drained Deford soils in depressions

Similar inclusions:
• Sandy soils that are moderately well drained
• Soils that have loamy material below a depth of 40 inches
• 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: Seasonal wetness, equipment limitation, seedling mortality, windthrow hazard, plant competition
Management considerations:
• Skidders should not be used during wet periods, when ruts form easily.
• 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.
• Landing sites generally can be used only during the driest time of the year.
• Special site preparation, such as bedding before planting, can reduce the seedling mortality rate.
• Special harvest methods may be needed to control undesirable plants.
• 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.
• Trees that can withstand seasonal wetness should be selected for planting.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Wetness can be reduced by installing 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: Rapid permeability, seasonal wetness
Management considerations:
• Filling or mounding with suitable 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 of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 4w
Woodland ordination symbol: 6W
Michigan soil management group: 5b

24A—Kinross-Au Gres complex, 0 to 3 percent slopes

Setting

Landform: Lake plains and outwash plains
Shape of areas: Irregular

Size of areas: 3 to 35 acres

Typical Profile

Kinross

Surface layer:
0 to 4 inches—black mucky peat

Subsurface layer:
4 to 11 inches—grayish brown sand

Subsoil:
11 to 13 inches—dark reddish brown, mottled sand
13 to 30 inches—dark brown and dark yellowish brown, mottled sand

Substratum:
30 to 80 inches—light yellowish brown sand

Au Gres

Organic mat:
0 to 2 inches—forest litter

Subsurface layer:
2 to 8 inches—pinkish gray sand

Subsoil:
8 to 18 inches—dark reddish brown, mottled sand
18 to 35 inches—dark brown, mottled sand

Substratum:
35 to 50 inches—light yellowish brown, mottled sand
50 to 80 inches—brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Kinross—poorly drained; Au Gres—somewhat poorly drained
Seasonal high water table: Kinross—apparent, 1 foot above to 1 foot below the surface at some time from October through May; Au Gres—apparent, at a depth of 0.5 foot to 1.5 feet at some time from November through May
Potential surface runoff: Negligible
Hazard of water erosion: Slight
Hazard of soil blowing: Kinross—moderate; Au Gres—severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Kinross and similar soils: 35 to 50 percent
Au Gres and similar soils: 35 to 50 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Croswell soils on the summits of low ridges and low knolls
- The very poorly drained Lupton and Tawas soils in landscape positions similar to those of the Kinross soil

Similar inclusions:
- Soils that have carbonates in the substratum
- Soils that have a surface layer of loamy sand
- Soils that have bands of loamy sand in the subsoil

Use and Management

Land use: Dominant use—woodland

Woodland

Major management concerns: Equipment limitation, windthrow hazard, seedling mortality, plant competition, seasonal wetness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads 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.
- Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
- Landing sites generally can be used only during the driest time of the year.
- Planting when the soil is moist can reduce the seedling mortality rate.
- Special site preparation, such as bedding before planting, can reduce the seedling mortality rate.
- Carefully managed reforestation helps to control undesirable understory plants.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.
- Trees that can withstand seasonal wetness should be selected for planting.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of the Kinross 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.

Building sites

Major management concerns: Seasonal wetness and cutbanks caving; ponding in areas of the Kinross soil

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 installing a drainage system around structures with basements and crawl spaces.
• Because of ponding, the Kinross soil is generally unsuited to building site development.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Seasonal wetness and poor filtering capacity; ponding in areas of the Kinross soil
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system helps to lower the water table.
• The poor filtering capacity can result in the pollution of ground water.
• On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.
• Because of ponding, the Kinross soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 6w
Woodland ordination symbol: Kinross—2W; Au Gres—6W
Michigan soil management group: Kinross—5c-a; Au Gres—5b

32B—Kellogg sand, 0 to 6 percent slopes

Setting

Landform: Flats and low knolls on lake plains and smaller lake plains on ground moraines
Shape of areas: Linear or irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 10 inches—pinkish gray sand

Subsoil:
10 to 16 inches—dark brown sand
16 to 30 inches—strong brown sand
30 to 39 inches—light yellowish brown, mottled fine sand
39 to 46 inches—brown, mottled silty clay

Substratum:
46 to 80 inches—brown, mottled, calcareous silty clay

Soil Properties and Qualities

Permeability: Rapid in the sandy material and very slow in the clayey material
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched, at a depth of 2.5 to 3.5 feet from October through December and from March through May
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: High
Potential for frost action: Low

Composition

Kellogg and similar soils: 85 to 100 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
• The excessively drained Rubicon soils in landscape positions similar to those of the Kellogg soil
• The somewhat poorly drained Allendale soils in landscape positions similar to or slightly lower than those of the Kellogg soil
• The well drained Klacking and somewhat excessively drained Graycalm soils in landscape positions similar to those of the Kellogg soil
• The poorly drained Wakeley and Caffey soils in small, shallow closed depressions

Similar inclusions:
• Soils that have mottles below a depth of 48 inches
• Soils that have a lighter colored subsoil
• Soils that have less clay in the subsoil and substratum
• Soils that have more than 40 inches of sand over the clayey underlying material

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality, plant competition

Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting seedlings when the soil is moist and planting special nursery stock can reduce the seedling mortality rate. Replanting may be needed in some areas.
- After trees are harvested, plant competition from unwanted species may delay the establishment of desired species.
- Carefully managed reforestation helps to control undesirable understory plants.
- Competing vegetation can be controlled by mechanical or chemical means.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness, shrink-swell
Management considerations:
- Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
- Wetness can be reduced by installing 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: Seasonal wetness, restricted permeability
Management considerations:
- Filling or mounding with suitable fill material helps to raise the absorption field above the water table and increases the thickness of the filtering material.
- Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.

Interpretive Groups

Land capability classification: 3s
Woodland ordination symbol: 3S
Michigan soil management group: 4/1a

32C—Kellogg sand, 6 to 12 percent slopes

Setting

Landform: Low ridges and low knolls on lake plains and smaller lake plains on ground moraines
Shape of areas: Linear, oval, or irregular
Size of areas: 3 to 60 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 10 inches—pinkish gray sand

Subsoil:
10 to 16 inches—dark brown sand
16 to 30 inches—strong brown sand
30 to 39 inches—light yellowish brown, mottled fine sand
39 to 46 inches—brown, mottled silty clay

Substratum:
46 to 80 inches—brown, mottled, calcareous silty clay

Soil Properties and Qualities

Permeability: Rapid in the sandy material and very slow in the clayey material
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched, at a depth of 2.5 to 3.5 feet from October through December and from March through May
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: High
Potential for frost action: Low

Composition

Kellogg and similar soils: 85 to 100 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
- The excessively drained Rubicon soils in landscape positions similar to those of the Kellogg soil
- The somewhat poorly drained Allendale soils in landscape positions similar to or slightly lower than those of the Kellogg soil
- The well drained Klacking and somewhat excessively drained Graycalm soils in landscape positions similar to those of the Kellogg soil
- The poorly drained Wakeley and Caffey soils in small, shallow closed depressions

Similar inclusions:
- Soils that have mottles below a depth of 48 inches
- Soils that have a lighter colored subsoil
- Soils that have less clay in the subsoil and substratum

• Soils that have more than 40 inches of sand over the clayey underlying material

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality, plant competition
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting seedlings when the soil is moist and planting special nursery stock can reduce the seedling mortality rate. Replanting may be needed in some areas.
• After trees are harvested, plant competition from unwanted species may delay the establishment of desired species.
• Carefully managed reforestation helps to control undesirable understory plants.
• Competing vegetation can be controlled by mechanical or chemical means.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness, shrink-swell, slope
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
• Wetness can be reduced by installing 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.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted permeability, slope
Management considerations:
• Filling or mounding with suitable fill material helps to raise the absorption field above the water table and increases the thickness of the filtering material.
• 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.

Interpretive Groups

Land capability classification: 4s
Woodland ordination symbol: 3S
Michigan soil management group: 4/1a

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 375 acres

Typical Profile

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

Subsurface layer:
7 to 11 inches—pinkish gray, mottled loamy fine sand

Subsoil:
11 to 19 inches—dark brown and strong brown, mottled loamy fine sand
19 to 29 inches—pale brown, mottled loamy fine sand and brown, mottled fine sandy loam

Substratum:
29 to 80 inches—reddish brown, mottled, stratified very fine sand to silt loam

Soil Properties and Qualities

Permeability: Moderate
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, at a depth of 0.5 foot to 1.5 feet at some time from November through May
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils, which

are sandy throughout; in landscape positions similar to those of the Richter soil
• The poorly drained Caffey soils, which have sandy textures in the upper 20 to 40 inches of the solum; in small depressions and drainageways
• The somewhat poorly drained Allendale soils, which have sand or loamy sand textures in the upper 20 to 40 inches of the solum and have clayey textures below a depth of 20 to 40 inches; in landscape positions similar to those of the Richter soil
• The somewhat poorly drained Algonquin soils, which have silty and clayey textures throughout; in landscape positions similar to those of the Richter soil
• The well drained Ocqueoc soils, which have sandy textures in the upper 20 to 40 inches of the solum; on small ridges and low knolls

Similar inclusions:
• Soils that have sandier textures throughout the profile
• Soils that have less clay in the subsoil

Use and Management

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

Cropland

Major management concerns: Seasonal wetness, soil blowing, tilth of the surface layer
Management considerations:
• Most adapted crops can be grown if an adequate drainage system is installed.
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• 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, crop residue management, windbreaks, and cover crops help to control soil blowing.
• 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.

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.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants.

Woodland

Major management concerns: Seasonal wetness, equipment limitation, 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.
• 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.
• Carefully managed reforestation helps to control undesirable understory plants.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.
• 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.

Building sites

Major management concerns: Seasonal wetness, cutbanks caving, 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 installing 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: Seasonal wetness

Management considerations:
- Filling or mounding with suitable material helps to raise the absorption field above the water table.
- A subsurface drainage system helps to lower the water table.

Interpretive Groups

Land capability classification: 2e
Woodland ordination symbol: 3W
Michigan soil management group: 3b-s

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

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

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

Surface layer:
1 to 2 inches—black loamy sand

Subsurface layer:
2 to 4 inches—light brownish gray loamy sand

Subsoil:
4 to 6 inches—strong brown loamy sand
6 to 16 inches—dark yellowish brown loamy sand
16 to 25 inches—grayish brown loamy sand and reddish brown sandy loam
25 to 35 inches—reddish brown sandy loam

Substratum:
35 to 80 inches—light reddish brown sandy loam

Soil Properties and Qualities

Permeability: Moderately rapid in the sandy part and moderate in the loamy part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

McGinn 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

Woodland

Major management concerns: Plant competition
Management considerations:
- 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.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Cropland

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

Pasture

Major management concerns: Overgrazing
Management considerations:
- Proper stocking rates, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.

• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

Major management concerns: Cutbanks caving, frost action
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.

Septic tank absorption fields

Major management concerns: No major limitations

Interpretive Groups

Land capability classification: 3s
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: 5 to 55 acres

Typical Profile

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

Surface layer:
1 to 2 inches—black loamy sand

Subsurface layer:
2 to 4 inches—light brownish gray loamy sand

Subsoil:
4 to 6 inches—strong brown loamy sand
6 to 16 inches—dark yellowish brown loamy sand
16 to 25 inches—grayish brown loamy sand and reddish brown sandy loam
25 to 35 inches—reddish brown sandy loam

Substratum:
35 to 80 inches—light reddish brown sandy loam

Soil Properties and Qualities

Permeability: Moderately rapid in the sandy part and moderate in the loamy part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

McGinn 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

Woodland

Major management concerns: Plant competition
Management considerations:
• 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Cropland

Major management concerns: Soil blowing, low content of organic matter, nutrient loss
Management considerations:
• 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.
• Including green manure crops in the cropping sequence, using a system of conservation tillage, and managing crop residue increase the content of organic matter.
• Increasing the content of organic matter in the root zone may increase the ability of the soil to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.

• Integrated pest management, such as scouting and bio-control methods, can help prevent the leaching of pesticides.

Pasture

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

Building sites

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

Interpretive Groups

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

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

Setting

Landform: Moraines
Shape of areas: Irregular
Size of areas: 3 to 600 acres

Typical Profile

Surface layer:
0 to 6 inches—very dark gray fine sandy loam

Subsoil:
6 to 10 inches—dark brown sandy loam
10 to 16 inches—yellowish brown loamy sand
16 to 22 inches—reddish brown clay loam and yellowish brown loamy sand
22 to 29 inches—reddish brown, mottled clay loam
29 to 38 inches—reddish brown clay loam

Substratum:
38 to 80 inches—brown, calcareous clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched, at a depth of 1.5 to 3.5 feet at some time from October through December and from March through May
Potential surface runoff: High
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Morganlake soils along footslopes
• The somewhat excessively drained Mancelona soils, which have very gravelly sand in the substratum; in landscape positions similar to those of the Ossineke soil and along footslopes and toeslopes

Similar inclusions:
• Well drained soils

Use and Management

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

Cropland

Major management concerns: Water erosion, soil compaction, low content of organic matter
Management considerations:
• Conservation tillage, grassed waterways, cover crops, crop residue management, and crop rotations that include close-growing crops help to prevent excessive soil loss.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Including green manure crops in the cropping sequence, using a system of conservation tillage, and managing crop residue increase the content of organic matter.

Pasture

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

Woodland

Major management concerns: Equipment limitation, windthrow hazard, plant competition
Management considerations:
• 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Seasonal wetness, frost action, shrink-swell
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 and by frost action.

Septic tank absorption fields

Major management concerns: Restricted 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.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: 2e
Woodland ordination symbol: 3L
Michigan soil management group: 3a

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

Setting

Landform: Moraines
Shape of areas: Irregular
Size of areas: 5 to 70 acres

Typical Profile

Surface layer:
0 to 6 inches—very dark gray fine sandy loam

Subsoil:
6 to 10 inches—dark brown sandy loam
10 to 16 inches—yellowish brown loamy sand
16 to 22 inches—reddish brown clay loam and yellowish brown loamy sand
22 to 29 inches—reddish brown, mottled clay loam
29 to 38 inches—reddish brown clay loam

Substratum:
38 to 80 inches—brown, calcareous clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched, at a depth of 1.5 to 3.5 feet at some time from October through December and from March through May
Potential surface runoff: Very high
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Morganlake soils along footslopes
• The somewhat excessively drained Mancelona soils, which have very gravelly sand in the substratum; in landscape positions similar to those of the Ossineke soil and along footslopes and toeslopes

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

Use and Management

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

Cropland

Major management concerns: Water erosion, soil compaction, low content of organic matter
Management considerations:
• Conservation tillage, grassed waterways, cover crops, crop residue management, and crop rotations that include close-growing crops help to prevent excessive soil loss.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Including green manure crops in the cropping sequence, using a system of conservation tillage, and managing crop residue increase the content of organic matter.

Pasture

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

Woodland

Major management concerns: Equipment limitation, plant competition
Management considerations:
• Because of low strength, suitable surfacing material is needed on year-round logging roads and landings.
• Skidders should not be used during wet periods, when ruts form easily.
• Access is easiest during periods in winter when access roads are frozen.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Seasonal wetness, frost action, slope, shrink-swell
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 and 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: Restricted 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.
• 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: 3e
Woodland ordination symbol: 3L
Michigan soil management group: 3a

47D—Graycalm sand, 6 to 18 percent slopes

Setting

Landform: Knolls and low ridges on outwash plains, kames, and moraines
Shape of areas: Irregular
Size of areas: 3 to 370 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 16 inches—strong brown sand
16 to 27 inches—reddish yellow sand
27 to 80 inches—yellow sand that has bands of yellowish red loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: 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 and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Mancelona soils on footslopes
- The well drained Klacking soils in landscape positions similar to those of the Graycalm soil

Similar inclusions:
- Soils that do not have bands of loamy sand in the subsoil
- Soils that have a redder subsoil
- Soils that have bands of gravelly sand in the subsoil
- Soils that have calcareous sand and gravel in the substratum

Use and Management

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

Woodland

Major management concerns: Equipment limitation, 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 can reduce the seedling mortality rate.
- Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.

Building sites

Major management concerns: Cutbanks caving, 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: Rapid permeability, slope
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to 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: 6s
Woodland ordination symbol: 6S
Michigan soil management group: 5a

47F—Graycalm sand, 18 to 45 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 3 to 525 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 16 inches—strong brown sand
16 to 27 inches—reddish yellow sand
27 to 80 inches—yellow sand that has bands of yellowish red loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Moderate or severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
- The well drained Klacking soils in landscape

positions similar to those of the Graycalm soil

Similar inclusions:
• Soils that do not have bands of loamy sand in the subsoil
• Soils that have a redder subsoil
• Soils that have bands of gravelly sand in the subsoil
• Soils that have calcareous sand and gravel in the substratum

Use and Management

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

Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality
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 can reduce the seedling mortality rate. Replanting is needed in some areas.

Building sites

Major management concerns: Slope, cutbanks caving
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.

Septic tank absorption fields

Major management concerns: Slope, poor filtering capacity
Management considerations:
• Because of the slope, this soil is generally unsuited to use as a site for septic tank absorption fields.
• The poor filtering capacity of this soil can result in the pollution of ground water.
• On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 7s
Woodland ordination symbol: 6R
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 230 acres

Typical Profile

Surface layer:
0 to 5 inches—dark grayish brown silt loam

Subsoil:
5 to 8 inches—pinkish gray silt loam and reddish brown silty clay
8 to 13 inches—reddish brown silty clay and pinkish gray silt loam
13 to 34 inches—reddish brown, mottled silty clay

Substratum:
34 to 80 inches—light reddish brown, calcareous, mottled silty clay

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched, at a depth of 1.5 to 3.0 feet at some time from October through December and from March through May
Potential surface runoff: 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 and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Algonquin soils on footslopes of low knolls and low ridges
• The poorly drained Springport soils and the very poorly drained Lupton and Dorval soils in adjacent small, shallow closed depressions and drainageways
• The moderately well drained Kellogg soils, which have a 20- to 40-inch sand cap; in landscape positions similar to those of the Negwegon soil

Similar inclusions:
• Soils that are well drained
• Soils that have a thin sand cap overlying the lacustrine sediments

Use and Management

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

Cropland

Major management concerns: Water erosion, tilth of the surface layer, permeability, soil compaction
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.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain 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: Compaction
Management considerations:
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants.

Woodland

Major management concerns: Equipment limitation, windthrow hazard, plant competition
Management considerations:
• Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled. 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.

Building sites

Major management concerns: Seasonal wetness, shrink-swell, slope, 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 installing 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 and by frost action.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system helps to lower 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: 3e
Woodland ordination symbol: 3L
Michigan soil management group: 1.5a

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

Setting

Landform: Low ridges and low knolls on lake plains

Shape of areas: Irregular
Size of areas: 3 to 65 acres

Typical Profile

Surface layer:
0 to 5 inches—dark grayish brown silt loam

Subsoil:
5 to 8 inches—pinkish gray silt loam and reddish brown silty clay
8 to 13 inches—reddish brown silty clay and pinkish gray silt loam
13 to 34 inches—reddish brown, mottled silty clay

Substratum:
34 to 80 inches—light reddish brown, calcareous, mottled silty clay

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched, at a depth of 1.5 to 3.0 feet at some time from October through December and from March through May
Potential surface runoff: 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 and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Algonquin soils on footslopes of low knolls and low ridges
- The poorly drained Springport soils and the very poorly drained Lupton and Dorval soils in adjacent small, shallow closed depressions and drainageways
- The moderately well drained Kellogg soils, which have a 20- to 40-inch sand cap; in landscape positions similar to those of the Negwegon soil

Similar inclusions:
- Soils that are well drained
- Soils that have a thin sand cap overlying the lacustrine sediments

Use and Management

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

Cropland

Major management concerns: Water erosion, tilth of the surface layer, permeability, soil compaction
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.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain 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: Compaction
Management considerations:
- Restricted grazing during wet periods helps to prevent compaction and poor tilth.
- Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants.

Woodland

Major management concerns: Equipment limitation, windthrow hazard, plant competition
Management considerations:
- Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled. 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.

Building sites

Major management concerns: Seasonal wetness, shrink-swell, slope, 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 installing 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 and by frost action.
• Buildings should be designed so that they conform to the natural slope of the land.

Septic tank absorption fields

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

Interpretive Groups

Land capability classification: 3e
Woodland ordination symbol: 3L
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 185 acres

Typical Profile

Surface layer:
0 to 5 inches—black silt loam

Subsurface layer:
5 to 10 inches—light brownish gray fine sandy loam

Subsoil:
10 to 17 inches—dark brown, mottled silty clay
17 to 24 inches—pinkish gray, calcareous, mottled clay
24 to 80 inches—light reddish brown, calcareous, mottled clay

Soil Properties and Qualities

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

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Negwegon soils on small, low knolls and ridges
• The somewhat poorly drained Richter soils, which have stratified loamy and sandy textures; on low ridges and low knolls
• The somewhat poorly drained Allendale soils, which have sand or loamy sand in the upper 40 inches of the solum; on small ridges and low knolls
• The poorly drained Springport and Wakeley soils in small depressions
• The very poorly drained Dorval soils in small depressions

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, restricted 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 restricted 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 maintain tilth.

Pasture

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

Woodland

Major management concerns: Equipment limitation, 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 the sticky and plastic subsoil, logging roads should be graveled. 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 cutting, competition from brush can delay or prevent natural regeneration of desired species.
• Carefully managed reforestation helps to control undesirable understory 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.

Building sites

Major management concerns: Shrink-swell, 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 installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted 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: 3w
Woodland ordination symbol: 6W
Michigan soil management group: 1.5b

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

Setting

Landform: Algonquin—low knolls; Springport—depressions on lake plains
Shape of areas: Irregular
Size of areas: 3 to 850 acres

Typical Profile

Algonquin

Surface layer:
0 to 5 inches—black silt loam

Subsurface layer:
5 to 10 inches—light brownish gray fine sandy loam

Subsoil:
10 to 17 inches—dark brown, mottled silty clay
17 to 24 inches—pinkish gray, mottled clay
24 to 80 inches—light reddish brown, mottled clay

Springport

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

Subsurface layer:
3 to 9 inches—very dark gray, mottled silty clay loam

Subsoil:
9 to 13 inches—light brownish gray, mottled silty clay
13 to 35 inches—reddish brown, mottled silty clay

Substratum:
35 to 60 inches—light reddish brown, calcareous, mottled silty clay
60 to 80 inches—reddish brown, calcareous, mottled silty clay loam

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Algonquin—somewhat poorly drained; Springport—poorly drained
Seasonal high water table: Algonquin—perched, at a depth of 0.5 foot to 1.5 feet at some time from October through June; Springport—perched, 1 foot above to 1 foot below the surface at some time from October through June
Potential surface runoff: Algonquin—very high; Springport—high
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Algonquin and similar soils: 50 to 60 percent
Springport and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Allendale soils, which have a sandy surface layer and subsoil; in landscape positions similar to those of the Algonquin soil
• The very poorly drained Wakeley soils, which have a sandy surface layer and subsoil; in landscape positions similar to those of the Springport soil
• The moderately well drained Negwegon soils on the summits of low knolls
• The very poorly drained Dorval soils in the center of depressions and swales

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: Algonquin—seasonal wetness, restricted permeability, compaction, tilth of the surface layer, erosion; Springport—seasonal wetness, restricted permeability, compaction, tilth of the surface layer, ponding
Management considerations:
• Conservation tillage, grassed waterways, cover crops, crop residue management, and crop rotations that include close-growing crops help to control runoff and water erosion.
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Because of the restricted 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 maintain 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.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants.

Woodland

Major management concerns: Equipment limitation, 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 the sticky and plastic subsoil, logging roads should be graveled. In some areas, landings should be stabilized.

• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of the Springport soil.
• 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.
• Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Algonquin—shrink-swell, seasonal wetness; Springport—shrink-swell, seasonal wetness, 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.
• Because of ponding, the Springport soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Algonquin—seasonal wetness, restricted permeability; Springport—seasonal wetness, restricted permeability, 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 use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 3e
Woodland ordination symbol: Algonquin—6W; Springport—6W
Michigan soil management group: Algonquin—1.5b; Springport—1.5c

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

Setting

Landform: Moraines, outwash plains, and lake plains
Shape of areas: Irregular
Size of areas: 5 to 70 acres

Typical Profile

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

Subsoil:
10 to 18 inches—reddish brown, mottled loamy sand
18 to 25 inches—yellowish brown sand
25 to 45 inches—brown, mottled silty clay

Substratum:
45 to 80 inches—light reddish brown, mottled, calcareous silty clay

Soil Properties and Qualities

Permeability: Rapid in the sandy part and very slow in the clayey part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, at a depth of 0.5 foot to 1.5 feet at some time from November through May
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the upper part and high in the lower part
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Kellogg soils, which are not mottled in the upper part of the solum; in landscape positions similar to or slightly higher than those of the Allendale soil
• The somewhat excessively drained Rubicon soils, which are sandy to a depth of more than 80 inches; in the slightly higher landscape positions

• The somewhat poorly drained Au Gres soils, which are sandy to a depth of more than 80 inches; in landscape positions similar to those of the Allendale soil
• 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, low content of organic matter
Management considerations:
• 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.
• Ensuring that the nutrients in manure and fertilizer applications do not exceed the nutrient requirements of the plants helps to protect ground water.
• Including green manure crops in the cropping sequence, using a system of conservation tillage, and managing crop residue 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.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants.

Woodland

Major management concerns: Seasonal wetness, equipment limitation, 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.
• Equipment should be used only when the soil is relatively dry 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.
• Special harvest methods may be needed to control undesirable plants.
• 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.

Building sites

Major management concerns: Seasonal wetness, shrink-swell, potential frost action, cutbanks caving
Management considerations:
• Wetness can be reduced by installing 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 and 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, restricted permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system helps to lower 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: 3w
Woodland ordination symbol: 4W
Michigan soil management group: 4/1b

72—Dorval muck

Setting

Landform: Depressions on lake plains
Slope range: 0 to 2 percent
Shape of areas: Oval or irregular
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 18 inches—black muck

Substratum:
18 to 80 inches—light gray clay

Soil Properties and Qualities

Permeability: Moderate or moderately rapid in the organic layers and very slow in the clayey substratum
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 November through May
Potential 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 and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The poorly drained Springport soils, which do not have an organic surface layer; at the extreme edges of the mapped areas
• The poorly drained Wakeley soils, which do not have an organic surface layer and have 20 to 40 inches of sandy material over the underlying clayey substratum; in landscape positions similar to those of the Dorval soil
• The somewhat poorly drained Algonquin soils on low knolls
• The very poorly drained Lupton soils, which have more than 51 inches of muck; in landscape positions similar to those of the Dorval soil

Similar inclusions:
• Soils that have a thin layer of sand above the underlying clayey substratum
• Soils that have less than 16 inches of muck over the clayey substratum

Use and Management

Land use: Dominant use—woodland

Woodland

Major management concerns: Equipment limitation, 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of this soil.

Building sites

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 use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 5w
Woodland ordination symbol: 2W
Michigan soil management group: M/1c

75B—Rubicon sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, moraines, lake plains, and beaches
Shape of areas: Irregular
Size of areas: 5 to 550 acres

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 9 inches—brown sand

Subsoil:
9 to 16 inches—dark brown sand
16 to 22 inches—strong brown sand
22 to 47 inches—yellowish brown sand

Substratum:
47 to 80 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential 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 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
• The well drained Millersburg and Klacking soils, which have more clay in the subsoil and substratum than the Rubicon soil; at the edges of mapped areas adjacent to and on moraines

Similar inclusions:
• Soils that have bands of loamy sand in the subsoil
• Soils that have carbonates in the substratum
• Soils that have a lighter colored subsoil
• Soils that have bands of gravelly sand in the substratum

Use and Management

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

Woodland

Major management concerns: Equipment limitation, 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 can reduce the seedling mortality rate.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.

Building sites

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

Septic tank absorption fields

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

Interpretive Groups

Land capability classification: 6s
Woodland ordination symbol: 4S
Michigan soil management group: 5.3a

75D—Rubicon sand, 6 to 18 percent slopes

Setting

Landform: Outwash plains, moraines, and beach ridges
Shape of areas: Irregular
Size of areas: 3 to 240 acres

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 9 inches—brown sand

Subsoil:
9 to 16 inches—dark brown sand
16 to 22 inches—strong brown sand
22 to 47 inches—yellowish brown sand

Substratum:
47 to 80 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
- The moderately well drained Croswell soils in depressions and at edges of mapped areas adjoining poorly drained soils
- The well drained Millersburg and Klacking soils, which have more clay in the subsoil and substratum than the Rubicon soil; at edges of mapped areas adjacent to and on moraines

Similar inclusions:
- Soils that have bands of loamy sand in the subsoil
- Soils that have a darker subsoil
- Soils that have carbonates in the substratum
- Soils that have a lighter colored subsoil
- Soils that have bands of gravelly sand in the substratum

Use and Management

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

Woodland

Major management concerns: Equipment limitation, 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 can reduce the seedling mortality rate.
- Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.

Building sites

Major management concerns: Cutbanks caving, 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: Rapid permeability, slope
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to 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: 7s
Woodland ordination symbol: 4S
Michigan soil management group: 5.3a

75E—Rubicon sand, 18 to 35 percent slopes

Setting

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

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 9 inches—brown sand

Subsoil:
9 to 16 inches—dark brown sand
16 to 22 inches—strong brown sand
22 to 47 inches—yellowish brown sand

Substratum:
47 to 80 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid

Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
- The moderately well drained Croswell soils in depressions and at the edges of mapped areas adjoining poorly drained soils
- The well drained Millersburg and Klacking soils, which have more clay in the subsoil and substratum than the Rubicon soil; at the edges of mapped areas adjacent to and on moraines
- The somewhat excessively drained Mancelona soils in landscape positions similar to those of the Rubicon soil

Similar inclusions:
- Soils that have bands of loamy sand in the substratum
- Soils that have carbonates in the substratum
- Soils that have a lighter colored subsoil

Use and Management

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

Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality
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 can reduce the seedling mortality rate. Replanting is needed in some areas.
- Seedling mortality rates may be higher on southern exposures than in other areas.

Building sites

Major management concerns: Slope, cutbanks caving
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.

Septic tank absorption fields

Major management concerns: Slope, poor filtering capacity
Management considerations:
- Because of the slope, this soil is generally unsuited to use as a site for septic tank absorption fields.
- The poor filtering capacity of this soil can result in the pollution of ground water.
- On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 7s
Woodland ordination symbol: 4R
Michigan soil management group: 5.3a

75F—Rubicon sand, 35 to 70 percent slopes

Setting

Landform: Moraines and outwash plains
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 9 inches—brown sand

Subsoil:
9 to 16 inches—dark brown sand
16 to 22 inches—strong brown sand
22 to 47 inches—yellowish brown sand

Substratum:
47 to 80 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
- The well drained Millersburg and Klacking soils, which have more clay in the subsoil and substratum than the Rubicon soil; at the edges of mapped areas adjacent to and on moraines
- The somewhat excessively drained Mancelona soils in landscape positions similar to those of the Rubicon soil

Similar inclusions:
- Soils that have bands of loamy sand in the substratum
- Soils that have a lighter colored subsoil

Use and Management

Land use: Major use—woodland

Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality
Management considerations:
- Ordinary crawler tractors and rubber-tired skidders cannot be operated safely on these slopes. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
- Cable yarding systems are generally safer than other logging methods and result in less surface disturbance.
- In areas that are susceptible to erosion and drought conditions and where esthetics are a consideration, mulch may be needed. Straw, bark, or wood chips can be used.
- Planting when the soil is moist can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Seedling mortality rates may be higher on southern exposures than in other areas.

Interpretive Groups

Land capability classification: 7s
Woodland ordination symbol: 4R
Michigan soil management group: 5.3a

78—Pits, borrow

Setting

Shape of areas: Irregular
Size of areas: 5 to 150 acres

Composition

Pits: 100 percent

Use and Management

Land use: Major use—source of gravel, sand, or fill material

- Some areas have been excavated below the seasonal high water table and are ponded. A few pits contain small deposits of rubbish and trash.
- Onsite investigation is needed to determine the suitability of this unit for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

81B—Grayling sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains and deltas
Shape of areas: Irregular
Size of areas: 5 to 2,000 acres

Typical Profile

Surface layer:
0 to 5 inches—black sand

Subsoil:
5 to 17 inches—yellowish red sand

Substratum:
17 to 80 inches—brownish yellow sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential 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 and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Croswell soils in depressions and at the edges of mapped areas adjoining poorly drained soils

Similar inclusions:
- Soils that have bands of loamy sand in the substratum
- Soils that have a darker subsoil
- Soils that have carbonates in the substratum

Use and Management

Land use: Dominant use—woodland (fig. 10); other use—building site development

Woodland

Major management concerns: Equipment limitation, 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 can reduce the seedling mortality rate.
- Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.

Building sites

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

Interpretive Groups

Land capability classification: 6s
Woodland ordination symbol: 4S
Michigan soil management group: 5.7a

81D—Grayling sand, 6 to 18 percent slopes

Setting

Landform: Outwash plains and deltas
Shape of areas: Irregular
Size of areas: 5 to 280 acres

Typical Profile

Surface layer:
0 to 5 inches—black sand

Subsoil:
5 to 17 inches—yellowish red sand

Substratum:
17 to 80 inches—brownish yellow sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Figure 10.—A stand of jack pine in an area of Grayling sand, 0 to 6 percent slopes.

Composition

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

Inclusions

Contrasting inclusions:
- The moderately well drained Croswell soils in depressions and at the edges of mapped areas adjoining poorly drained soils

Similar inclusions:
- Soils that have bands of loamy sand in the subsoil
- Soils that have a darker subsoil
- Soils that have carbonates in the substratum

Use and Management

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

Woodland

Major management concerns: Equipment limitation, 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 can reduce the seedling mortality rate.
- Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.

Building sites

Major management concerns: Cutbanks caving, 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.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.
• On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 7s
Woodland ordination symbol: 4S
Michigan soil management group: 5.7a

81E—Grayling sand, 18 to 35 percent slopes

Setting

Landform: Outwash plains and deltas
Shape of areas: Irregular
Size of areas: 3 to 30 acres

Typical Profile

Surface layer:
0 to 5 inches—black sand

Subsoil:
5 to 17 inches—yellowish red sand

Substratum:
17 to 80 inches—brownish yellow sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils in depressions and at the edges of mapped areas adjoining poorly drained soils

Similar inclusions:
• Soils that have a darker subsoil
• Soils that have carbonates in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitation, erosion hazard, seedling mortality
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 can reduce the seedling mortality rate. Replanting is needed in some areas.
• Seedling mortality rates may be higher on southern exposures than in other areas.

Building sites

Major management concerns: Slope, cutbanks caving
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.

Septic tank absorption fields

Major management concerns: Slope, poor filtering capacity
Management considerations:
• Because of the slope, this soil is generally unsuited to use as a site for septic tank absorption fields.
• The poor filtering capacity of this soil can result in the pollution of ground water.
• On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 7s
Woodland ordination symbol: 4R
Michigan soil management group: 5.7a

82B—Udorthents, loamy, nearly level and undulating

Setting

Landform: Moraines and lake plains
Slope range: 0 to 6 percent
Shape of areas: Irregular or rectangular
Size of areas: 5 to 120 acres

Typical Profile

Surface layer:
0 to 42 inches—dark grayish brown sandy loam

Subsoil:
42 to 54 inches—reddish brown clay loam and pinkish gray loamy sand

Substratum:
54 to 80 inches—brown, calcareous sandy loam

Soil Properties and Qualities

Permeability: Moderate or moderately slow
Available water capacity: Moderate or high
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• Small areas of undisturbed soils
• Somewhat poorly drained soils in the lower landscape positions
• Poorly and very poorly drained soils in small, shallow closed depressions
• Soils that have stratified sand and gravel below a depth of 60 inches

Similar inclusions:
• Soils that are moderately well drained

Use and Management

Land use: Major uses—golf courses, oil and gas well drilling sites, residential development, industrial installations, source of borrow material, abandoned land

• This map unit consists of well drained soils that have been disturbed. In places the original surface layer and parts of the subsoil have been removed and loamy subsoil and substratum material exposed. In some areas the original soil surface has been covered by loamy fill material. In other areas considerable land shaping has taken place and the original surface soil has subsequently been replaced.
Management considerations:
• Onsite investigation is needed to determine the suitability of this unit 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: Outwash plains, beach ridges, lake plains, deltas, terraces, moraines, kames, and kame terraces
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 3 to 30 acres

Typical Profile

Surface layer:
0 to 13 inches—dark yellowish brown and yellowish brown sand

Substratum:
13 to 80 inches—light yellowish brown and pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained or somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Composition

Udipsamments and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
- Small areas of undisturbed soils
- Soils that have a surface layer of sandy loam

Similar inclusions:
- Soils that have a surface layer of loamy sand
- Soils that have thin bands of loamy sand, sandy loam, or gravelly sand below the surface layer

Use and Management

Land use: Major uses—oil and gas well drilling sites, building site development, abandoned land

- This map unit consists of sandy areas where the surface layer and parts of the subsoil have been removed or disturbed. In some areas the original soil has been covered with sandy fill material. Most areas are barren or only sparsely vegetated.

Management considerations:
- Onsite investigation is needed to determine the suitability of this unit for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

86—Histosols and Aquents, ponded

Setting

Landform: Depressions on moraines, lake plains, and outwash plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 270 acres

Soil Properties and Qualities

Texture: Histosols—muck; Aquents—variable
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
Potential surface runoff: Negligible
Flooding: None to frequent
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

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 of this unit 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 and drainageways
Slope range: 0 to 2 percent
Shape of areas: Linear or irregular
Size of areas: 5 to 500 acres

Typical Profile

Surface layer:
0 to 10 inches—black muck

Substratum:
10 to 80 inches—brown sand with thin bands of very dark grayish brown muck

Soil Properties and Qualities

Permeability: Moderate in the organic surface layer and rapid in the mineral 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 November through May
Potential 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 and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The poorly drained Deford soils at the edges of the mapped areas
- The moderately well drained Croswell soils on low knolls and ridges
- The somewhat poorly drained Au Gres soils on slight rises

Similar inclusions:
- Soils that have more than 16 inches of muck
- Soils that have a substratum of gravelly sand

Use and Management

Land use: Dominant use—woodland

Woodland

Major management concerns: Equipment limitation, 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.
- Log landings should be located in areas of the drier, more suitable 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.
- Because of wetness, severe seedling mortality, and plant competition, trees generally are not planted in areas of this soil.
- Special harvest methods may be needed to control undesirable plants.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Seasonal flooding
Management considerations:
- Because of flooding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Seasonal flooding
Management considerations:
- Because of flooding, this soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 7w
Woodland ordination symbol: 2W
Michigan soil management group: L-4c

90B—Chinwhisker sand, 0 to 4 percent slopes

Setting

Landform: Stream terraces, outwash plains, beach ridges, and lake terraces
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsurface layer:
2 to 7 inches—brown sand

Subsoil:
7 to 18 inches—dark brown sand
18 to 27 inches—strong brown sand
27 to 48 inches—light yellowish brown sand that has bands of brown and reddish brown loamy sand
48 to 80 inches—light yellowish brown sand that has bands of brown loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Apparent, at a depth of 2 to 5 feet at some time from November through May
Potential 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 and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The excessively drained Rubicon soils, which do not have bands of loamy sand in the subsoil; in the slightly higher landscape positions
• The poorly drained Deford soils in depressions
• The somewhat poorly drained Au Gres soils in shallow depressions and drainageways

Similar inclusions:
• Soils that do not have bands of loamy sand in the subsoil
• Soils that have a lighter colored subsoil
• Soils that are well drained
• Soils that have mottles below a depth of 40 inches
• Soils in which the total thickness of the bands of loamy sand is more than 6 inches
• Soils that have a calcareous substratum

Use and Management

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

Woodland

Major management concerns: Equipment limitation, 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 can reduce the seedling mortality rate. Replanting is needed in some areas.
• Planting when the soil is moist can reduce the seedling mortality rate.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Special harvest methods may be needed to control undesirable plants.
• 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.

Pasture

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

Building sites

Major management concerns: Cutbanks caving, 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 installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

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

Interpretive Groups

Land capability classification: 4s
Woodland ordination symbol: 6S
Michigan soil management group: 5a

94F—Klacking-McGinn loamy sands, 8 to 50 percent slopes, dissected

Setting

Landform: Klacking—valleys; McGinn—ridges on moraines
Distinctive landscape feature: Dissected landscape
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Typical Profile

Klacking

Surface layer:
0 to 4 inches—very dark gray 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 and reddish brown loamy sand
33 to 64 inches—reddish brown sandy loam and light brown sand
64 to 80 inches—pale brown sand

McGinn

Organic mat:
2 inches to 0—black, partially decomposed leaf litter

Surface layer:
0 to 1 inch—black loamy sand

Subsurface layer:
1 to 3 inches—light brownish gray loamy sand

Subsoil:
3 to 5 inches—strong brown loamy sand
5 to 15 inches—dark yellowish brown loamy sand
15 to 24 inches—grayish brown loamy sand and reddish brown sandy loam
24 to 34 inches—reddish brown sandy loam

Substratum:
34 to 60 inches—light reddish brown sandy loam

Soil Properties and Qualities

Permeability: Klacking—moderately rapid; McGinn—moderately rapid in the sandy part and moderate in the loamy part
Available water capacity: Klacking—low; McGinn—moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Klacking—low; McGinn—medium
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Klacking—low; McGinn—low in the upper part and moderate in the lower part
Potential for frost action: Klacking—low; McGinn—moderate

Composition

Klacking and similar soils: 55 to 65 percent
McGinn and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Mancelona and Graycalm soils in landscape positions similar to those of the major soils

Similar inclusions:
- Soils that are moderately well drained

Use and Management

Land use: Dominant use—woodland

Woodland

Major management concerns: Equipment limitation, erosion hazard, seedling mortality
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 established in the less sloping areas between ravines.
- 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.
- Carefully managed reforestation helps to control undesirable understory plants in areas of the McGinn soil.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Slope, cutbanks caving

Management considerations:
• Because of the slope, these soils are 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.
• In areas where the slopes are more than 25 percent, McGinn and Klacking soils are generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Slope
Management considerations:
• Land shaping and installing the distribution lines on the contour help to overcome the slope.
• In areas where the slopes are more than 18 percent, McGinn and Klacking soils are generally unsuited to use as sites for septic tank absorption fields.

Interpretive Groups

Land capability classification: 7e
Woodland ordination symbol: Klacking—6R; McGinn—4R
Michigan soil management group: Klacking—4a; McGinn—3a

95D—Menominee loamy sand, 12 to 18 percent slopes

Setting

Landform: Moraines, till plains, outwash plains, and lake plains
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

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

Subsurface layer:
4 to 6 inches—pinkish gray sand

Subsoil:
6 to 13 inches—dark brown loamy sand
13 to 24 inches—yellowish brown sand
24 to 40 inches—reddish brown sandy clay loam

Substratum:
40 to 80 inches—light reddish brown, calcareous sandy clay loam

Soil Properties and Qualities

Permeability: Rapid in the upper sandy material and moderately slow or moderate in the underlying loamy material
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate in the subsoil and substratum
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Bamfield, Millersburg, and Blue Lake soils in landscape positions similar to those of the Menominee soil
• The somewhat excessively drained Mancelona soils on nose slopes, shoulders, and footslopes of moraines

Similar inclusions:
• Moderately well drained soils
• Soils that have stratified sand and gravel below a depth of 80 inches

Use and Management

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

Woodland

Major management concerns: 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Cropland

Major management concerns: Water erosion, low content of organic matter, seasonal droughtiness, soil blowing
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.
• Including green manure crops in the cropping sequence, using a system of conservation tillage, and managing crop residue increase the content of organic matter.
• 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, 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: Overgrazing, seasonal droughtiness
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

Major management concerns: Cutbanks caving, slope, shrink-swell
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.
• 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: Restricted permeability, slope
Management considerations:
• 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.

Interpretive Groups

Land capability classification: 4e
Woodland ordination symbol: 6A
Michigan soil management group: 4/2a

97—Colonville very fine sandy loam, occasionally flooded

Setting

Landform: Flood plains
Shape of areas: Irregular or elongated
Size of areas: 3 to 25 acres

Typical Profile

Surface layer:
0 to 19 inches—dark brown very fine sandy loam

Subsoil:
19 to 35 inches—light brown, mottled, calcareous fine sandy loam and very fine sandy loam

Substratum:
35 to 65 inches—light brown, mottled, calcareous fine sandy loam
65 to 80 inches—light brownish gray, calcareous very fine sandy loam

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, at a depth of 0.5 foot to 2.0 feet at some time from September through May
Potential surface runoff: Very low
Flooding: Occasional
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: High

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Allendale soils in the slightly higher landscape positions

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

Use and Management

Land use: Dominant use—woodland; other use—wildlife habitat

Woodland

Major management concerns: Seasonal wetness, equipment limitation, windthrow hazard, 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 adequate snow cover.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of 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.
• Carefully managed reforestation helps to control undesirable understory plants.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Flooding
Management considerations:
• Because of flooding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Flooding
Management considerations:
• Because of flooding, this soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 5w
Woodland ordination symbol: 3W
Michigan soil management group: L-2c-c

116B—Mancelona sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, moraines, and stream terraces
Shape of areas: Irregular
Size of areas: 3 to 200 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—dark brown sand
16 to 29 inches—yellowish brown and light yellowish brown sand
29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown, calcareous very gravelly sand

Soil Properties and Qualities

Permeability: Moderately rapid in the solum and very rapid in the substratum
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential 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

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

Inclusions

Contrasting inclusions:
• The excessively drained Rubicon soils, which are sandy throughout; in landscape positions similar to those of the Mancelona soil
• The somewhat excessively drained Graycalm soils, which have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Mancelona soil
• The well drained Blue Lake and Klacking soils, which have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Mancelona soil

Similar inclusions:
• Soils in which the very gravelly substratum is below a depth of 40 inches
• Soils that do not have a layer of sandy loam in the subsoil
• Soils that have a lighter colored 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: Equipment limitation, seedling mortality, 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.
• Planting seedlings that can withstand droughty conditions can reduce 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

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

Septic tank absorption fields

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

Interpretive Groups

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

116C—Mancelona sand, 6 to 12 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 3 to 120 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—dark brown sand
16 to 29 inches—yellowish brown and light yellowish brown sand
29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown, calcareous very gravelly sand

Soil Properties and Qualities

Permeability: Moderately rapid in the solum and very rapid in the substratum
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Graycalm soils, which have a banded substratum of sand and loamy sand; in landscape positions similar to those of the Mancelona soil
• The excessively drained Rubicon soils, which are sandy throughout; in landscape positions similar to those of the Mancelona soil
• The well drained Blue Lake soils, which have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Mancelona soil
• The well drained Millersburg and Menominee soils, which have more clay in the subsoil and substratum; in landscape positions similar to those of the Mancelona soil

Similar inclusions:
• Soils in which the very gravelly substratum is below a depth of 40 inches

• Soils that do not have a layer of sandy loam in the subsoil
• Soils that have a lighter colored 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: Equipment limitation, seedling mortality, 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.
• Planting seedlings that can withstand droughty conditions can reduce 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

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

Interpretive Groups

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

116D—Mancelona sand, 12 to 18 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 3 to 60 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—dark brown sand
16 to 29 inches—yellowish brown and light yellowish brown sand
29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown, calcareous very gravelly sand

Soil Properties and Qualities

Permeability: Moderately rapid in the solum and very rapid in the substratum
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Graycalm soils, which have a banded substratum of sand and loamy sand; in landscape positions similar to those of the Mancelona soil
• The excessively drained Rubicon soils, which are sandy throughout; in landscape positions similar to those of the Mancelona soil
• The well drained Blue Lake soils, which have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Mancelona soil

Similar inclusions:
• Soils in which the very gravelly substratum is below a depth of 40 inches
• Soils that do not have a layer of sandy loam in the subsoil
• Soils that have a lighter colored 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: Equipment limitation, seedling mortality, 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.
• Planting seedlings that can withstand droughty conditions can reduce 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

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

Interpretive Groups

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

116E—Mancelona sand, 18 to 35 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 3 to 70 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—dark brown sand
16 to 29 inches—yellowish brown and light yellowish brown sand
29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown, calcareous very gravelly sand

Soil Properties and Qualities

Permeability: Moderately rapid in the solum and very rapid in the substratum
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet

Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Graycalm soils, which have a banded substratum of sand and loamy sand; in landscape positions similar to those of the Mancelona soil
• The well drained Blue Lake soils, which have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Mancelona soil
• The excessively drained Rubicon soils, which are sandy throughout; in landscape positions similar to those of the Mancelona soil

Similar inclusions:
• Soils in which the very gravelly substratum is below a depth of 40 inches
• Soils that do not have a layer of sandy loam in the subsoil
• Soils that have a lighter colored 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 limitation, 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 seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Planting when the soil is moist can reduce the seedling mortality rate.
• 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Cutbanks caving, 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 poorly suited to building site development without extensive land shaping.

Septic tank absorption fields

Major management concerns: Very rapid permeability, slope
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Because of the slope, this soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 7e
Woodland ordination symbol: 3R
Michigan soil management group: 4a

116F—Mancelona sand, 35 to 50 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 5 to 300 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—dark brown sand
16 to 29 inches—yellowish brown and light yellowish brown sand
29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown, calcareous very gravelly sand

Soil Properties and Qualities

Permeability: Moderately rapid in the solum and very rapid in the substratum
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Graycalm soils, which have a banded substratum of sand and loamy sand; in landscape positions similar to those of the Mancelona soil
• The well drained Blue Lake soils, which have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Mancelona soil
• The excessively drained Rubicon soils, which are sandy throughout; in landscape positions similar to those of the Mancelona soil

Similar inclusions:
• Soils in which the very gravelly substratum is below a depth of 40 inches
• Soils that do not have a layer of sandy loam in the subsoil
• Soils that have a lighter colored subsoil
• Soils that have a surface layer of loamy sand

Use and Management

Land use: Dominant use—woodland

Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality, plant competition
Management considerations:
• Ordinary crawler tractors and rubber-tired skidders cannot be operated safely on these slopes. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
• Cable yarding systems are generally safer than other logging methods and result in less surface disturbance.
• Seedling mortality rates may be higher on southern exposures than in other areas.
• In areas that are susceptible to erosion and drought conditions and where esthetics are a consideration, mulch may be needed. Straw, bark, or wood chips can be used.
• Planting when the soil is moist can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Special harvest methods may be needed to control undesirable plants.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Cutbanks caving, 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 concerns: Very rapid permeability, slope
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Because of the slope, this soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 7e

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

123D—Klacking sand, 6 to 18 percent slopes

Setting

Landform: Outwash plains, kames, and moraines
Shape of areas: Irregular
Size of areas: 5 to 550 acres

Typical Profile

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

Subsoil:
4 to 23 inches—strong brown sand
23 to 30 inches—brownish yellow sand
30 to 80 inches—light brown sand and yellowish red sandy loam and loamy sand

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The excessively drained Grayling soils in downslope positions at the edges of the mapped areas and in landscape positions similar to those of the Klacking soil
• The somewhat excessively drained Horsehead soils, which have gravelly sand and very gravelly sand in the subsoil and substratum; on footslopes and toeslopes
• The well drained Millersburg soils, which have a substratum of calcareous loamy sand and sandy loam; in landscape positions similar to those of the Klacking soil

Similar inclusions:
• Somewhat excessively drained soils in which the cumulative thickness of bands of loamy sand in the subsoil is less than 6 inches
• Well drained soils that have a darker 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: Equipment limitation, 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 can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.

Building sites

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

Interpretive Groups

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

125B—Melita sand, 0 to 6 percent slopes

Setting

Landform: Lake plains; smaller lake plains on ground moraines
Shape of areas: Linear or irregular
Size of areas: 3 to 90 acres

Typical Profile

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

Subsurface layer:
4 to 8 inches—light brownish gray sand

Subsoil:
8 to 16 inches—dark brown sand
16 to 26 inches—strong brown sand
26 to 43 inches—very pale brown sand
43 to 47 inches—reddish brown silty clay loam

Substratum:
47 to 80 inches—light reddish brown and light gray, calcareous silty clay loam

Soil Properties and Qualities

Permeability: Rapid in the upper sandy layers and moderately slow in the underlying loamy layers
Available water capacity: Moderate
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential 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

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

Inclusions

Contrasting inclusions:
- The excessively drained Rubicon soils in landscape positions similar to those of the Melita soil
- The somewhat poorly drained Allendale soils in the slightly lower landscape positions
- The poorly drained Wakeley soils in small, shallow closed depressions

Similar inclusions:
- Soils that have less than 40 inches of sand over the loamy underlying material
- Moderately well drained soils

Use and Management

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

Woodland

Major management concerns: Equipment limitation, 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 can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.

Building sites

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

Septic tank absorption fields

Major management concerns: Restricted permeability
Management considerations:
- Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.

Interpretive Groups

Land capability classification: 4s
Woodland ordination symbol: 3S
Michigan soil management group: 5/2a

147B—Lindquist sand, 0 to 6 percent slopes

Setting

Landform: Flats or knolls on outwash plains, kame moraines, distintegration moraines, and stream terraces
Shape of areas: Irregular
Size of areas: 5 to 360 acres

Typical Profile

Surface layer:
0 to 1 inch—black sand

Subsurface layer:
1 to 3 inches—light brownish gray sand

Subsoil:
3 to 10 inches—dark brown, friable sand
10 to 22 inches—dark yellowish brown and yellowish brown, very friable sand
22 to 34 inches—pale brown sand
34 to 80 inches—pale brown sand with lamellae of strong brown loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet

Potential 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

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils in swales
• The moderately well drained Croswell soils in the slightly lower landscape positions
• The very poorly drained Deford soils in depressions

Similar inclusions:
• Soils that are sandy throughout
• Soils that are saturated below a depth 60 inches
• Soils in which the subsoil is below a depth of 80 inches
• Soils that have a darker or lighter colored subsoil

Use and Management

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

Woodland

Major management concerns: Equipment limitation, 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 can reduce the seedling mortality rate.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.

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.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

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

Interpretive Groups

Land capability classification: 4s
Woodland ordination symbol: 6S
Michigan soil management group: 5.3a

147E—Lindquist sand, 18 to 35 percent slopes

Setting

Landform: Outwash plains, kames, and moraines
Shape of areas: Irregular
Size of areas: 5 to 35 acres

Typical Profile

Surface layer:
0 to 1 inch—black sand

Subsurface layer:
1 to 3 inches—light brownish gray sand

Subsoil:
3 to 10 inches—dark brown, friable sand
10 to 22 inches—dark yellowish brown and yellowish brown, very friable sand
22 to 34 inches—pale brown sand
34 to 80 inches—pale brown sand with lamellae of strong brown loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Severe

Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Horsehead soils, which have gravelly sand and very gravelly sand in the subsoil and substratum; on footslopes and toeslopes
• The well drained Millersburg soils, which have a substratum of calcareous loamy sand and sandy loam; in landscape positions similar to those of the Lindquist soil

Similar inclusions:
• Well drained soils in which the cumulative thickness of bands of loamy sand in the subsoil is more than 6 inches

Use and Management

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

Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality
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 can reduce the seedling mortality rate. Replanting is needed in some areas.

Building sites

Major management concerns: Cutbanks caving, 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 concerns: Slope, poor filtering capacity
Management considerations:
• Because of the slope, this soil is generally unsuited to use as a site for septic tank absorption fields.
• The poor filtering capacity of this soil can result in the pollution of ground water.
• On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 7s
Woodland ordination symbol: 6R
Michigan soil management group: 5.3a

307B—Klacking sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 5 to 450 acres

Typical Profile

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

Subsoil:
4 to 23 inches—strong brown sand
23 to 30 inches—brownish yellow sand
30 to 80 inches—light brown sand and yellowish red sandy loam and loamy sand

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential 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

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

Inclusions

Contrasting inclusions:
• The excessively drained Grayling soils in downslope positions at the edges of the mapped areas and in landscape positions similar to those of the Klacking soil
• The somewhat excessively drained Horsehead soils, which have gravelly sand and very gravelly sand in the subsoil and substratum; on footslopes and toeslopes
• The well drained Millersburg soils, which have a substratum of calcareous loamy sand and sandy loam; in landscape positions similar to those of the Klacking soil

Similar inclusions:
• Somewhat excessively drained soils in which the cumulative thickness of bands of loamy sand in the subsoil is less than 6 inches
• Well drained soils that have a darker 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: Equipment limitation, 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 can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.

Building sites

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

Interpretive Groups

Land capability classification: 3s
Woodland ordination symbol: 6S
Michigan soil management group: 4a

307E—Klacking sand, 18 to 35 percent slopes

Setting

Landform: Outwash plains, kames, and moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

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

Subsoil:
4 to 23 inches—strong brown sand
23 to 30 inches—brownish yellow sand
30 to 80 inches—light brown sand and yellowish red sandy loam and loamy sand

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Klacking and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Horsehead soils, which have gravelly sand and very gravelly sand in the subsoil and substratum; on footslopes and toeslopes
• The well drained Millersburg soils, which have a substratum of calcareous loamy sand and sandy loam; in landscape positions similar to those of the Klacking soil

Similar inclusions:
• Somewhat excessively drained soils in which the

cumulative thickness of bands of loamy sand in the subsoil is less than 6 inches
• Soils that have more clay in the subsoil

Use and Management

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

Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality
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 can reduce the seedling mortality rate. Replanting is needed in some areas.

Building sites

Major management concerns: Cutbanks caving, 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 concerns: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 7e
Woodland ordination symbol: 6R
Michigan soil management group: 4a

307F—Klacking sand, 35 to 70 percent slopes

Setting

Landform: Moraines, kames, and outwash plains
Shape of areas: Irregular or elongated
Size of areas: 3 to 100 acres

Typical Profile

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

Subsoil:
4 to 23 inches—strong brown sand
23 to 30 inches—brownish yellow sand
30 to 80 inches—light brown sand and yellowish red sandy loam and loamy sand

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Horsehead soils, which have gravelly sand and very gravelly sand in the subsoil and substratum; on footslopes and toeslopes
• The well drained Millersburg soils, which have a substratum of calcareous loamy sand and sandy loam; in landscape positions similar to those of the Klacking soil

Similar inclusions:
• Somewhat excessively drained soils in which the cumulative thickness of bands of loamy sand in the subsoil is less than 6 inches
• Soils that have more clay in the subsoil

Use and Management

Land use: Major use—woodland

Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality
Management considerations:
- Ordinary crawler tractors and rubber-tired skidders cannot be operated safely on these slopes. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
- Cable yarding systems are generally safer than other logging methods and result in less surface disturbance.
- In areas that are susceptible to erosion and drought conditions and where esthetics are a consideration, mulch may be needed. Straw, bark, or wood chips can be used.
- Planting when the soil is moist can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Seedling mortality rates may be higher on southern exposures than in other areas.

Interpretive Groups

Land capability classification: 7e
Woodland ordination symbol: 6R
Michigan soil management group: 4a

350B—Blue Lake sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, ground moraines, and end moraines
Shape of areas: Irregular
Size of areas: 3 to 340 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—dark 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: Moderately rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Blue Lake 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
- The well drained Millersburg soils, which have more clay in the subsoil than the Blue Lake soil; in landscape positions similar to those of the Blue Lake soil

Similar inclusions:
- Soils that have a lighter colored subsoil
- Soils in which the cumulative thickness of the bands of loamy sand is less than 6 inches
- Soils that have mottles below a depth of 40 inches

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality, 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.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- 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.

Pasture

Major management concerns: Seasonal droughtiness

Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

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

Septic tank absorption fields

Major management concerns: None

Interpretive Groups

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

350D—Blue Lake sand, 6 to 18 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 3 to 400 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—dark 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: Moderately rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Blue Lake 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
• The excessively drained Grayling soils in downslope positions at the edges of the mapped areas and in landscape positions similar to those of the Blue Lake soil
• The somewhat excessively drained Mancelona soils, which have very gravelly sand in the substratum; on footslopes and toeslopes

Similar inclusions:
• Excessively drained soils in which the cumulative thickness of bands of loamy sand in the subsoil is less than 6 inches
• Moderately well drained soils
• 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: Equipment limitation, seedling mortality, 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.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• 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.

Building sites

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

Interpretive Groups

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

350E—Blue Lake sand, 18 to 35 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 3 to 55 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—dark 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: Moderately rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Medium
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Blue Lake 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
• The excessively drained Grayling soils in downslope positions at the edges of the mapped areas and in landscape positions similar to those of the Blue Lake soil
• The somewhat excessively drained Mancelona soils, which have very gravelly sand in the substratum; on footslopes and toeslopes

Similar inclusions:
• Excessively drained soils in which the cumulative thickness of bands of loamy sand in the subsoil is less than 6 inches
• 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 limitation, 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 can reduce 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

desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Slope, cutbanks caving
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 concerns: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 7e
Woodland ordination symbol: 3R
Michigan soil management group: 4a

351A—Allendale-Wakeley-Dorval complex, 0 to 3 percent slopes

Setting

Landform: Lake plains
Position on the landform: Allendale—shoulders of low knolls; Wakeley—footslopes and toeslopes of low knolls; Dorval—depressions and swales between low knolls
Shape of areas: Irregular
Size of areas: 3 to 625 acres

Typical Profile

Allendale

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

Subsoil:
10 to 18 inches—reddish brown, mottled loamy sand
18 to 25 inches—yellowish brown sand
25 to 45 inches—brown, mottled silty clay

Substratum:
45 to 80 inches—light reddish brown, mottled, calcareous silty clay

Wakeley

Organic mat:
0 to 3 inches—black muck

Surface layer:
3 to 7 inches—black mucky sand

Substratum:
7 to 12 inches—grayish brown, mottled loamy sand
12 to 41 inches—light brownish gray sand
41 to 80 inches—gray, stratified sandy clay and silty clay loam

Dorval

Surface layer:
0 to 18 inches—black muck

Substratum:
18 to 80 inches—light gray clay

Soil Properties and Qualities

Permeability: Allendale—rapid in the sandy upper part and very slow in the clayey lower part; Wakeley—rapid in the sandy upper part and slow in the clayey lower part; Dorval—moderate in the organic layers and very slow in the clayey substratum
Available water capacity: Allendale—moderate; Wakeley—moderate; Dorval—high
Drainage class: Allendale—somewhat poorly drained; Wakeley—poorly drained; Dorval—very poorly drained
Seasonal high water table: Allendale—perched, at a depth of 0.5 foot to 1.5 feet at some time from November through May; Wakeley—perched, 1 foot above to 1 foot below the surface at some time from October through May; Dorval—perched, 1 foot above to 1 foot below the surface at some time from November through May
Potential surface runoff: Allendale—very low; Wakeley—very low; Dorval—negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: High in the clayey substratum
Potential for frost action: Allendale—moderate; Wakeley—moderate; Dorval—high

Composition

Allendale and similar soils: 25 to 35 percent
Wakeley and similar soils: 20 to 35 percent
Dorval and similar soils: 15 to 25 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Kellogg soils, which are

not mottled in the upper part of the solum; on the summits of low knolls
• The moderately well drained Croswell soils, which are sandy throughout; on the summits of low knolls
• The somewhat poorly drained Au Gres soils, which are sandy throughout; in landscape positions similar to those of the Allendale soil
• The somewhat poorly drained Algonquin soils, which are not sandy in the upper part of the solum; in landscape positions similar to those of the Allendale soil
• The poorly drained Deford soils, which are sandy throughout; in small depressions and drainageways
• The poorly drained Springport soils, which do not have an organic surface layer; in landscape positions similar to those of the Dorval soil

Similar inclusions:
• Soils that have loamy textures in the subsoil and substratum
• Soils that have more than 50 inches of muck

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard on all three soils; plant competition on the Allendale and Wakeley soils
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 wetness and low strength in areas of the Dorval soil, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Skidders should not be used during wet periods, when ruts form easily.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of these soils.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.
• 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.

Cropland

Major management concerns: Allendale—soil blowing, seasonal wetness, restricted permeability in the subsoil and substratum; Wakeley and Dorval—ponding, restricted permeability in the subsoil and substratum
Management considerations:
• 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.
• Most adapted crops can be grown in areas of the Allendale soil if an adequate drainage system is installed.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Because of ponding and the restricted permeability in the subsoil and substratum, the Wakeley and Dorval soils are generally unsuited to crops.

Pasture

Major management concerns: Seasonal wetness on all three soils; seasonal droughtiness in areas of the Allendale soil
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants.

Building sites

Major management concerns: Allendale—shrink-swell, frost action, wetness, cutbanks caving; Wakeley—shrink-swell, frost action, wetness, ponding, cutbanks caving; Dorval—shrink-swell, frost action, wetness, ponding
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.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Because of ponding, the Wakeley and Dorval soils are generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Allendale—restricted permeability, seasonal wetness; Wakeley and Dorval—restricted permeability, ponding
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.
• The poor filtering capacity of the upper sandy part of the Allendale and Wakeley soils can result in the pollution of ground water.
• Because of ponding, the Wakeley and Dorval soils are generally unsuited to use as sites for septic tank absorption fields.

Interpretive Groups

Land capability classification: 3w
Woodland ordination symbol: Allendale—4W; Wakeley—3W; Dorval—2W
Michigan soil management group: Allendale—4/1b; Wakeley—4/1c; Dorval—M/1c

352B—Deford-Au Gres-Croswell complex, 0 to 6 percent slopes

Setting

Landform: Beach ridges and swales
Position on the landform: Deford—depressions and swales; Au Gres—footslopes of low ridges, shallow depressions; Croswell—low ridges
Shape of areas: Irregular
Size of areas: 3 to 355 acres

Typical Profile

Deford

Surface layer:
0 to 6 inches—black muck

Substratum:
6 to 9 inches—light brownish gray sand
9 to 38 inches—brown sand
38 to 45 inches—pale brown sand
45 to 80 inches—brown sand

Au Gres

Organic mat:
0 to 2 inches—partially decomposed forest litter

Subsurface layer:
2 to 8 inches—pinkish gray sand

Subsoil:
8 to 18 inches—dark reddish brown, mottled sand
18 to 35 inches—dark brown, mottled sand

Substratum:
35 to 50 inches—light yellowish brown, mottled sand
50 to 80 inches—brown sand

Croswell

Organic mat:
0 to 2 inches—forest litter

Surface layer:
2 to 5 inches—black sand

Subsurface layer:
5 to 11 inches—grayish brown sand

Subsoil:
11 to 27 inches—strong brown sand
27 to 33 inches—brownish yellow sand

Substratum:
33 to 49 inches—yellow, mottled sand
49 to 80 inches—pale brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Deford—poorly drained; Au Gres—somewhat poorly drained; Croswell—moderately well drained
Seasonal high water table: Deford—apparent, 1 foot above to 1 foot below the surface at some time from October through May; Au Gres—apparent, at a depth of 0.5 foot to 1.5 feet at some time from November through May; Croswell—apparent, at a depth of 2.0 to 3.5 feet at some time from November through May
Potential surface runoff: Negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Deford—moderate; Au Gres—severe; Croswell—severe
Shrink-swell potential: Low
Potential for frost action: Deford—moderate; Au Gres—moderate; Croswell—low

Composition

Deford and similar soils: 30 to 40 percent
Au Gres and similar soils: 25 to 30 percent
Croswell and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The excessively drained Rubicon soils on the summits of low ridges and low knolls

• The moderately well drained Kellogg soils, which have more clay in the subsoil and substratum than the Croswell soil; in landscape positions similar to those of the Croswell soil
• The somewhat poorly drained Allendale soils, which have more clay in the subsoil and substratum than the Au Gres soil; in landscape positions similar to those of the Au Gres soil
• The very poorly drained Lupton and Tawas soils in landscape positions similar to those of the Deford soil
• The poorly drained Wakeley and very poorly drained Dorval soils, which have thicker organic horizons and more clay in the substratum than the Deford soil; in landscape positions similar to those of the Deford soil

Similar inclusions:
• Soils that have carbonates in the substratum
• Soils that have a surface layer of loamy sand
• Soils that have bands of loamy sand in the subsoil
• Soils that have a substratum of gravelly sand

Use and Management

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

Woodland

Major management concerns: Equipment limitation, windthrow hazard, seedling mortality, plant competition on all three soils; seasonal wetness on the Au Gres and Deford soils
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• In areas of the Deford and Au Gres soils, 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.
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Landing sites generally can be used only during the driest time of the year.
• Planting when the soil is moist can reduce the seedling mortality rate.
• Special site preparation, such as bedding before planting, can reduce the seedling mortality rate.
• Carefully managed reforestation helps to control undesirable understory plants.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.
• Trees that can withstand seasonal wetness should be selected for planting.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of the Deford 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.

Building sites

Major management concerns: Seasonal wetness, cutbanks caving on all three soils; ponding in areas of the Deford soil
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 installing a drainage system around structures with basements and crawl spaces.
• Because of ponding, the Deford soil is generally unsuited to building site development.
• 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 on all three soils; ponding in areas of the Deford soil
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system helps to lower the water table.
• The poor filtering capacity of the soils can result in the pollution of ground water.
• On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.
• Because of ponding, the Deford soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 5w
Woodland ordination symbol: Deford—4W; Au Gres—6W; Croswell—5S
Michigan soil management group: Deford—4c; Au Gres—5b; Croswell—5a

353B—Mancelona-Ossineke-Blue Lake complex, 0 to 6 percent slopes

Setting

Landform: Disintegration moraines
Shape of areas: Irregular
Size of areas: 15 to 340 acres

Typical Profile

Mancelona

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—pinkish gray sand

Subsoil:
6 to 16 inches—dark brown sand
16 to 29 inches—yellowish brown and light yellowish brown sand
29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown very gravelly sand

Ossineke

Surface layer:
0 to 6 inches—very dark gray fine sandy loam

Subsoil:
6 to 10 inches—dark brown sandy loam
10 to 16 inches—yellowish brown loamy sand
16 to 22 inches—reddish brown clay loam and yellowish brown loamy sand
22 to 29 inches—reddish brown, mottled clay loam
29 to 38 inches—reddish brown clay loam

Substratum:
38 to 80 inches—brown, calcareous clay loam

Blue Lake

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—dark 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: Mancelona—moderately rapid in the solum and very rapid in the substratum; Ossineke—slow; Blue Lake—moderately rapid
Available water capacity: Mancelona—low; Ossineke—high; Blue Lake—low
Drainage class: Mancelona—somewhat excessively drained; Ossineke—moderately well drained; Blue Lake—well drained
Seasonal high water table: Mancelona and Blue Lake—at a depth of more than 6 feet; Ossineke—perched, at a depth of 1.5 to 3.5 feet at some time from October through December and from March through May
Potential surface runoff: Mancelona—negligible; Ossineke—high; Blue Lake—very low
Flooding: None
Hazard of water erosion: Mancelona—slight; Ossineke—moderate; Blue Lake—slight
Hazard of soil blowing: Mancelona—severe; Ossineke—moderate; Blue Lake—severe
Shrink-swell potential: Mancelona—low; Ossineke—moderate; Blue Lake—low
Potential for frost action: Mancelona—low; Ossineke—moderate; Blue Lake—low

Composition

Mancelona and similar soils: 25 to 30 percent
Ossineke and similar soils: 20 to 25 percent
Blue Lake and similar soils: 20 to 25 percent
Contrasting inclusions: 20 to 25 percent

Inclusions

Contrasting inclusions:
- The well drained Millersburg soils, which are coarse-loamy; in landscape positions similar to those of the major soils
- The moderately well drained Morganlake soils, which are sandy in the upper part of the solum and loamy in the lower part of the solum and in the substratum; in landscape positions similar to those of the major soils
- The excessively drained Rubicon soils in landscape positions similar to those of the major soils

Similar inclusions:
- Soils that have a lighter colored subsoil
- Soils in which the cumulative thickness of loamy bands in the subsoil is less than 6 inches

Use and Management

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

Woodland

Major management concerns: Mancelona and Blue Lake—equipment limitation, plant competition, seedling mortality; Ossineke—equipment limitation, plant competition, windthrow hazard

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 in areas of the Ossineke soil.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Planting when the soil is moist can reduce the seedling mortality rate.
• 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.
• 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.

Pasture

Major management concerns: Overgrazing in areas of all three soils; compaction in areas of the Ossineke soil

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 poor tilth.
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

Major management concerns: Mancelona and Blue Lake—cutbanks caving; Ossineke—seasonal wetness, shrink-swell, 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.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling and by frost action.

Septic tank absorption fields

Major management concerns: Mancelona and Blue Lake—poor filtering capacity; Ossineke—restricted permeability, seasonal wetness

Management considerations:

• The poor filtering capacity of the Mancelona and Blue Lake soils can result in the pollution of ground water.
• On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability in areas of the Ossineke soil.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: 3s
Woodland ordination symbol: Mancelona—3S; Ossineke—3L; Blue Lake—3S
Michigan soil management group: Mancelona—4a; Ossineke—3a; Blue Lake—4a

354F—Mancelona-Blue Lake sands, 15 to 70 percent slopes, dissected

Setting

Landform: Disintegration moraines
Distinctive landscape feature: Dissected landscape
Shape of areas: Irregular
Size of areas: 5 to 70 acres

Typical Profile

Mancelona

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—pinkish gray sand

Subsoil:
6 to 16 inches—dark brown sand
16 to 29 inches—yellowish brown and light yellowish brown sand

29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown very gravelly sand

Blue Lake

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—dark 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: Mancelona—moderately rapid in the solum and very rapid in the substratum; Blue Lake—moderately rapid
Available water capacity: Low
Drainage class: Mancelona—somewhat excessively drained; Blue Lake—well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Mancelona—low; Blue Lake—medium
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Mancelona and similar soils: 35 to 40 percent
Blue Lake and similar soils: 35 to 40 percent
Contrasting inclusions: 20 to 25 percent

Inclusions

Contrasting inclusions:
• The excessively drained Rubicon soils in landscape positions similar to those of the major soils
• The well drained Millersburg soils, which have a substratum of calcareous loamy sand and sandy loam; in landscape positions similar to those of the major soils
• The well drained Menominee soils, which are sandy in the upper part of the solum and loamy in the lower part of the solum and in the substratum; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that have a lighter colored subsoil
• Soils in which the cumulative thickness of bands of loamy sand in the subsoil is less than 6 inches

Use and Management

Land use: Dominant use—woodland

Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality, plant competition
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 established in the less sloping areas between ravines.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• The hazard 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.
• In areas that are susceptible to erosion and drought conditions and where esthetics are a consideration, mulch may be needed. Straw, bark, or wood chips can be used.
• 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.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Seedling mortality rates may be higher on southern exposures than in other areas.
• Special harvest methods may be needed to control undesirable plants.
• Species preference can be managed by selective cutting.

Interpretive Groups

Land capability classification: 7e
Woodland ordination symbol: Mancelona—3R; Blue Lake—3R
Michigan soil management group: Mancelona—4a; Blue Lake—4a

359C—Algonquin-Negwegon-Dorval complex, 0 to 12 percent slopes

Setting

Landform: Lake plains
Position on the landform: Algonquin—backslopes and toeslopes of low knolls; Negwegon—summits and shoulders of low knolls; Dorval—depressions and swales between low knolls
Shape of areas: Irregular
Size of areas: 5 to 420 acres

Typical Profile

Algonquin

Surface layer:
0 to 5 inches—black silt loam

Subsurface layer:
5 to 10 inches—light brownish gray fine sandy loam

Subsoil:
10 to 17 inches—dark brown, mottled silty clay
17 to 24 inches—pinkish gray, calcareous, mottled clay
24 to 80 inches—light reddish brown, calcareous, mottled clay

Negwegon

Surface layer:
0 to 5 inches—dark grayish brown silt loam

Subsoil:
5 to 8 inches—pinkish gray silt loam and reddish brown silty clay
8 to 13 inches—reddish brown silty clay and pinkish gray silt loam
13 to 34 inches—reddish brown, mottled silty clay

Substratum:
34 to 80 inches—light reddish brown, calcareous, mottled silty clay

Dorval

Surface layer:
0 to 18 inches—black muck

Substratum:
18 to 80 inches—light gray clay

Soil Properties and Qualities

Permeability: Algonquin—very slow; Negwegon—very slow; Dorval—moderate in the organic layers and very slow in the clayey substratum
Available water capacity: High
Drainage class: Algonquin—somewhat poorly drained; Negwegon—moderately well drained; Dorval—very poorly drained
Seasonal high water table: Algonquin—perched, at a depth of 0.5 foot to 1.5 feet at some time from October through May; Negwegon—perched, at a depth of 1.5 to 3.0 feet at some time from October through December and from March through May; Dorval—perched, 1 foot above to 1 foot below the surface at some time from November through May
Potential surface runoff: Algonquin—very high; Negwegon—very high; Dorval—negligible
Flooding: None
Hazard of water erosion: Algonquin—moderate; Negwegon—moderate; Dorval—slight
Hazard of soil blowing: Algonquin—slight; Negwegon—slight; Dorval—moderate
Shrink-swell potential: High
Potential for frost action: Algonquin—high; Negwegon—moderate; Dorval—high

Composition

Algonquin and similar soils: 35 to 45 percent
Negwegon and similar soils: 25 to 35 percent
Dorval and similar soils: 20 to 30 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Kellogg soils, which are sandy in the upper part of the solum; in landscape positions similar to those of the Negwegon soil
- The somewhat poorly drained Allendale soils, which are sandy in the upper part of the solum; in landscape positions similar to those of the Algonquin soil
- The poorly drained Wakeley soils, which are sandy in the upper part of the solum; 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 organic layers more than 50 inches thick; 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 overlying 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: Algonquin and Negwegon—water erosion, tilth of the surface layer, restricted 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 maintain tilth.

• In areas of the Algonquin and Dorval soils, both surface and subsurface drainage systems are needed to reduce the wetness.

• Lift pumps are needed in areas where adequate drainage outlets are not available.

• Because of the restricted permeability, subsurface drains should be narrowly spaced.

• Because of ponding, areas of the Dorval soil are generally unsuited to crops.

Pasture

Major management concerns: Algonquin—compaction, seasonal wetness; Negwegon—compaction

Management considerations:

• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded in areas of the Algonquin soil.

• Because of ponding and year-round wetness, areas of the Dorval soil are generally unsuited to pasture.

Woodland

Major management concerns: Algonquin and Dorval—equipment limitation, windthrow hazard, plant competition, seedling mortality; Negwegon—equipment limitation, windthrow hazard, plant competition

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 the sticky and plastic subsoil, logging roads should be graveled. 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 desirable seed trees along the edge of the openings can promote natural regeneration.

• Special site preparation, such as bedding before planting, can reduce the seedling mortality rate in areas of the Algonquin soil.

• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of the Dorval soil.

Building sites

Major management concerns: Algonquin—shrink-swell, frost action, seasonal wetness; Negwegon—shrink-swell, frost action, seasonal wetness, slope; Dorval—shrink-swell, frost action, ponding, subsidence

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.

• Wetness can be reduced by installing 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: Algonquin—restricted permeability, seasonal wetness; Negwegon—restricted permeability, seasonal wetness, slope; Dorval—restricted permeability, ponding
Management considerations:
• Because of ponding and low strength, the Dorval soil is generally unsuited to use as a site for 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 helps to lower the water table.

Interpretive Groups

Land capability classification: 3w
Woodland ordination symbol: Algonquin—6W; Negwegon—3L; Dorval—2W
Michigan soil management group: Algonquin—1.5b; Negwegon—1.5a; Dorval—M/1c

360—Wakeley muck

Setting

Landform: Outwash plains and lake plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 120 acres

Typical Profile

Organic mat:
0 to 3 inches—black muck

Surface layer:
3 to 7 inches—black mucky sand

Substratum:
7 to 12 inches—grayish brown, mottled loamy sand
12 to 41 inches—light brownish gray sand
41 to 80 inches—gray, stratified sandy clay and silty clay loam

Soil Properties and Qualities

Permeability: Rapid in the upper sandy material and slow in the lower clayey material
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: Perched, 1 foot above to 1 foot below the surface at some time from October through May
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the upper sandy material and high in the lower clayey material
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Deford and very poorly drained Tawas soils, which have a sandy substratum; in landscape positions similar to those of the Wakeley soil
• The poorly drained Springport soils, which are clayey throughout; in landscape positions similar to those of the Wakeley soil
• The very poorly drained Dorval soils, which have clayey textures in the substratum; in landscape positions similar to those of the Wakeley soil
• The somewhat poorly drained Allendale soils on slight rises and at the edges of the mapped areas
• The somewhat poorly drained Algonquin soils, which have clayey textures throughout; in the slightly higher landscape positions

Similar inclusions:
• Soils that have a substratum of sandy loam

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard, 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.
• Landing sites generally can be used only during the driest time of the year.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of 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 desirable seed trees along the edge of the openings can promote natural regeneration.

Pasture

Major management concerns: 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.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants.

Building sites

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

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 5w
Woodland ordination symbol: 3W
Michigan soil management group: 4/1c

361B—Allendale-Dorval-Blue Lake complex, 0 to 6 percent slopes

Setting

Landform: Lake plains
Position on the landform: Allendale—backslopes and toeslopes of low knolls; Dorval—depressions and swales between low knolls; Blue Lake—summits and shoulders of low knolls
Shape of areas: Irregular
Size of areas: 5 to 2,500 acres

Typical Profile

Allendale

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

Subsoil:
10 to 18 inches—reddish brown, mottled loamy sand
18 to 25 inches—yellowish brown sand
25 to 45 inches—brown, mottled silty clay

Substratum:
45 to 80 inches—light reddish brown, mottled, calcareous 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—dark 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: Allendale—rapid in the sandy upper part and very slow in the clayey lower part; Dorval—moderate in the organic layers and very slow in the clayey substratum; 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, at a depth of 0.5 foot to 1.5 feet at some time from November through May; Dorval—perched, 1 foot above to 1 foot below the surface at some time

from November through May; Blue Lake—at a depth of more than 6 feet
Potential surface runoff: Allendale—very low; Dorval—negligible; Blue Lake—very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Allendale—moderate; 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 and similar soils: 35 to 45 percent
Dorval 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 Kellogg soils, which are not mottled in the upper part of the solum and are clayey in the lower part of the subsoil; in landscape positions similar to those of the Blue Lake soil
• The moderately well drained Chinwhisker soils, which 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 of the solum; in landscape positions similar to those of the Dorval soil
• The poorly drained Springport soils, which have mineral surface horizons; in landscape positions similar to those of the Dorval soil

Similar inclusions:
• Soils that do not have bands of loamy sand in the subsoil
• Soils that have lighter colored horizons in the 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: Allendale—equipment limitation, plant competition, windthrow hazard; Dorval—equipment limitation, plant competition, windthrow hazard, seedling mortality; Blue Lake—equipment limitation, plant competition, seedling mortality
Management considerations:
• In areas of the Allendale and Dorval soils, equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized in areas of the Blue Lake soil.
• Special site preparation, such as bedding before planting, can reduce the seedling mortality rate in areas of 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 reduce the seedling mortality rate. Replanting is needed in some areas.
• In areas of the 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 desirable seed trees along the edge of the openings can promote natural regeneration.

Cropland

Major management concerns: Allendale—seasonal wetness, restricted permeability in the subsoil and substratum, soil blowing, tilth of the surface layer; Dorval—ponding, restricted permeability; Blue Lake—soil blowing, seasonal droughtiness, low content of organic matter in the surface layer
Management considerations:
• In areas of the Allendale and Dorval soils, subsurface drains can reduce the wetness if a suitable outlet is available.
• Because of the restricted permeability, subsurface drains should be narrowly spaced in areas of the Allendale and Dorval soils.
• In areas of the Dorval soil, both surface and subsurface drainage systems are needed to reduce the wetness. Lift pumps are needed in areas where adequate drainage outlets are not available.
• In areas of the Allendale and Blue Lake soils, 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.
• 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.
• In areas of the Blue Lake soil, drought-tolerant crops should be selected for planting.

Pasture

Major management concerns: Allendale—seasonal wetness, seasonal droughtiness; Dorval—seasonal wetness; Blue Lake—seasonal droughtiness
Management considerations:
• Because of ponding and year-round wetness, areas of the Dorval soil are 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.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

Major management concerns: Allendale—cutbanks caving, seasonal wetness, shrink-swell, frost action; Dorval—ponding, shrink-swell, frost action; Blue Lake—cutbanks caving
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 installing a drainage system around structures with basements and crawl spaces.
• Because cutbanks in areas of the Allendale and Blue Lake soils 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 and swelling and by frost action.
• Because of ponding, the Dorval soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Allendale—restricted permeability, wetness, poor filtering capacity; Dorval—ponding, wetness, low strength, restricted permeability
Management considerations:
• Because of ponding and low strength, the Dorval soil is generally unsuited to use as a site for septic tank absorption fields.
• Filling or mounding with suitable material helps to raise the absorption field above the water table in areas of the Allendale soil.
• A subsurface drainage system helps to lower the water table in areas of the Allendale soil.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability in areas 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 of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 3w
Woodland ordination symbol: Allendale—4W; Dorval—2W; Blue Lake—3S
Michigan soil management group: Allendale—4/1b; Dorval—M/1c; Blue Lake—4a

362B—Millersburg loamy sand, 0 to 6 percent slopes

Setting

Landform: Moraines and drumlins
Shape of areas: Linear and irregular
Size of areas: 5 to 900 acres

Typical Profile

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 5 inches—brown sand

Subsoil:
5 to 10 inches—strong brown loamy sand
10 to 18 inches—pale brown sand and reddish brown sandy loam
18 to 26 inches—reddish brown sandy loam and pinkish gray loamy sand
26 to 34 inches—yellowish red sandy loam
34 to 43 inches—light reddish brown, calcareous sandy loam

Substratum:
43 to 80 inches—light yellowish brown, calcareous loamy sand

Soil Properties and Qualities

Permeability: Moderate
Available water capacity: Moderate

Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Graycalm and well drained Blue Lake soils, which have less clay in the subsoil and substratum than the Millersburg soil; in landscape positions similar to those of the Millersburg soil
- The somewhat excessively drained Mancelona soils, which have gravel in the subsoil and substratum; in landscape positions similar to those of the Millersburg soil
- The well drained Melita soils, which have more clay in the subsoil and substratum than the Millersburg soil; in landscape positions similar to those of the Millersburg soil
- The moderately well drained Morganlake soils, which have more clay in the subsoil and substratum than the Millersburg soil; in landscape positions similar to or slightly lower than those of the Millersburg soil
- The poorly drained Deford soils in small, shallow closed depressions

Similar inclusions:
- Soils that have less clay in the subsoil
- Soils that have a darker subsoil
- Soils that are moderately well drained

Use and Management

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

Woodland

Major management concerns: Plant competition
Management considerations:
- 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 undesirable hardwoods may be needed.
- Carefully managed reforestation helps to control undesirable understory plants.

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.
- Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

Major management concerns: Cutbanks caving, frost action
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.

Septic tank absorption fields

Major management concerns: No major limitations

Interpretive Groups

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

362D—Millersburg loamy sand, 6 to 18 percent slopes

Setting

Landform: Moraines and drumlins
Shape of areas: Linear and irregular
Size of areas: 5 to 900 acres

Typical Profile

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 5 inches—brown sand

Subsoil:
5 to 10 inches—strong brown loamy sand
10 to 18 inches—pale brown sand and reddish brown sandy loam
18 to 26 inches—reddish brown sandy loam and pinkish gray loamy sand

26 to 34 inches—yellowish red sandy loam
34 to 43 inches—light reddish brown, calcareous sandy loam

Substratum:
43 to 80 inches—light yellowish brown, calcareous loamy sand

Soil Properties and Qualities

Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Graycalm soils, which have less clay in the subsoil and substratum than the Millersburg soil; in landscape positions similar to those of the Millersburg soil
• The somewhat excessively drained Mancelona soils, which have gravel in the subsoil and substratum; in landscape positions similar to those of the Millersburg soil
• The excessively drained Rubicon and well drained Klacking soils, which have less clay in the subsoil and substratum than the Millersburg soil; in landscape positions similar to those of the Millersburg soil
• The well drained Menominee soils, which have more clay in the subsoil and substratum than the Millersburg soil; in landscape positions similar to those of the Millersburg soil

Similar inclusions:
• Soils that have less clay in the subsoil
• Soils that have a darker subsoil
• Moderately well drained soils

Use and Management

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

Woodland

Major management concerns: Plant competition
Management considerations:
• 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 undesirable hardwoods may be needed.
• Carefully managed reforestation helps to control undesirable understory plants.

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.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

Major management concerns: Cutbanks caving, 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 concerns: Slope
Management considerations:
• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

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

362E—Millersburg loamy sand, 18 to 35 percent slopes

Setting

Landform: Moraines and drumlins
Shape of areas: Linear and irregular
Size of areas: 5 to 220 acres

Typical Profile

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 5 inches—brown sand

Subsoil:
5 to 10 inches—strong brown loamy sand
10 to 18 inches—pale brown sand and reddish brown sandy loam
18 to 26 inches—reddish brown sandy loam and pinkish gray loamy sand
26 to 34 inches—yellowish red sandy loam
34 to 43 inches—light reddish brown, calcareous sandy loam

Substratum:
43 to 80 inches—light yellowish brown, calcareous loamy sand

Soil Properties and Qualities

Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Medium
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Graycalm soils, which have less clay in the subsoil and substratum than the Millersburg soil; in landscape positions similar to those of the Millersburg soil
• The somewhat excessively drained Mancelona soils, which have gravel in the subsoil and substratum; in landscape positions similar to those of the Millersburg soil
• The excessively drained Rubicon and well drained Klacking soils, which have less clay in the subsoil and substratum than the Millersburg soil; in landscape positions similar to those of the Millersburg soil
• The well drained Menominee soils, which have more clay in the subsoil and substratum than the Millersburg soil; in landscape positions similar to those of the Millersburg soil

Similar inclusions:
• Soils that have less clay in the subsoil
• Soils that have a darker subsoil

Use and Management

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

Woodland

Major management concerns: Erosion hazard, equipment limitation, 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 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.

Building sites

Major management concerns: Cutbanks caving, slope, frost action
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.
• 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
Management considerations:
• Because of the slope, this soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 7e
Woodland ordination symbol: 3R
Michigan soil management group: 3a

363D—Mancelona-Millersburg-Blue Lake complex, 6 to 18 percent slopes

Setting

Landform: Disintegration moraines
Shape of areas: Irregular
Size of areas: 5 to 1,350 acres

Typical Profile

Mancelona

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—pinkish gray sand

Subsoil:
6 to 16 inches—dark brown sand
16 to 29 inches—yellowish brown and light yellowish brown sand
29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown, calcareous very gravelly sand

Millersburg

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 5 inches—brown sand

Subsoil:
5 to 10 inches—strong brown loamy sand
10 to 18 inches—pale brown sand and reddish brown sandy loam
18 to 26 inches—reddish brown sandy loam and pinkish gray loamy sand
26 to 34 inches—yellowish red sandy loam
34 to 43 inches—light reddish brown, calcareous sandy loam

Substratum:
43 to 80 inches—light yellowish brown, calcareous loamy sand

Blue Lake

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—dark 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: Mancelona—moderately rapid in the solum and very rapid in the substratum; Millersburg—moderate; Blue Lake—moderately rapid
Available water capacity: Mancelona—low; Millersburg—moderate; Blue Lake—low
Drainage class: Mancelona—somewhat excessively drained; Millersburg—well drained; Blue Lake—well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Mancelona—very low; Millersburg—low; Blue Lake—low
Flooding: None
Hazard of water erosion: Mancelona—severe; Millersburg—moderate; Blue Lake—moderate
Hazard of soil blowing: Mancelona—severe; Millersburg—moderate; Blue Lake—severe
Shrink-swell potential: Low
Potential for frost action: Mancelona—low; Millersburg—moderate; Blue Lake—low

Composition

Mancelona and similar soils: 25 to 30 percent
Millersburg and similar soils: 25 to 30 percent
Blue Lake and similar soils: 20 to 25 percent
Contrasting inclusions: 20 to 25 percent

Inclusions

Contrasting inclusions:
• The well drained Bamfield soils, which have more clay in the subsoil and substratum than the major soils; in landscape positions similar to those of the major soils
• The well drained Menominee soils, which are sandy in the upper part of the solum and loamy in the lower

part of the solum and in the 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 moderately well drained Kellogg soils, which are sandy in the upper part of the solum and clayey in the lower part of the solum and in the substratum; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that have a lighter colored subsoil
• Soils in which the cumulative thickness of bands of loamy sand in the substratum is less than 6 inches

Use and Management

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

Woodland

Major management concerns: Mancelona and Blue Lake—equipment limitation, seedling mortality, plant competition; Millersburg—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 can reduce the seedling mortality rate. Replanting is needed in some areas.
• Planting when the soil is moist can reduce the seedling mortality rate.
• 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Cutbanks caving, slope on all three soils; frost action in areas of the Millersburg soil
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.
• 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 on all three soils; poor filtering capacity in areas of the Mancelona soil
Management considerations:
• The poor filtering capacity of the Mancelona soil can result in the pollution of ground water.
• On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.
• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: 4e
Woodland ordination symbol: Mancelona—3S; Millersburg—3A; Blue Lake—3S
Michigan soil management group: Mancelona—4a; Millersburg—3a; Blue Lake—4a

364E—Mancelona-Millersburg-Blue Lake complex, 8 to 35 percent slopes, dissected

Setting

Landform: Disintegration moraines
Distinctive landscape feature: Dissected landscape
Shape of areas: Irregular
Size of areas: 5 to 360 acres

Typical Profile

Mancelona

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—pinkish gray sand

Subsoil:
6 to 16 inches—dark brown sand
16 to 29 inches—yellowish brown and light yellowish brown sand
29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown, calcareous very gravelly sand

Millersburg

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 5 inches—brown sand

Subsoil:
5 to 10 inches—strong brown loamy sand
10 to 18 inches—pale brown sand and reddish brown sandy loam
18 to 26 inches—reddish brown sandy loam and pinkish gray loamy sand
26 to 34 inches—yellowish red sandy loam
34 to 43 inches—light reddish brown, calcareous sandy loam

Substratum:
43 to 80 inches—light yellowish brown, calcareous loamy sand

Blue Lake

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—dark 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: Mancelona—moderately rapid in the solum and very rapid in the substratum; Millersburg—moderate; Blue Lake—moderately rapid
Available water capacity: Mancelona—low; Millersburg—moderate; Blue Lake—low
Drainage class: Mancelona—somewhat excessively drained; Millersburg—well drained; Blue Lake—well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Mancelona—low; Millersburg—medium; Blue Lake—medium
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Mancelona—severe; Millersburg—moderate; Blue Lake—severe
Shrink-swell potential: Low
Potential for frost action: Mancelona—low; Millersburg—moderate; Blue Lake—low

Composition

Mancelona and similar soils: 25 to 30 percent
Millersburg and similar soils: 20 to 25 percent
Blue Lake and similar soils: 20 to 25 percent
Contrasting inclusions: 20 to 25 percent

Inclusions

Contrasting inclusions:
• The excessively drained Rubicon soils, which are sandy throughout; in landscape positions similar to those of the major soils
• The well drained Bamfield soils, which have more clay in the subsoil and substratum than the major soils; in landscape positions similar to those of the major soils
• The well drained Menominee soils, which are sandy in the upper part of the solum and loamy in the lower part of the solum and in the substratum; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that have a lighter colored subsoil
• Soils in which the cumulative thickness of bands of loamy sand in the subsoil is less than 6 inches

Use and Management

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

Woodland

Major management concerns: Mancelona and Blue Lake—erosion hazard, equipment limitation, seedling mortality, plant competition; Millersburg—erosion hazard, equipment limitation, plant competition
Management considerations:
• Establishing logging roads and skid roads in the less sloping areas between the ravines or diagonally across the side slopes reduces the hazard of erosion.
• The grade should be kept as low as possible.
• Because loose sand can interfere with the traction of wheeled equipment, 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.
• 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.

• The hazard 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 when the soil is moist can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Special harvest methods may be needed to control undesirable plants.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Mancelona and Blue Lake—cutbanks caving, slope; Millersburg—slope, frost action
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Because of the slope, these soils are poorly suited to building site development without extensive land shaping.
• In areas of the Millersburg soil, 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 on all three soils; poor filtering capacity in areas of the Mancelona soil
Management considerations:
• The poor filtering capacity of the Mancelona soil can result in the pollution of ground water.
• Because of the slope, these soils are generally unsuited to use as sites for septic tank absorption fields.

Interpretive Groups

Land capability classification: 7e
Woodland ordination symbol: Mancelona—3R; Millersburg—3R; Blue Lake—3R
Michigan soil management group: Mancelona—4a; Millersburg—3a; Blue Lake—4a

369—Deford muck

Setting

Landform: Moraines, lake plains, deltas, and outwash plains
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 6 inches—black muck

Substratum:
6 to 9 inches—light brownish gray sand
9 to 38 inches—brown sand
38 to 45 inches—pale brown sand
45 to 80 inches—brown sand

Soil Properties and Qualities

Permeability: Rapid
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 October through May
Potential 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 and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Tawas soils in depressions
• The somewhat poorly drained Au Gres soils on knolls

Similar inclusions:
• Soils that have pockets of gravel in the substratum
• Soils that have a surface layer of sand
• Soils that have clay in the substratum

Use and Management

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

Woodland

Major management concerns: Seasonal wetness, equipment limitation, 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.
• Access is easiest during periods in winter when access roads are frozen.
• Landing sites generally can be used only during the driest time of the year.

• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

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

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 5w
Woodland ordination symbol: 4W
Michigan soil management group: 4c

371—Springport silt loam

Setting

Landform: Depressions on lake plains and moraines
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 4 to 225 acres

Typical Profile

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

Subsurface layer:
3 to 9 inches—very dark gray, mottled silty clay loam

Subsoil:
9 to 13 inches—light brownish gray, mottled silty clay loam
13 to 35 inches—reddish brown, mottled silty clay

Substratum:
35 to 60 inches—light reddish brown, calcareous, mottled silty clay
60 to 80 inches—reddish brown, calcareous, mottled silty clay loam

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Poorly drained
Seasonal high water table: Perched, 1 foot above to 1 foot below the surface at some time from October through June
Potential surface runoff: High
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Springport 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 positions on the landscape
• The somewhat poorly drained Algonquin soils in the slightly higher positions on the landscape

Similar inclusions:
• Soils that have a mucky surface layer

Use and Management

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

Woodland

Major management concerns: Seasonal wetness, equipment limitation, seedling mortality, windthrow hazard, plant competition
Management considerations:
• Because of the restricted permeability and a sticky and plastic subsoil, logging roads should be graveled. 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.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of 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.

• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants.

Building sites

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

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 5w
Woodland ordination symbol: 6W
Michigan soil management group: 1.5c

380—Access denied

Shape of areas: Square or rectangular
Size of areas: 10 to 280 acres

Use and Management

Management considerations:
• Because access to these areas was denied, no interpretations are available. Onsite investigation is needed.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

384B—Iosco sand, 0 to 6 percent slopes

Setting

Landform: Moraines and outwash plains
Shape of areas: Irregular or elongated
Size of areas: 3 to 80 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 12 inches—pinkish gray sand

Subsoil:
12 to 18 inches—dark reddish brown and strong brown, mottled sand
18 to 20 inches—pale brown loamy sand
20 to 30 inches—reddish brown, mottled sandy clay loam and yellowish brown, mottled loamy sand
30 to 42 inches—reddish brown, mottled sandy clay loam

Substratum:
42 to 80 inches—brown, calcareous, mottled loam

Soil Properties and Qualities

Permeability: Rapid in the upper sandy material and moderate or moderately slow in the underlying material
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, at a depth of 0.5 foot to 1.5 feet at some time from November through June
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Deford soils in depressions and drainageways
• The well drained Millersburg and Klacking soils on slight rises

• The moderately well drained Croswell soils on slight rises and in landscape positions similar to those of the Iosco soil

Similar inclusions:
• Soils that have loamy material below a depth of 40 inches

Use and Management

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

Woodland

Major management concerns: Seasonal wetness, equipment limitation, seedling mortality, windthrow hazard, 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.
• 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.
• Special harvest methods may be needed to control undesirable plants.
• 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 desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness, shrink-swell, 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 installing 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 and by frost action.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system helps to lower 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: 3w
Woodland ordination symbol: 5W
Michigan soil management group: 4/2b

385D—Lindquist sand, 6 to 18 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 3 to 175 acres

Typical Profile

Surface layer:
0 to 1 inch—black sand

Subsurface layer:
1 to 3 inches—light brownish gray sand

Subsoil:
3 to 10 inches—dark brown sand
10 to 22 inches—dark yellowish brown and yellowish brown sand
22 to 34 inches—pale brown sand
34 to 80 inches—pale brown sand with thin bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None

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

Composition

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

Inclusions

Contrasting inclusions:
• The excessively drained Grayling soils in landscape positions similar to those of the Lindquist soil
• The poorly drained Deford soils in small, closed depressions

Similar inclusions:
• Soils that do not have bands of loamy sand in the subsoil
• Soils that have calcareous sand and gravel in the substratum
• Soils that have a lighter colored subsoil

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality
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 can reduce the seedling mortality rate. Replanting is needed in some areas.
• Planting when the soil is moist can reduce the seedling mortality rate.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.

Building sites

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

Interpretive Groups

Land capability classification: 6s
Woodland ordination symbol: 6S
Michigan soil management group: 5.3a

386B—Mancelona-Rubicon sands, 0 to 6 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 5 to 145 acres

Typical Profile

Mancelona

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—pinkish gray sand

Subsoil:
6 to 16 inches—dark brown sand
16 to 29 inches—yellowish brown and light yellowish brown sand
29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown, calcareous very gravelly sand

Rubicon

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 9 inches—brown sand

Subsoil:
9 to 16 inches—dark brown sand
16 to 22 inches—strong brown sand
22 to 47 inches—yellowish brown sand

Substratum:
47 to 80 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Mancelona—moderately rapid in the solum and very rapid in the substratum; Rubicon—rapid
Available water capacity: Low
Drainage class: Mancelona—somewhat excessively drained; Rubicon—excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential 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

Mancelona and similar soils: 35 to 50 percent
Rubicon and similar soils: 30 to 40 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Blue Lake and Klacking soils, which have more clay in the subsoil and substratum than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that have bands of loamy sand in the subsoil
• Soils that have a lighter colored subsoil

Use and Management

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

Woodland

Major management concerns: Mancelona—equipment limitation, seedling mortality, plant competition; Rubicon—equipment limitation, 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 can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Special harvest methods may be needed to control undesirable plants.
• 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

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

Septic tank absorption fields

Major management concerns: Rapid permeability
Management considerations:
• The poor filtering capacity of these soils can result in the pollution of ground water.
• On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 3s
Woodland ordination symbol: Mancelona—3S; Rubicon—4S
Michigan soil management group: Mancelona—4a; Rubicon—5.3a

386D—Mancelona-Rubicon sands, 6 to 18 percent slopes

Setting

Landform: Outwash plains and moraines
Shape of areas: Irregular
Size of areas: 3 to 335 acres

Typical Profile

Mancelona

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—pinkish gray sand

Subsoil:
6 to 16 inches—dark brown sand
16 to 29 inches—yellowish brown and light yellowish brown sand
29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown, calcareous very gravelly sand

Rubicon

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 9 inches—brown sand

Subsoil:
9 to 16 inches—dark brown sand
16 to 22 inches—strong brown sand
22 to 47 inches—yellowish brown sand

Substratum:
47 to 80 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Mancelona—moderately rapid in the solum and very rapid in the substratum; Rubicon—rapid
Available water capacity: Low
Drainage class: Mancelona—somewhat excessively drained; Rubicon—excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Mancelona—severe; Rubicon—moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Mancelona and similar soils: 35 to 50 percent
Rubicon and similar soils: 30 to 40 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Millersburg, Blue Lake, and Klacking soils, which have more clay in the subsoil and substratum than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that have bands of loamy sand in the subsoil
• Soils that have a lighter colored subsoil

Use and Management

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

Woodland

Major management concerns: Mancelona—equipment limitation, seedling mortality, plant competition; Rubicon—equipment limitation, 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 can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Special harvest methods may be needed to control undesirable plants.
• 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Cutbanks caving, 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: Rapid permeability, slope
Management considerations:
• The poor filtering capacity of these soils can result in the pollution of ground water.
• On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to 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: 4e
Woodland ordination symbol: Mancelona—3S; Rubicon—4S
Michigan soil management group: Mancelona—4a; Rubicon—5.3a

387E—Mancelona-Rubicon sands, 8 to 35 percent slopes, dissected

Setting

Landform: Outwash plains and moraines
Distinctive landscape feature: Dissected landscape
Shape of areas: Irregular
Size of areas: 3 to 140 acres

Typical Profile

Mancelona

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—pinkish gray sand

Subsoil:
6 to 16 inches—dark brown sand
16 to 29 inches—yellowish brown and light yellowish brown sand
29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown, calcareous very gravelly sand

Rubicon

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 9 inches—brown sand

Subsoil:
9 to 16 inches—dark brown sand
16 to 22 inches—strong brown sand
22 to 47 inches—yellowish brown sand

Substratum:
47 to 80 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Mancelona—moderately rapid in the solum and very rapid in the substratum; Rubicon—rapid
Available water capacity: Low
Drainage class: Mancelona—somewhat excessively drained; Rubicon—excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Mancelona and similar soils: 35 to 50 percent
Rubicon and similar soils: 30 to 40 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Millersburg, Blue Lake, and Klacking soils, which have more clay in the subsoil and substratum than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
- Soils that have bands of loamy sand in the subsoil
- Soils that have a lighter colored subsoil

Use and Management

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

Woodland

Major management concerns: Mancelona—erosion hazard, equipment limitation, seedling mortality, plant competition; Rubicon—erosion hazard, equipment limitation, seedling mortality
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.
- Skid roads and skid trails should be established in the less sloping areas between ravines.
- 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 loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- 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.
- Establishing logging roads and skid roads in the less sloping areas between the ravines or diagonally across the side slopes can reduce the hazard of erosion.

• The hazard 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 can reduce the seedling mortality rate. Replanting is needed in some areas.
• Special harvest methods may be needed to control undesirable plants.
• 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Slope, cutbanks caving
Management considerations:
• Because of the slope, these soils are generally unsuited to building site development.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Slope, rapid permeability
Management considerations:
• Because of the slope, these soils are generally unsuited to use as sites for 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 of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 7e
Woodland ordination symbol: Mancelona—3R; Rubicon—4R
Michigan soil management group: Mancelona—4a; Rubicon—5.3a

387F—Mancelona-Rubicon sands, 15 to 70 percent slopes, dissected

Setting

Landform: Outwash plains and moraines
Distinctive landscape feature: Dissected landscape
Shape of areas: Irregular or elongated
Size of areas: 3 to 100 acres

Typical Profile

Mancelona

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—pinkish gray sand

Subsoil:
6 to 16 inches—dark brown sand
16 to 29 inches—yellowish brown and light yellowish brown sand
29 to 35 inches—reddish brown gravelly sandy loam

Substratum:
35 to 80 inches—yellowish brown, calcareous very gravelly sand

Rubicon

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 9 inches—brown sand

Subsoil:
9 to 16 inches—dark brown sand
16 to 22 inches—strong brown sand
22 to 47 inches—yellowish brown sand

Substratum:
47 to 80 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Mancelona—moderately rapid in the solum and very rapid in the substratum; Rubicon—rapid
Available water capacity: Low
Drainage class: Mancelona—somewhat excessively drained; Rubicon—excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Mancelona and similar soils: 35 to 50 percent
Rubicon and similar soils: 30 to 40 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Millersburg, Blue Lake, and Klacking soils, which have more clay in the subsoil and substratum than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
- Soils that have bands of loamy sand in the subsoil
- Soils that have a darker subsoil
- Soils that have a lighter colored subsoil

Use and Management

Land use: Dominant use—woodland

Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality on both soils; plant competition in areas of the Mancelona soil
Management considerations:
- Ordinary crawler tractors and rubber-tired skidders cannot be operated safely on these slopes. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
- Skid roads and skid trails should be established in the less sloping areas between ravines.
- Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
- Establishing logging roads and skid roads in the less sloping areas between the ravines or diagonally across the side slopes can reduce the hazard of erosion.
- The hazard 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.
- Cable yarding systems are generally safer than other logging methods and result in less surface disturbance.
- Planting when the soil is moist can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Special harvest methods may be needed to control undesirable plants.
- 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.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Interpretive Groups

Land capability classification: 7e
Woodland ordination symbol: Mancelona—3R; Rubicon—4R
Michigan soil management group: Mancelona—4a; Rubicon—5.3a

388B—Millersburg-Klacking-Graycalm complex, 0 to 6 percent slopes

Setting

Landform: Moraines
Shape of areas: Irregular
Size of areas: 5 to 790 acres

Typical Profile

Millersburg

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 5 inches—brown sand

Subsoil:
5 to 10 inches—strong brown loamy sand
10 to 18 inches—pale brown sand and reddish brown sandy loam
18 to 26 inches—reddish brown sandy loam and pinkish gray loamy sand
26 to 34 inches—yellowish red sandy loam
34 to 43 inches—light reddish brown, calcareous sandy loam

Substratum:
43 to 80 inches—light yellowish brown, calcareous loamy sand

Klacking

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

Subsoil:
4 to 23 inches—strong brown sand
23 to 30 inches—brownish yellow sand
30 to 80 inches—light brown sand and yellowish red sandy loam and loamy sand

Graycalm

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 16 inches—strong brown sand
16 to 27 inches—reddish yellow sand

27 to 80 inches—yellow sand that has bands of yellowish red loamy sand

Soil Properties and Qualities

Permeability: Millersburg—moderate; Klacking—moderately rapid; Graycalm—rapid
Available water capacity: Millersburg—moderate; Klacking—low; Graycalm—low
Drainage class: Millersburg and Klacking—well drained; Graycalm—somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Millersburg—very low; Klacking—negligible; Graycalm—negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Millersburg—moderate; Klacking—severe; Graycalm—severe
Shrink-swell potential: Low
Potential for frost action: Millersburg—moderate; Klacking—low; Graycalm—low

Composition

Millersburg and similar soils: 35 to 50 percent
Klacking and similar soils: 20 to 40 percent
Graycalm and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Mancelona and Horsehead soils, which have gravel in the subsoil and substratum; in landscape positions similar to those of the major soils
• The moderately well drained Morganlake soils, which have more clay in the subsoil and substratum than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that do not have bands of loamy sand in the subsoil
• Soils that have a darker subsoil

Use and Management

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

Woodland

Major management concerns: Millersburg—plant competition; Klacking and Graycalm—equipment limitation, 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 can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• 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.
• 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Millersburg—cutbanks caving, frost action; Klacking and Graycalm—cutbanks caving
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations in areas of the Millersburg soil can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Millersburg—restricted permeability; Graycalm—rapid permeability
Management considerations:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability in areas of the Millersburg soil.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• The poor filtering capacity of the Graycalm soil can result in the pollution of ground water.
• On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 3s
Woodland ordination symbol: Millersburg—3A; Klacking—6S; Graycalm—6S

Michigan soil management group: Millersburg—3a; Klacking—4a; Graycalm—5a

388D—Millersburg-Klacking-Graycalm complex, 6 to 18 percent slopes

Setting

Landform: Moraines
Shape of areas: Irregular
Size of areas: 5 to 250 acres

Typical Profile

Millersburg

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 5 inches—brown sand

Subsoil:
5 to 10 inches—strong brown loamy sand
10 to 18 inches—pale brown sand and reddish brown sandy loam
18 to 26 inches—reddish brown sandy loam and pinkish gray loamy sand
26 to 34 inches—yellowish red sandy loam
34 to 43 inches—light reddish brown, calcareous sandy loam

Substratum:
43 to 80 inches—light yellowish brown, calcareous loamy sand

Klacking

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

Subsoil:
4 to 23 inches—strong brown sand
23 to 30 inches—brownish yellow sand
30 to 80 inches—light brown sand and yellowish red sandy loam and loamy sand

Graycalm

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 16 inches—strong brown sand
16 to 27 inches—reddish yellow sand
27 to 80 inches—yellow sand that has bands of yellowish red loamy sand

Soil Properties and Qualities

Permeability: Millersburg—moderate; Klacking—moderately rapid; Graycalm—rapid
Available water capacity: Millersburg—moderate; Klacking—low; Graycalm—low
Drainage class: Millersburg and Klacking—well drained; Graycalm—somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Millersburg—low; Klacking—very low; Graycalm—very low
Flooding: None
Hazard of water erosion: Millersburg—moderate; Klacking—moderate; Graycalm—slight
Hazard of soil blowing: Millersburg—moderate; Klacking—severe; Graycalm—severe
Shrink-swell potential: Low
Potential for frost action: Millersburg—moderate; Klacking—low; Graycalm—low

Composition

Millersburg and similar soils: 35 to 50 percent
Klacking and similar soils: 20 to 40 percent
Graycalm and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Horsehead soils, which have gravel in the subsoil and substratum; in landscape positions similar to those of the major soils

Similar inclusions:
- Soils that do not have bands of loamy sand in the subsoil
- Soils that have a darker subsoil

Use and Management

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

Woodland

Major management concerns: Millersburg—plant competition; Klacking and Graycalm—equipment limitation, 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 can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- 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.

- 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.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Millersburg—cutbanks caving, slope, frost action; Klacking and Graycalm—cutbanks caving, 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.
- Properly designing and strengthening footings and foundations in areas of the Millersburg soil can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: Millersburg—slope, restricted permeability; Klacking—slope; Graycalm—slope, rapid permeability
Management considerations:
- Land shaping and installing the distribution lines on the contour help to overcome the slope.
- Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability in areas of the Millersburg soil.
- Backfilling the trenches with porous material helps to compensate for the restricted permeability.
- The poor filtering capacity of the Graycalm soil can result in the pollution of ground water.
- On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 4e
Woodland ordination symbol: Millersburg—3A; Klacking—6S; Graycalm—6S
Michigan soil management group: Millersburg—3a; Klacking—4a; Graycalm—5a

388E—Millersburg-Klacking-Graycalm complex, 18 to 35 percent slopes

Setting

Landform: Moraines
Shape of areas: Irregular
Size of areas: 5 to 130 acres

Typical Profile

Millersburg

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 5 inches—brown sand

Subsoil:
5 to 10 inches—strong brown loamy sand
10 to 18 inches—pale brown sand and reddish brown sandy loam
18 to 26 inches—reddish brown sandy loam and pinkish gray loamy sand
26 to 34 inches—yellowish red sandy loam
34 to 43 inches—light reddish brown, calcareous sandy loam

Substratum:
43 to 80 inches—light yellowish brown, calcareous loamy sand

Klacking

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

Subsoil:
4 to 23 inches—strong brown sand
23 to 30 inches—brownish yellow sand
30 to 80 inches—light brown sand and yellowish red sandy loam and loamy sand

Graycalm

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 16 inches—strong brown sand
16 to 27 inches—reddish yellow sand
27 to 80 inches—yellow sand that has bands of yellowish red loamy sand

Soil Properties and Qualities

Permeability: Millersburg—moderate; Klacking—moderately rapid; Graycalm—rapid

Available water capacity: Millersburg—moderate; Klacking—low; Graycalm—low
Drainage class: Millersburg and Klacking—well drained; Graycalm—somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Millersburg—medium; Klacking—low; Graycalm—low
Flooding: None
Hazard of water erosion: Millersburg—severe; Klacking—severe; Graycalm—moderate
Hazard of soil blowing: Millersburg—moderate; Klacking—severe; Graycalm—severe
Shrink-swell potential: Low
Potential for frost action: Millersburg—moderate; Klacking—low; Graycalm—low

Composition

Millersburg and similar soils: 35 to 50 percent
Klacking and similar soils: 20 to 40 percent
Graycalm and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Horsehead soils, which have gravel in the subsoil and substratum; in landscape positions similar to those of the major soils

Similar inclusions:
- Soils that do not have bands of loamy sand in the subsoil
- Soils that have a darker subsoil

Use and Management

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

Woodland

Major management concerns: Millersburg—erosion hazard, equipment limitation, plant competition; Klacking and Graycalm—erosion hazard, equipment limitation, seedling mortality
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.
- 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 in areas of the Klacking and Graycalm soils.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Special harvest methods may be needed to control undesirable plants in areas of the Millersburg soil.
- 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.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Millersburg—cutbanks caving, slope, frost action; Klacking and Graycalm—cutbanks caving, slope
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Because of the slope, these soils are generally unsuited to building site development.
- In areas of the Millersburg soil, 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: Millersburg and Klacking—slope; Graycalm—slope, rapid permeability
Management considerations:
- Because of the slope, these soils are generally unsuited to use as sites for septic tank absorption fields.
- The poor filtering capacity of the Graycalm soil can result in the pollution of ground water.
- On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter

of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 7e
Woodland ordination symbol: Millersburg—3R; Klacking—6R; Graycalm—6R
Michigan soil management group: Millersburg—3a; Klacking—4a; Graycalm—5a

389B—Horsehead gravelly sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, outwash channels, river and stream terraces, eskers, deltas, and moraines
Shape of areas: Irregular
Size of areas: 5 to 120 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark gray gravelly sand

Subsurface layer:
2 to 7 inches—grayish brown very gravelly sand

Subsoil:
7 to 18 inches—yellowish brown very gravelly sand
18 to 37 inches—dark brown very gravelly loamy sand

Substratum:
37 to 80 inches—very pale brown, calcareous very gravelly sand

Soil Properties and Qualities

Permeability: Rapid or very rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential 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

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

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Graycalm soils, which have less gravel throughout than the Horsehead soil and have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Horsehead soil
- The excessively drained Rubicon soils, which are sandy throughout and have a darker subsoil than that of the Horsehead soil; in landscape positions similar to those of the Horsehead soil
- The excessively drained Grayling soils, which are sandy throughout; in landscape positions similar to those of the Horsehead soil
- The somewhat excessively drained Lindquist soils, which are sandy throughout and have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Horsehead soil

Similar inclusions:
- Soils that have a darker subsoil
- Soils that have less gravel in the surface and subsurface layers

Use and Management

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

Woodland

Major management concerns: Seasonal droughtiness, equipment limitation, 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 can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

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

Septic tank absorption fields

Major management concerns: Rapid permeability

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

Interpretive Groups

Land capability classification: 4s
Woodland ordination symbol: 3S
Michigan soil management group: Ga

389D—Horsehead gravelly sand, 6 to 18 percent slopes

Setting

Landform: Outwash plains, outwash channels, river and stream terraces, eskers, deltas, and moraines
Shape of areas: Irregular
Size of areas: 5 to 375 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark gray gravelly sand

Subsurface layer:
2 to 7 inches—grayish brown very gravelly sand

Subsoil:
7 to 18 inches—yellowish brown very gravelly sand
18 to 37 inches—dark brown very gravelly loamy sand

Substratum:
37 to 80 inches—very pale brown, calcareous very gravelly sand

Soil Properties and Qualities

Permeability: Rapid or very rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Graycalm soils, which have less gravel throughout than the Horsehead soil and have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Horsehead soil
- The excessively drained Rubicon soils, which are sandy throughout and have a darker subsoil than that of the Horsehead soil; in landscape positions similar to those of the Horsehead soil
- The excessively drained Grayling soils, which are sandy throughout; in landscape positions similar to those of the Horsehead soil
- The somewhat excessively drained Lindquist soils, which are sandy throughout and have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Horsehead soil

Similar inclusions:
- Soils that have a darker subsoil
- Soils that have less gravel in the surface and subsurface layers

Use and Management

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

Woodland

Major management concerns: Seasonal droughtiness, equipment limitation, 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 can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Cutbanks caving, 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: Very rapid permeability, slope
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to 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: 6s
Woodland ordination symbol: 3S
Michigan soil management group: Ga

389E—Horsehead gravelly sand, 18 to 35 percent slopes

Setting

Landform: Outwash plains, outwash channels, river and stream terraces, eskers, deltas, and moraines
Shape of areas: Irregular
Size of areas: 5 to 175 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark gray gravelly sand

Subsurface layer:
2 to 7 inches—grayish brown very gravelly sand

Subsoil:
7 to 18 inches—yellowish brown very gravelly sand
18 to 37 inches—dark brown very gravelly loamy sand

Substratum:
37 to 80 inches—very pale brown, calcareous very gravelly sand

Soil Properties and Qualities

Permeability: Rapid or very rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Graycalm soils, which have less gravel throughout than the Horsehead soil and have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Horsehead soil
- The excessively drained Rubicon soils, which are sandy throughout and have a darker subsoil than that of the Horsehead soil; in landscape positions similar to those of the Horsehead soil
- The excessively drained Grayling soils, which are sandy throughout; in landscape positions similar to those of the Horsehead soil
- The somewhat excessively drained Lindquist soils, which are sandy throughout and have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Horsehead soil

Similar inclusions:
- Soils that have a darker subsoil
- Soils that have less gravel in the surface and subsurface layers

Use and Management

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

Woodland

Major management concerns: Seasonal droughtiness, erosion hazard, equipment limitation, seedling mortality
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 seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Planting when the soil is moist can reduce the seedling mortality rate.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Cutbanks caving, 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 poorly suited to building site development without extensive land shaping.

Septic tank absorption fields

Major management concerns: Very rapid permeability, slope
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- Because of the slope, this soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 7s
Woodland ordination symbol: 3R
Michigan soil management group: Ga

390B—Horsehead-Graycalm sands, 0 to 6 percent slopes

Setting

Landform: Outwash plains, moraines, eskers, and stream terraces
Shape of areas: Irregular
Size of areas: 5 to 1,600 acres

Typical Profile

Horsehead

Surface layer:
0 to 2 inches—very dark gray sand

Subsoil:
2 to 10 inches—dark yellowish brown gravelly sand
10 to 27 inches—yellowish brown gravelly sand
27 to 36 inches—dark yellowish brown very gravelly loamy sand

Substratum:
36 to 80 inches—stratified, light yellowish brown, calcareous very gravelly sand and sand

Graycalm

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 16 inches—strong brown sand
16 to 27 inches—reddish yellow sand
27 to 80 inches—yellow sand that has bands of yellowish red loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential 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

Horsehead and similar soils: 40 to 50 percent
Graycalm and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The excessively drained Grayling soils, which do not have a gravelly or very gravelly subsoil or substratum or bands of loamy sand in the subsoil; in landscape positions similar to those of the major soils
- The well drained Klacking soils, which do not have a gravelly or very gravelly subsoil or substratum and have more clay in the subsoil than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
- Soils that have a surface layer of loamy sand
- Soils that have more gravel in the surface and subsurface layers and in the subsoil
- Soils that have less clay in the subsoil
- Soils that have a darker subsoil

Use and Management

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

Woodland

Major management concerns: Seasonal droughtiness, equipment limitation, 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 can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

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

Septic tank absorption fields

Major management concerns: Rapid permeability
Management considerations:
• The poor filtering capacity of these soils can result in the pollution of ground water.
• On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to minimize the risk of ground-water pollution.

Interpretive Groups

Land capability classification: 4s
Woodland ordination symbol: Horsehead—3S; Graycalm—6S
Michigan soil management group: Horsehead—Ga; Graycalm—5a

390D—Horsehead-Graycalm sands, 6 to 18 percent slopes

Setting

Landform: Outwash plains, moraines, eskers, and stream terraces
Shape of areas: Irregular
Size of areas: 5 to 305 acres

Typical Profile

Horsehead

Surface layer:
0 to 2 inches—very dark gray sand

Subsoil:
2 to 10 inches—dark yellowish brown gravelly sand
10 to 27 inches—yellowish brown gravelly sand
27 to 36 inches—dark yellowish brown very gravelly loamy sand

Substratum:
36 to 80 inches—stratified, light yellowish brown, calcareous very gravelly sand and sand

Graycalm

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 16 inches—strong brown sand
16 to 27 inches—reddish yellow sand
27 to 80 inches—yellow sand that has bands of yellowish red loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Horsehead—moderate; Graycalm—slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Horsehead and similar soils: 50 to 75 percent
Graycalm and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The excessively drained Grayling soils, which do not have a gravelly or very gravelly subsoil or substratum or bands of loamy sand in the subsoil; in landscape positions similar to those of the major soils
• The well drained Klacking soils, which do not have a gravelly or very gravelly subsoil or substratum and

have more clay in the subsoil than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
- Soils that have a surface layer of loamy sand
- Soils that have more gravel in the surface and subsurface layers and in the subsoil
- Soils that have less clay in the subsoil
- Soils that have a darker subsoil

Use and Management

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

Woodland

Major management concerns: Seasonal droughtiness, equipment limitation, 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 can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Cutbanks caving, 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: Rapid permeability, slope
Management considerations:
- The poor filtering capacity of these soils can result in the pollution of ground water.
- On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to 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: 6s
Woodland ordination symbol: Horsehead—3S; Graycalm—6S
Michigan soil management group: Horsehead—Ga; Graycalm—5a

390E—Horsehead-Graycalm sands, 18 to 35 percent slopes

Setting

Landform: Outwash plains, moraines, eskers, and stream terraces
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Horsehead

Surface layer:
0 to 2 inches—very dark gray sand

Subsoil:
2 to 10 inches—dark yellowish brown gravelly sand
10 to 27 inches—yellowish brown gravelly sand
27 to 36 inches—dark yellowish brown very gravelly loamy sand

Substratum:
36 to 80 inches—stratified, light yellowish brown, calcareous very gravelly sand and sand

Graycalm

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 16 inches—strong brown sand
16 to 27 inches—reddish yellow sand
27 to 80 inches—yellow sand that has bands of yellowish red loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Horsehead and similar soils: 50 to 75 percent
Graycalm and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The excessively drained Grayling soils, which do not have a gravelly or very gravelly subsoil or substratum or bands of loamy sand in the subsoil; in landscape positions similar to those of the major soils
• The well drained Klacking soils, which do not have a gravelly or very gravelly subsoil or substratum and have more clay in the subsoil than the major soils; in landscape positions similar to those of the major soils
• The well drained Millersburg soils, which have more clay in the subsoil and substratum than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that have a surface layer of loamy sand
• Soils that have more gravel in the surface and subsurface layers and in the subsoil
• Soils that have less clay in the subsoil
• Soils that have a darker subsoil

Use and Management

Land use: Dominant use—woodland

Woodland

Major management concerns: Seasonal droughtiness, erosion hazard, equipment limitation, seedling mortality
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.
• The hazard 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 when the soil is moist can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Interpretive Groups

Land capability classification: 7s
Woodland ordination symbol: Horsehead—3R; Graycalm—6R
Michigan soil management group: Horsehead—Ga; Graycalm—5a

390F—Horsehead-Graycalm sands, 35 to 70 percent slopes

Setting

Landform: Outwash plains, moraines, eskers, and stream terraces
Shape of areas: Irregular
Size of areas: 5 to 800 acres

Typical Profile

Horsehead

Surface layer:
0 to 2 inches—very dark gray sand

Subsoil:
2 to 10 inches—dark yellowish brown gravelly sand
10 to 27 inches—yellowish brown gravelly sand
27 to 36 inches—dark yellowish brown very gravelly loamy sand

Substratum:
36 to 80 inches—stratified, light yellowish brown, calcareous very gravelly sand and sand

Graycalm

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 16 inches—strong brown sand
16 to 27 inches—reddish yellow sand
27 to 80 inches—yellow sand that has bands of yellowish red loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Horsehead and similar soils: 50 to 75 percent
Graycalm and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:

- The excessively drained Grayling soils, which do not have a gravelly or very gravelly subsoil or substratum or bands of loamy sand in the subsoil; in landscape positions similar to those of the major soils
- The well drained Klacking soils, which do not have a gravelly or very gravelly subsoil or substratum and have more clay in the subsoil than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:

- Soils that have a surface layer of loamy sand
- Soils that have more gravel in the surface and subsurface layers and in the subsoil
- Soils that have less clay in the subsoil
- Soils that have a darker subsoil

Use and Management

Land use: Dominant use—woodland

Woodland

Major management concerns: Seasonal droughtiness, erosion hazard, equipment limitation, seedling mortality

Management considerations:

- Ordinary crawler tractors and rubber-tired skidders cannot be operated safely on these slopes. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
- Cable yarding systems are generally safer than other logging methods and result in less surface disturbance.
- 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.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Interpretive Groups

Land capability classification: 7s
Woodland ordination symbol: Horsehead—3R; Graycalm—6R
Michigan soil management group: Horsehead—Ga; Graycalm—5a

391B—Horsehead sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, moraines, eskers, and stream terraces
Shape of areas: Irregular
Size of areas: 3 to 550 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsoil:
2 to 10 inches—dark yellowish brown gravelly sand
10 to 27 inches—yellowish brown gravelly sand
27 to 36 inches—dark yellowish brown very gravelly loamy sand

Substratum:
36 to 80 inches—stratified, light yellowish brown, calcareous very gravelly sand and sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential 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

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

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Graycalm soils, which have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Horsehead soil
• The excessively drained Grayling soils, which are sandy throughout; in landscape positions similar to those of the Horsehead soil
• The well drained Klacking soils, which have less gravel in the subsoil and substratum than the Horsehead soil and have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Horsehead soil

Similar inclusions:
• Soils in which the very gravelly substratum is below a depth of 40 inches
• Soils that have less clay in the subsoil
• Soils that have a darker 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: Seasonal droughtiness, equipment limitation, 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 can reduce the seedling mortality rate.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

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

Septic tank absorption fields

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

Interpretive Groups

Land capability classification: 6s
Woodland ordination symbol: 3S
Michigan soil management group: Ga

391D—Horsehead sand, 6 to 18 percent slopes

Setting

Landform: Outwash plains, moraines, eskers, and stream terraces
Shape of areas: Irregular
Size of areas: 3 to 190 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsoil:
2 to 10 inches—dark yellowish brown gravelly sand
10 to 27 inches—yellowish brown gravelly sand
27 to 36 inches—dark yellowish brown very gravelly loamy sand

Substratum:
36 to 80 inches—stratified, light yellowish brown, calcareous very gravelly sand and sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Graycalm soils, which have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Horsehead soil
- The excessively drained Grayling soils, which are sandy throughout; in landscape positions similar to those of the Horsehead soil
- The well drained Klacking soils, which have less gravel in the subsoil and substratum than the Horsehead soil and have a banded subsoil of sand and loamy sand; in landscape positions similar to those of the Horsehead soil

Similar inclusions:
- Soils in which the very gravelly substratum is below a depth of 40 inches
- Soils that have less clay in the subsoil
- Soils that have a darker 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: Seasonal droughtiness, equipment limitation, 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 can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Cutbanks caving, 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: Very rapid permeability, slope
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- On large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system and low, uniform application rates help to 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: 6s
Woodland ordination symbol: 3S
Michigan soil management group: Ga

392—Caffey mucky sand

Setting

Landform: Lake plains, outwash plains, and deltas
Shape of areas: Irregular
Size of areas: 5 to 120 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 and moderately slow in the loamy lower part
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 October through May
Potential surface runoff: Low
Flooding: None

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

Composition

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

Inclusions

Contrasting inclusions:
- The poorly drained Deford soils, which have a sandy substratum; in landscape positions similar to those of the Caffey soil
- The poorly drained Wakeley soils, which have a clayey substratum; in landscape positions similar to those of the Caffey soil
- The somewhat poorly drained Richter soils, which have more clay in the subsoil than the Caffey soil; in the slightly higher landscape positions
- The somewhat poorly drained Otisco soils, which have less clay in the subsoil and substratum than the Caffey soil; in the slightly higher landscape positions

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.
- Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
- Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants.

Woodland

Major management concerns: Seasonal wetness, equipment limitation, 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 in areas of 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 desirable seed trees along the edge of the openings can promote natural regeneration.

Interpretive Groups

Land capability classification: 5w
Woodland ordination symbol: 2W
Michigan soil management group: 4/2c

393B—Morganlake loamy sand, 0 to 6 percent slopes

Setting

Landform: Moraines, till plains, outwash plains, and lake plains
Shape of areas: Irregular
Size of areas: 5 to 260 acres

Typical Profile

Organic mat:
0 to 4 inches—black, 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

Soil Properties and Qualities

Permeability: Rapid in the sandy material and moderately slow in the underlying loamy material
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched, at a depth of 1.5 to 2.5 feet at some time from October through December and from March through May
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Ossineke soils in landscape positions similar to those of the Morganlake soil
• The well drained Millersburg soils, which have less clay in the subsoil and substratum than the Morganlake soil; in landscape positions similar to those of the Morganlake soil
• The moderately well drained Kellogg soils, which have more clay in the subsoil and substratum than the Morganlake soil; in landscape positions similar to those of the Morganlake soil

Similar inclusions:
• Well drained soils
• Soils that have a surface layer and subsurface layer of sand

Use and Management

Land use: Dominant uses—woodland (fig. 11); other uses—cropland, pasture, building site development

Woodland

Major management concerns: 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.

Cropland

Major management concerns: Low content of organic matter, seasonal droughtiness, soil blowing
Management considerations:
• Including green manure crops in the cropping sequence, using a system of conservation tillage, and managing crop residue 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.

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.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness, shrink-swell
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 installing 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: Restricted permeability, seasonal wetness

Figure 11.—A mixed stand of sugar maple and beech in an area of Morganlake loamy sand, 0 to 6 percent slopes.

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: 3s
Woodland ordination symbol: 6A
Michigan soil management group: 4/2a

393C—Morganlake loamy sand, 6 to 12 percent slopes

Setting

Landform: Moraines, till plains, outwash plains, and lake plains
Shape of areas: Irregular
Size of areas: 5 to 95 acres

Typical Profile

Organic mat:
0 to 4 inches—black, 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

Soil Properties and Qualities

Permeability: Rapid in the sandy material and moderately slow in the underlying loamy material
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched, at a depth of 1.5 to 2.5 feet at some time from October through December and from March through May
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Ossineke soils in landscape positions similar to those of the Morganlake soil
• The well drained Millersburg soils, which have less clay in the subsoil and substratum than the Morganlake soil; in landscape positions similar to those of the Morganlake soil
• The moderately well drained Kellogg soils, which have more clay in the subsoil and substratum than the Morganlake soil; in landscape positions similar to those of the Morganlake soil

Similar inclusions:
• Well drained soils
• Soils that have a surface layer and subsurface layer of sand

Use and Management

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

Woodland

Major management concerns: 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.

Cropland

Major management concerns: Low content of organic matter, seasonal droughtiness, soil blowing, water erosion
Management considerations:
• Including green manure crops in the cropping sequence, using a system of conservation tillage, and managing crop residue increase the content of organic matter.
• 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.
• 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, windbreaks, and cover crops help to control soil blowing.
• Conservation tillage, grassed waterways, cover crops, crop residue management, and crop rotations that include close-growing crops help to prevent excessive soil loss.

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.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness, shrink-swell, 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 installing 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: Restricted 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: 3e
Woodland ordination symbol: 6A
Michigan soil management group: 4/2a

394B—Ocqueoc sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains and lake plains
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 7 inches—brown sand

Subsoil:
7 to 16 inches—dark brown sand
16 to 23 inches—yellowish brown sand
23 to 28 inches—brownish yellow sand

Substratum:
28 to 61 inches—stratified pale brown, light yellowish brown, and strong brown very fine sand and silt
61 to 80 inches—stratified, calcareous, light yellowish brown, light gray, and very pale brown very fine sand, sand, and fine sand

Soil Properties and Qualities

Permeability: Rapid in the upper sandy material and moderately slow in the loamy substratum
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

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

Inclusions

Contrasting inclusions:
• The excessively drained Rubicon soils, which are sandy throughout; in landscape positions similar to those of the Ocqueoc soil
• The somewhat excessively drained Lindquist soils, which have bands of loamy sand in the subsoil as much as 6 inches in cumulative thickness; in landscape positions similar to those of the Ocqueoc soil
• The somewhat excessively drained Melita and moderately well drained Morganlake soils, which have more clay in the subsoil and substratum than the Ocqueoc soil; in landscape positions similar to those of the Ocqueoc soil
• The moderately well drained Chinwhisker soils, which have bands of loamy sand in the subsoil as much as 6 inches in cumulative thickness; in the slightly lower landscape positions
• The moderately well drained Negwegon soils, which are clayey throughout; in landscape positions similar to those of the Ocqueoc soil
• The somewhat poorly drained Iosco soils in the lower landscape positions
• The poorly drained Caffey soils in small, shallow closed depressions

Similar inclusions:
• Soils that have more clay in the subsoil
• Soils that have a surface layer and subsurface layer of loamy sand

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality, 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.
- Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- 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.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Cropland

Major management concerns: Low content of organic matter, seasonal droughtiness, soil blowing
Management considerations:
- Including green manure crops in the cropping sequence, using a system of conservation tillage, and managing crop residue increase the content of organic matter.
- The rate of water infiltration can be increased by growing cover crops, leaving crop residue on the surface, and regularly adding other organic material.
- 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, 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: Overgrazing, seasonal droughtiness
Management considerations:
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
- Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

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

Septic tank absorption fields

Major management concerns: Restricted permeability
Management considerations:
- Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.

Interpretive Groups

Land capability classification: 3s
Woodland ordination symbol: 3S
Michigan soil management group: 4/2a

399D—Menominee-Bamfield, sandy substratum-Blue Lake complex, 12 to 18 percent slopes

Setting

Landform: Disintegration moraines
Shape of areas: Irregular
Size of areas: 5 to 320 acres

Typical Profile

Menominee

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

Subsurface layer:
4 to 6 inches—pinkish gray sand

Subsoil:
6 to 13 inches—dark brown loamy sand
13 to 24 inches—yellowish brown sand
24 to 40 inches—reddish brown sandy clay loam

Substratum:
40 to 80 inches—light reddish brown, calcareous sandy clay loam

Bamfield

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

Subsoil:
9 to 10 inches—strong brown sandy loam
10 to 14 inches—pinkish gray loamy sand and yellowish red clay loam

14 to 23 inches—reddish brown clay loam
23 to 29 inches—reddish brown loam

Substratum:
29 to 61 inches—light reddish brown, calcareous loam
61 to 80 inches—pale brown, stratified sand and gravelly sand

Blue Lake

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—dark 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: Menominee—rapid in the sandy material and slow or moderate in the underlying loamy material; Bamfield—very slow; Blue Lake—moderately rapid
Available water capacity: Menominee—moderate; Bamfield—high; Blue Lake—low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Menominee—low; Bamfield—very high; Blue Lake—low
Flooding: None
Hazard of water erosion: Menominee—severe; Bamfield—severe; Blue Lake—moderate
Hazard of soil blowing: Menominee—moderate; Bamfield—moderate; Blue Lake—severe
Shrink-swell potential: Menominee—moderate in the subsoil and substratum; Bamfield—low in the upper part and moderate in the lower part; Blue Lake—low
Potential for frost action: Menominee—low; Bamfield—moderate; Blue Lake—low

Composition

Menominee and similar soils: 30 to 45 percent
Bamfield and similar soils: 25 to 35 percent
Blue Lake and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Mancelona and Horsehead 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 bands of loamy sand is less than 6 inches
• Soils that have mottles below a depth of 40 inches

Use and Management

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

Woodland

Major management concerns: Menominee—plant competition; Bamfield—equipment limitation, plant competition; Blue Lake—equipment limitation, seedling mortality, plant competition
Management considerations:
• Because of low strength in areas of the Bamfield soil, suitable surfacing material is needed on year-round logging roads and landings.
• Because loose sand can interfere with the traction of wheeled equipment in areas of the Blue Lake soil, logging roads should be stabilized.
• In areas of the Blue Lake soil, planting when the soil is moist can reduce the seedling mortality rate.
• In areas of the Blue Lake soil, planting seedlings that can withstand droughty conditions can reduce 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 desirable seed trees along the edge of the openings can promote natural regeneration.

Pasture

Major management concerns: Erosion hazard, compaction, seasonal droughtiness

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

Building sites

Major management concerns: Menominee—cutbanks caving, shrink-swell, slope; Bamfield—frost action, shrink-swell, slope; Blue Lake—cutbanks caving, slope
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced in areas of the Blue Lake and Menominee soils.
• 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 and by frost action.

Septic tank absorption fields

Major management concerns: Menominee and Bamfield—slope, restricted permeability; Blue Lake—slope
Management considerations:
• Land shaping and installing the distribution lines on the contour help to overcome the slope.
• 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: 4e
Woodland ordination symbol: Menominee—6A; Bamfield—3L; Blue Lake—3S
Michigan soil management group: Menominee—4/2a; Bamfield—3/2a; Blue Lake—4a

400F—Menominee-Bamfield, sandy substratum-Blue Lake complex, 18 to 70 percent slopes, dissected

Setting

Landform: Disintegration moraines
Distinctive landscape feature: Dissected landscape
Shape of areas: Irregular
Size of areas: 4 to 85 acres

Typical Profile

Menominee

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

Subsurface layer:
4 to 6 inches—pinkish gray sand

Subsoil:
6 to 13 inches—dark brown loamy sand
13 to 24 inches—yellowish brown sand
24 to 40 inches—reddish brown sandy clay loam

Substratum:
40 to 80 inches—light reddish brown, calcareous sandy clay loam

Bamfield

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

Subsoil:
9 to 10 inches—strong brown sandy loam
10 to 14 inches—pinkish gray loamy sand and yellowish red clay loam
14 to 23 inches—reddish brown clay loam
23 to 29 inches—reddish brown loam

Substratum:
29 to 61 inches—light reddish brown, calcareous loam
61 to 80 inches—pale brown, stratified sand and gravelly sand

Blue Lake

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—dark 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: Menominee—rapid in the sandy material and slow or moderate in the underlying loamy material; Bamfield—very slow; Blue Lake—moderately rapid
Available water capacity: Menominee—moderate; Bamfield—high; Blue Lake—low
Drainage class: Well drained

Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Menominee—medium; Bamfield—very high; Blue Lake—medium
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Menominee—moderate; Bamfield—moderate; Blue Lake—severe
Shrink-swell potential: Menominee—moderate in the subsoil and substratum; Bamfield—low in the upper part and moderate in the lower part; Blue Lake—low
Potential for frost action: Menominee—low; Bamfield—moderate; Blue Lake—low

Composition

Menominee and similar soils: 30 to 45 percent
Bamfield and similar soils: 25 to 35 percent
Blue Lake and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Mancelona and Horsehead 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 bands of loamy sand is less than 6 inches
- Soils that have mottles below a depth of 40 inches

Use and Management

Land use: Dominant use—woodland

Woodland

Major management concerns: Menominee and Bamfield—erosion hazard, equipment limitation, plant competition; Blue Lake—erosion hazard, equipment limitation, plant competition, seedling mortality
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.
- Because loose sand can interfere with the traction of wheeled equipment in areas of the Blue Lake soil, logging roads should be stabilized.
- 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 established in the less sloping areas between ravines.
- 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.
- In areas of the Blue Lake soil, planting when the soil is moist can reduce the seedling mortality rate.
- In areas of the Blue Lake soil, planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Special harvest methods may be needed to control undesirable plants.
- 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 desirable seed trees along the edge of the openings can promote natural regeneration.

Interpretive Groups

Land capability classification: 7e
Woodland ordination symbol: Menominee—6R; Bamfield—3R; Blue Lake—3R
Michigan soil management group: Menominee—4/2a; Bamfield—3/2a; Blue Lake—4a

420A—Otisco mucky sand, 0 to 3 percent slopes

Setting

Landform: Outwash plains, lake plains, and moraines
Shape of areas: Linear and irregular
Size of areas: 5 to 100 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 that has 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, at a depth of 0.5 foot to 1.5 feet at some time from November through May
Potential 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

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

Inclusions

Contrasting inclusions:
- The poorly drained and 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
- Areas 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 limitation, 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 desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Seasonal wetness, potential frost action, cutbanks caving
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 installing 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: Rapid 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 of shallow trenches with shrubbery planted around the perimeter

of the system and low, uniform application rates help to minimize 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 helps to lower the water table.

Interpretive Groups

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

421A—Richter-Caffey complex, 0 to 3 percent slopes

Setting

Landform: Lake plains
Position on the landform: Richter—low knolls; Caffey—depressions
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Richter

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

Subsurface layer:
7 to 11 inches—pinkish gray, mottled loamy fine sand

Subsoil:
11 to 19 inches—dark brown and strong brown, mottled loamy fine sand
19 to 29 inches—pale brown, mottled loamy fine sand and brown, mottled fine sandy loam

Substratum:
29 to 80 inches—reddish brown, mottled, stratified very fine sand to silt loam

Caffey

Surface layer:
0 to 9 inches—black mucky sand

Substratum:
9 to 14 inches—dark grayish brown sand
14 to 21 inches—light yellowish brown, mottled sand
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: Richter—moderate; Caffey—rapid or moderately rapid in the sandy upper part and moderately slow in the loamy lower part
Available water capacity: Richter—moderate; Caffey—high
Drainage class: Richter—somewhat poorly drained; Caffey—poorly drained
Seasonal high water table: Richter—apparent, at a depth of 0.5 foot to 1.5 feet at some time from November through May; Caffey—apparent, 1 foot above to 1 foot below the surface at some time from October through May
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Richter—high; Caffey—moderate

Composition

Richter and similar soils: 40 to 55 percent
Caffey and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Algonquin soils, which are silty and clayey throughout; in landscape positions similar to those of the Richter soil
• The poorly drained Wakeley soils, which have a clayey substratum; in landscape positions similar to those of the Caffey soil

Similar inclusions:
• Soils that are sandier throughout
• Soils that have less clay in the subsoil
• Soils that have a thick, dark mineral surface layer
• Soils that have a loamy, stratified subsoil

Use and Management

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

Woodland

Major management concerns: Seasonal wetness, equipment limitation, seedling mortality, windthrow hazard, 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.

• Skidders should not be used during wet periods, when ruts form easily.
• In areas of the Caffey soil, year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• 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.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of the Caffey 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 desirable seed trees along the edge of the openings can promote natural regeneration.

Cropland

Major management concerns: Richter—seasonal wetness, soil blowing, tilth of the surface layer; Caffey—seasonal wetness, soil blowing, ponding
Management considerations:
• Most adapted crops can be grown if an adequate drainage system is installed.
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• 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, crop residue management, windbreaks, and cover crops help to control soil blowing.
• 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.

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.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants.

Interpretive Groups

Land capability classification: 3w
Woodland ordination symbol: Richter—3W; Caffey—2W
Michigan soil management group: Richter—3b-s; Caffey—4/2c

422B—Morganlake-Iosco-Deford complex, 0 to 6 percent slopes

Setting

Landform: Moraines, outwash plains
Position on the landform: Morganlake—low ridges and low knolls; Iosco—shallow depressions, footslopes of low ridges; Deford—depressions and swales
Shape of areas: Irregular
Size of areas: 30 to 190 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

Iosco

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 12 inches—pinkish gray sand

Subsoil:
12 to 18 inches—dark reddish brown and strong brown, mottled sand
18 to 20 inches—pale brown loamy sand
20 to 30 inches—reddish brown, mottled sandy clay loam and yellowish brown, mottled loamy sand
30 to 42 inches—reddish brown, mottled sandy clay loam

Substratum:
42 to 80 inches—brown, calcareous, mottled loam

Deford

Surface layer:
0 to 6 inches—black muck

Substratum:
6 to 9 inches—light brownish gray sand
9 to 38 inches—brown sand
38 to 45 inches—pale brown sand
45 to 80 inches—brown sand

Soil Properties and Qualities

Permeability: Morganlake—rapid in the sandy material and moderately slow in the underlying loamy material; Iosco—rapid in the upper sandy material and moderate or moderately slow in the underlying loamy material; Deford—rapid
Available water capacity: Morganlake—high; Iosco—high; Deford—low
Drainage class: Morganlake—moderately well drained; Iosco—somewhat poorly drained; Deford—poorly drained
Seasonal high water table: Morganlake—perched, at a depth of 1.5 to 2.5 feet at some time from October through December and from March through May; Iosco—apparent, at a depth of 0.5 foot to 1.5 feet at some time from November through June; Deford—apparent, 1 foot above to 1 foot below the surface at some time from October through May
Potential surface runoff: Morganlake—very low; Iosco—very low; Deford—negligible
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Morganlake—moderate; Iosco—severe; Deford—moderate
Shrink-swell potential: Morganlake—moderate; Iosco—moderate; Deford—low
Potential for frost action: Morganlake—low; Iosco—moderate; Deford—moderate

Composition

Morganlake and similar soils: 40 to 45 percent
Iosco and similar soils: 20 to 35 percent
Deford and similar soils: 15 to 20 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Kellogg soils, which have more clay in the subsoil and substratum than the Morganlake soil; in landscape positions similar to those of the Morganlake soil
- The moderately well drained Chinwhisker soils, which are sandier throughout than the Morganlake soil; in landscape positions similar to those of the Morganlake soil
- The moderately well drained Ossineke soils, which have more clay in the surface layer and subsoil than the Morganlake soil; in landscape positions similar to those of the Morganlake soil
- The somewhat poorly drained Otisco and Au Gres soils, which are sandier throughout than the Iosco soil; in landscape positions similar to those of the Iosco soil
- The poorly drained Wakeley soils, which have more clay in the substratum than the Deford soil; in landscape positions similar to those of the Deford soil
- The very poorly drained Tawas soils, which have a thicker organic surface layer than the Deford soil; in landscape positions similar to those of the Deford soil

Similar inclusions:
- Soils that have less clay in the substratum
- Soils that have loamy material below a depth of 40 inches
- Soils that have gravelly strata in the substratum

Use and Management

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

Woodland

Major management concerns: Morganlake—plant competition; Iosco and Deford—plant competition, seasonal wetness, equipment limitation, seedling mortality, windthrow hazard
Management considerations:
- Special harvest methods may be needed to control undesirable plants.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.
- Carefully managed reforestation helps to control undesirable understory 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.
• 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.
• In areas of the Iosco and Deford soils, 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.
• Special site preparation, such as bedding before planting, can reduce the seedling mortality rate.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of the Deford 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.

Pasture

Major management concerns: Morganlake—overgrazing, seasonal droughtiness; Iosco and Deford—overgrazing, seasonal wetness
Management considerations:
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants on all soils.
• In areas of the Morganlake soil, proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• In areas of the Iosco and Deford soils, proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.

Building sites

Major management concerns: Morganlake and Iosco—cutbanks caving, seasonal wetness, shrink-swell, frost action; Deford—cutbanks caving, ponding
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 installing 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 and by frost action.
• Because of ponding, the Deford soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Morganlake and Iosco—seasonal wetness, restricted permeability; Deford—ponding
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system helps to lower 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: 3s
Woodland ordination symbol: Morganlake—6A; Iosco—5W; Deford—4W
Michigan soil management group: Morganlake—4/2a; Iosco—4/2b; Deford—4c

423B—Richter-Algonquin complex, 0 to 6 percent slopes

Setting

Landform: Lake plains and glacial drainageways
Shape of areas: Irregular
Size of areas: 5 to 215 acres

Typical Profile

Richter

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

Subsurface layer:
7 to 11 inches—pinkish gray, mottled loamy fine sand

Subsoil:
11 to 19 inches—dark brown and strong brown, mottled loamy fine sand
19 to 29 inches—pale brown, mottled loamy fine sand and brown, mottled fine sandy loam

Substratum:
29 to 80 inches—reddish brown, mottled, stratified very fine sand to silt loam

Algonquin

Surface layer:
0 to 5 inches—black silt loam

Subsurface layer:
5 to 10 inches—light brownish gray fine sandy loam

Subsoil:
10 to 17 inches—dark brown, mottled silty clay
17 to 24 inches—pinkish gray, mottled clay
24 to 80 inches—light reddish brown, mottled clay

Soil Properties and Qualities

Permeability: Richter—moderate; Algonquin—very slow
Available water capacity: Richter—moderate; Algonquin—high
Drainage class: Somewhat poorly drained
Seasonal high water table: Richter—apparent, at a depth of 0.5 foot to 1.5 feet at some time from November through May; Algonquin—perched, at a depth of 0.5 foot to 1.5 feet at some time from October through May
Potential surface runoff: Richter—low; Algonquin—very high
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Richter—moderate; Algonquin—slight
Shrink-swell potential: Richter—low; Algonquin—high
Potential for frost action: High

Composition

Richter and similar soils: 50 to 60 percent
Algonquin and similar soils: 30 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Allendale soils, which have sand and loamy sand in the upper 20 to 40 inches; in landscape positions similar to those of the major soils
• The poorly drained Springport soils in depressions and drainageways
• The moderately well drained Kellogg soils, which have sand and loamy sand in the upper 20 to 40 inches; on small ridges and low knolls
• The poorly drained Caffey soils, which are sandy in the upper 20 to 40 inches; in depressions and drainageways
• The poorly drained Deford soils, which are sandy throughout the solum; in depressions and drainageways
• The well drained Ocqueoc soils, which are sandy in the upper 20 to 40 inches; on small ridges and low knolls
• The moderately well drained Negwegon soils on small ridges and low knolls

Similar inclusions:
• Soils that have slightly more sand in the solum than the Richter soil

Use and Management

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

Cropland

Major management concerns: Seasonal wetness, soil blowing, tilth of the surface layer, soil compaction
Management considerations:
• Most adapted crops can be grown if an adequate drainage system is installed.
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• 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.
• Lift pumps are needed in areas where adequate drainage outlets are not available.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• 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.
• Deep tillage when the soil is dry may improve water infiltration and permeability.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain 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.

• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.

• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants.

Woodland

Major management concerns: Seasonal wetness, equipment limitation, 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.

• 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.

• Carefully managed reforestation helps to control undesirable understory plants.

• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

• 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.

Building sites

Major management concerns: Shrink-swell, seasonal wetness, frost action, cutbanks caving

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 installing 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 in areas of the Richter soil.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted permeability

Management considerations:

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

• A subsurface drainage system helps to lower the water table.

• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability in areas of the Algonquin soil.

• Backfilling the trenches with porous material helps to compensate for the restricted permeability of the Algonquin soil.

Interpretive Groups

Land capability classification: 2e
Woodland ordination symbol: Richter—3W; Algonquin—6W
Michigan soil management group: Richter—3b-s; Algonquin—1.5b

424B—Morganlake-Ossineke, sandy substratum-Blue Lake complex, 0 to 6 percent slopes

Setting

Landform: Moraines and disintegration moraines
Shape of areas: Irregular
Size of areas: 5 to 765 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

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—dark 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 and moderately slow in the underlying loamy material; Ossineke—slow; Blue Lake—moderately rapid
Available water capacity: Morganlake—high; Ossineke—high; Blue Lake—low
Drainage class: Morganlake—moderately well drained; Ossineke—moderately well drained; Blue Lake—well drained
Seasonal high water table: Morganlake—perched, at a depth of 1.5 to 2.5 feet at some time from October through December and from March through May; Ossineke—perched, at a depth of 1.5 to 3.5 feet at some time from October through December and from March through May; Blue Lake—at a depth of more than 6 feet
Potential surface runoff: Morganlake—very low; Ossineke—high; Blue Lake—very low
Flooding: None
Hazard of water erosion: Morganlake—slight; Ossineke—moderate; Blue Lake—slight
Hazard of soil blowing: Morganlake—moderate; Ossineke—slight; Blue Lake—severe
Shrink-swell potential: Morganlake—moderate; Ossineke—low in the upper part and moderate in the lower part; Blue Lake—low
Potential for frost action: Morganlake—low; Ossineke—moderate; Blue Lake—low

Composition

Morganlake and similar soils: 30 to 45 percent
Ossineke and similar soils: 25 to 35 percent
Blue Lake and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:

- The somewhat excessively drained Mancelona and Horsehead 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 bands of loamy sand is less than 6 inches

Use and Management

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

Woodland

Major management concerns: Morganlake—plant competition; Ossineke—equipment limitation, windthrow hazard, plant competition; Blue Lake—equipment limitation, seedling mortality, plant competition
Management considerations:

- Because of low strength in areas of 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 can interfere with the traction of wheeled equipment in areas of the Blue Lake soil, logging roads should be stabilized.

• In areas of the Blue Lake soil, planting when the soil is moist can reduce the seedling mortality rate.
• In areas of the Blue Lake soil, planting seedlings that can withstand droughty conditions can reduce 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 desirable seed trees along the edge of the openings can promote natural regeneration.

Cropland

Major management concerns: Water erosion, soil compaction, low content of organic matter, seasonal droughtiness, soil blowing
Management considerations:
• Conservation tillage, grassed waterways, cover crops, crop residue management, and crop rotations that include close-growing crops 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 maintain tilth.
• Including green manure crops in the cropping sequence, using a system of conservation tillage, and managing crop residue 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.

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.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

Major management concerns: Morganlake—cutbanks caving, seasonal wetness; Ossineke—seasonal wetness, shrink-swell; Blue Lake—cutbanks caving
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced in areas of the Morganlake and Blue Lake soils.
• 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 concerns: Morganlake and Ossineke—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: 3s
Woodland ordination symbol: Morganlake—6A; Ossineke—4L; Blue Lake—3S
Michigan soil management group: Morganlake—4/2a; Ossineke—3a; Blue Lake—4a

424C—Morganlake-Ossineke, sandy substratum-Blue Lake complex, 6 to 12 percent slopes

Setting

Landform: Moraines and 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

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—dark 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 and moderately slow in the underlying loamy material; Ossineke—slow; Blue Lake—moderately rapid
Available water capacity: Morganlake—high; Ossineke—high; Blue Lake—low
Drainage class: Morganlake—moderately well drained; Ossineke—moderately well drained; Blue Lake—well drained
Seasonal high water table: Morganlake—perched, at a depth of 1.5 to 2.5 feet at some time from October through December and from March through May; Ossineke—perched, at a depth of 1.5 to 3.5 feet at some time from October through December and from March through May; Blue Lake—at a depth of more than 6 feet
Potential surface runoff: Morganlake—low; Ossineke—very high; Blue Lake—low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Morganlake—moderate; Ossineke—slight; Blue Lake—severe
Shrink-swell potential: Morganlake—moderate; Ossineke—low in the upper part and moderate in the lower part; Blue Lake—low
Potential for frost action: Morganlake—low; Ossineke—moderate; Blue Lake—low

Composition

Morganlake and similar soils: 30 to 45 percent
Ossineke and similar soils: 25 to 35 percent
Blue Lake and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Mancelona and Horsehead 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 bands of loamy sand is less than 6 inches

Use and Management

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

Woodland

Major management concerns: Morganlake—plant competition; Ossineke—equipment limitation, windthrow hazard, plant competition; Blue Lake—equipment limitation, seedling mortality, plant competition

Management considerations:
• Because of low strength in areas of 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 can interfere with the traction of wheeled equipment, logging roads should be stabilized in areas of the Blue Lake soil.
• In areas of the Blue Lake soil, planting when the soil is moist can reduce the seedling mortality rate.
• In areas of the Blue Lake soil, planting seedlings that can withstand droughty conditions can reduce 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 desirable seed trees along the edge of the openings can promote natural regeneration.

Cropland

Major management concerns: Water erosion, soil compaction, low content of organic matter, seasonal droughtiness, soil blowing
Management considerations:
• Conservation tillage, grassed waterways, cover crops, crop residue management, and crop rotations that include close-growing crops 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 maintain tilth.
• Including green manure crops in the cropping sequence, using a system of conservation tillage, and managing crop residue 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.

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.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

Major management concerns: Morganlake—cutbanks caving, seasonal wetness, slope; Ossineke—seasonal wetness, shrink-swell, slope; Blue Lake—cutbanks caving, slope
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced in areas of the Morganlake and Blue Lake soils.
• 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: Morganlake and Ossineke—restricted permeability, slope; Blue Lake—slope
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: 3e
Woodland ordination symbol: Morganlake—6A; Ossineke—4L; Blue Lake—3S

Michigan soil management group: Morganlake—4/2a; Ossineke—3a; Blue Lake—4a

450B—Millersburg-Blue Lake complex, 0 to 6 percent slopes

Setting

Landform: Moraines
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Millersburg

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 5 inches—brown sand

Subsoil:
5 to 10 inches—strong brown loamy sand
10 to 18 inches—pale brown sand and reddish brown sandy loam
18 to 26 inches—reddish brown sandy loam and pinkish gray loamy sand
26 to 34 inches—yellowish red sandy loam
34 to 43 inches—light reddish brown, calcareous sandy loam

Substratum:
43 to 80 inches—light yellowish brown, calcareous loamy sand

Blue Lake

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—dark 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: Millersburg—moderate; Blue Lake—moderately rapid
Available water capacity: Millersburg—moderate; Blue Lake—low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very low
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Millersburg—moderate; Blue Lake—severe
Shrink-swell potential: Low
Potential for frost action: Millersburg—moderate; Blue Lake—low

Composition

Millersburg and similar soils: 35 to 60 percent
Blue Lake and similar soils: 25 to 40 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Mancelona and Horsehead soils, which have gravel in the subsoil and substratum; in landscape positions similar to those of the major soils
- The moderately well drained Morganlake soils, which contain more clay in the subsoil and substratum than the major soils; in landscape positions similar to those of the major soils
- The excessively drained Rubicon soils, which have less clay in the subsoil than the major soils; in landscape positions similar to those of the major soils

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
- Soils that have mottles below a depth of 40 inches

Use and Management

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

Woodland

Major management concerns: Millersburg—plant competition; Blue Lake—equipment limitation, seedling mortality, 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.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- 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.
• 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.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Millersburg—cutbanks caving, frost action; Blue Lake—cutbanks caving
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations in areas of the Millersburg soil can help to prevent the structural damage caused by frost action.

Septic tank absorption fields

Major management concerns: None

Interpretive Groups

Land capability classification: 3s
Woodland ordination symbol: Millersburg—3A; Blue Lake—3S
Michigan soil management group: Millersburg—3a; Blue Lake—4a

450D—Millersburg-Blue Lake complex, 6 to 18 percent slopes

Setting

Landform: Moraines
Shape of areas: Irregular
Size of areas: 5 to 260 acres

Typical Profile

Millersburg

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 5 inches—brown sand

Subsoil:
5 to 10 inches—strong brown loamy sand
10 to 18 inches—pale brown sand and reddish brown sandy loam
18 to 26 inches—reddish brown sandy loam and pinkish gray loamy sand
26 to 34 inches—yellowish red sandy loam
34 to 43 inches—light reddish brown, calcareous sandy loam

Substratum:
43 to 80 inches—light yellowish brown, calcareous loamy sand

Blue Lake

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—dark 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: Millersburg—moderate; Blue Lake—moderately rapid
Available water capacity: Millersburg—moderate; Blue Lake—low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Low
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Millersburg—moderate; Blue Lake—severe
Shrink-swell potential: Low
Potential for frost action: Millersburg—moderate; Blue Lake—low

Composition

Millersburg and similar soils: 35 to 60 percent
Blue Lake and similar soils: 25 to 40 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Mancelona and Horsehead soils, which have gravel in the subsoil and substratum; in landscape positions similar to those of the major soils
• The moderately well drained Morganlake soils, which contain more clay in the subsoil and substratum than the major soils; in landscape positions similar to those of the major soils
• The excessively drained Rubicon soils, which have less clay in the subsoil than the major soils; in landscape positions similar to those of the major soils

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
- Soils that have mottles below a depth of 40 inches

Use and Management

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

Woodland

Major management concerns: Millersburg—plant competition; Blue Lake—equipment limitation, 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 can reduce the seedling mortality rate. Replanting is needed in some areas.
- Planting when the soil is moist can reduce the seedling mortality rate.
- 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.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Millersburg—cutbanks caving, slope, frost action; Blue Lake—cutbanks caving, 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.
- 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
Management considerations:
- Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: 4e
Woodland ordination symbol: Millersburg—3A; Blue Lake—3S
Michigan soil management group: Millersburg—3a; Blue Lake—4a

450E—Millersburg-Blue Lake complex, 18 to 35 percent slopes

Setting

Landform: Moraines
Shape of areas: Irregular
Size of areas: 10 to 350 acres

Typical Profile

Millersburg

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 5 inches—brown sand

Subsoil:
5 to 10 inches—strong brown loamy sand
10 to 18 inches—pale brown sand and reddish brown sandy loam
18 to 26 inches—reddish brown sandy loam and pinkish gray loamy sand
26 to 34 inches—yellowish red sandy loam
34 to 43 inches—light reddish brown, calcareous sandy loam

Substratum:
43 to 80 inches—light yellowish brown, calcareous loamy sand

Blue Lake

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 6 inches—brown sand

Subsoil:
6 to 15 inches—dark 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: Millersburg—moderate; Blue Lake—moderately rapid
Available water capacity: Millersburg—moderate; Blue Lake—low
Drainage class: Well drained

Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Medium
Flooding: None
Hazard of water erosion: Millersburg—severe; Blue Lake—moderate
Hazard of soil blowing: Millersburg—moderate; Blue Lake—severe
Shrink-swell potential: Low
Potential for frost action: Millersburg—moderate; Blue Lake—low

Composition

Millersburg and similar soils: 35 to 60 percent
Blue Lake and similar soils: 25 to 40 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Mancelona and Horsehead soils, which have gravel in the subsoil and substratum; in landscape positions similar to those of the major soils
• The well drained Menominee soils, which contain more clay in the subsoil and substratum than the major soils; in landscape positions similar to those of the major soils
• The excessively drained Rubicon soils, which have less clay in the subsoil than the major soils; in landscape positions similar to those of the major soils

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 use—building site development

Woodland

Major management concerns: Millersburg—erosion hazard, equipment limitation, plant competition; Blue Lake—erosion hazard, equipment limitation, 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.
• The hazard 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 when the soil is moist can reduce the seedling mortality rate.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Special harvest methods may be needed to control undesirable plants.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Building sites

Major management concerns: Millersburg—slope, frost action; Blue Lake—cutbanks caving, slope
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Because of the slope, these soils are poorly suited to building site development without extensive land shaping.
• In areas of the Millersburg soil, 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
Management considerations:
• Because of the slope, these soils are generally unsuited to use as sites for septic tank absorption fields.

Interpretive Groups

Land capability classification: 7e
Woodland ordination symbol: Millersburg—3R; Blue Lake—3R
Michigan soil management group: Millersburg—3a; Blue Lake—4a

451B—Annalake loamy fine sand, 0 to 6 percent slopes

Setting

Landform: Lake plains, deltas, outwash plains, and moraines
Shape of areas: Irregular
Size of areas: 3 to 80 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—dark brown loamy fine sand
16 to 30 inches—light brown loamy sand and reddish brown sandy loam
30 to 46 inches—reddish brown, mottled sandy loam

Substratum:
46 to 80 inches—light brown and light brownish gray, stratified, calcareous, mottled sandy loam, silt loam, loamy sand, fine sandy loam, sand, fine sand, and silt

Soil Properties and Qualities

Permeability: Moderate
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched, at a depth of 2.5 to 3.5 feet at some time from September through November and from March through June
Potential surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
- The well drained Ocqueoc soils, which have more sand in the upper 20 to 40 inches than the Annalake soil; in landscape positions similar to those of the Annalake soil
- 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, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
- Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitation, 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.

Building sites

Major management concerns: Cutbanks caving, 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.
• 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: Restricted 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.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: 2e
Woodland ordination symbol: 3L
Michigan soil management group: 3a-s

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 60 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—dark brown loamy fine sand
16 to 30 inches—light brown loamy sand and reddish brown sandy loam
30 to 46 inches—reddish brown, mottled sandy loam

Substratum:
46 to 80 inches—light brown and light brownish gray, stratified, calcareous, mottled sandy loam, silt loam, loamy sand, fine sandy loam, sand, fine sand, and silt

Soil Properties and Qualities

Permeability: Moderate
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched, at a depth of 2.5 to 3.5 feet at some time from September through June
Potential surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Ocqueoc soils, which have more sand in the upper 20 to 40 inches than the Annalake soil; in landscape positions similar to those of the Annalake soil
• 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, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitation, 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.

Building sites

Major management concerns: Cutbanks caving, 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: Restricted permeability, slope, seasonal wetness
Management considerations:
• 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.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

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

452D—Bamfield fine sandy loam, sandy substratum, 12 to 18 percent slopes

Setting

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

Typical Profile

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

Subsoil:
9 to 10 inches—strong brown sandy loam
10 to 14 inches—pinkish gray loamy sand and yellowish red clay loam
14 to 23 inches—reddish brown clay loam
23 to 29 inches—reddish brown loam

Substratum:
29 to 61 inches—light reddish brown, calcareous loam
61 to 80 inches—pale brown, stratified sand and gravelly sand

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet

Potential surface runoff: Very high
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the upper part and moderate in the lower part
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
- The well drained Menominee soils along footslopes
- The somewhat excessively drained Mancelona soils along footslopes and toeslopes
- The poorly drained Lupton soils in closed depressions

Similar inclusions:
- Moderately well drained soils
- Soils that have a surface layer of loam
- Soils that have a sandy and gravelly substratum at a depth of more than 80 inches
- Soils that have a sandy and gravelly substratum at a depth of less than 60 inches

Use and Management

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

Woodland

Major management concerns: Equipment limitation, plant competition
Management considerations:
- Because of low strength, suitable surfacing material is needed on year-round logging roads and landings.
- Skidders should not be used during wet periods, when ruts form easily.
- Special harvest methods may be needed to control undesirable plants.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Pasture

Major management concerns: Erosion hazard, compaction
Management considerations:
- Proper stocking rates, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
- Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Building sites

Major management concerns: Slope, shrink-swell, 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.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling and by frost action.

Septic tank absorption fields

Major management concerns: Slope, restricted permeability
Management considerations:
- Land shaping and installing the distribution lines on the contour help to overcome the slope.
- 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: 4e
Woodland ordination symbol: 3L
Michigan soil management group: 3/2a

452E—Bamfield fine sandy loam, sandy substratum, 18 to 35 percent slopes

Setting

Landform: Moraines
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

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

Subsoil:
9 to 10 inches—strong brown sandy loam
10 to 14 inches—pinkish gray loamy sand and yellowish red clay loam
14 to 23 inches—reddish brown clay loam
23 to 29 inches—reddish brown loam

Substratum:
29 to 61 inches—light reddish brown, calcareous loam

61 to 80 inches—pale brown, stratified sand and gravelly sand

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Potential surface runoff: Very high
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the upper part and moderate in the lower part
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
- The well drained Menominee soils along footslopes
- The somewhat excessively drained Mancelona soils along footslopes and toeslopes

Similar inclusions:
- Moderately well drained soils
- Soils that have a surface layer of loam
- Soils that have a sandy and gravelly substratum at a depth of more than 80 inches
- Soils that have a sandy and gravelly substratum at a depth of less than 60 inches

Use and Management

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

Woodland

Major management concerns: Erosion hazard, equipment limitation, 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.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings can promote natural regeneration.

Pasture

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

Building sites

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

Septic tank absorption fields

Major management concerns: Slope, restricted permeability
Management considerations:
- Because of the slope, this soil is generally unsuited to use as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: 6e
Woodland ordination symbol: 3R
Michigan soil management group: 3/2a

453B—Ossineke fine sandy loam, sandy substratum, 0 to 6 percent slopes

Setting

Landform: Flats and depressions on moraines
Shape of areas: Irregular
Size of areas: 10 to 500 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown fine sandy loam

Subsoil:
8 to 13 inches—brown sandy loam
13 to 21 inches—dark reddish brown sandy clay loam surrounded by brown sandy loam

21 to 38 inches—dark reddish brown, mottled sandy clay loam
38 to 51 inches—brown, mottled sandy loam

Substratum:
51 to 77 inches—brown, mottled sandy loam
77 to 80 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Moderately slow in the loamy material and rapid in the sandy substratum
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched, at a depth of 1.5 to 3.5 feet at some time from October through November and from March through May
Potential surface runoff: High
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Mancelona, Bamfield, and Menominee soils in the steeper landscape positions

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

Use and Management

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

Cropland

Major management concerns: Water erosion, tilth of the surface layer
Management considerations:
• Crop rotations that include grasses and legumes and small grain help to control runoff and water erosion.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Pasture

Major management concerns: 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.
• Basing applications of lime and fertilizer on the results of soil tests helps to ensure maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitation, plant competition
Management considerations:
• Because of low strength, suitable surfacing material is needed on year-round logging roads and landings.
• Species preference can be managed by selective cutting.

Building sites

Major management concerns: Shrink-swell, frost action, wetness
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.

Septic tank absorption fields

Major management concerns: Restricted permeability, 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: 3e
Woodland ordination symbol: 4L
Michigan soil management group: 3a

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as forestland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; for agricultural waste management; and as 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

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops 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 described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Although farming is not the primary land use in Montmorency County, it does play a significant role in the economy of the Hillman and Vienna Corners area.

About 17,600 acres, or about 5 percent of the total land area in the county, is classified as farmland. The average size of the farms in the county is 223 acres. In 1990, a total of 108 farms made up a total of 24,000 acres of cropland, pasture, and forestland. Of this total, approximately 15,000 acres was cropland and 5,300 was used for the production of forage crops.

The most common row crop produced in the county is corn. The average yield of corn is 80 to 85 bushels per acre. Several types of small grain are grown, including oats, wheat, and rye. The production of dry beans, such as kidney beans, is established in the county and is increasing. Several farmers in the county have developed a market for sunflower seeds used as birdseed. In addition, pumpkins, sugar beets, and other crops are grown, some of which are planted for use as deer feed by many of the hunt clubs in the county. Hunt clubs also serve as a major market for the hay that is produced in the county.

Water erosion is a major hazard in some areas of loamy and clayey soils that have slopes of more than 3 percent. Examples are Negwegon, Ossineke, and Bamfield soils. The loss of the surface layer through erosion results in reduced productivity. As the surface layer is eroded away, nutrients and organic matter are lost and part of the subsoil is incorporated into the plow layer. The subsoil material, which dominantly has a high pH and low natural fertility, can restrict seed germination and the availability of nutrients. Exposure of the subsoil can increase the hazard of erosion.

Water erosion can result in clogged tile drains and in the sedimentation of creeks and waterways.

Sediment that contains fertilizer and pesticides can reduce the quality of water. Controlling erosion reduces the runoff rate, increases the rate of water infiltration, and minimizes the loss of organic matter and the amount of sediment that enters waterways.

A system of conservation tillage that leaves crop residue on the surface increases the rate of water infiltration and reduces the hazards of runoff and erosion. No-till cropping systems require high levels of management. Herbicides and insecticides are used to control weeds, insects, and pests. No-till farming is especially effective in minimizing erosion on the lighter colored, sloping soils in the county.

Contour stripcropping is effective in controlling erosion. It is best suited to well drained, sloping soils that are highly susceptible to erosion. Ossineke soils are examples. Contour stripcropping alternates strips of row crops with strips of small grain or hay.

Grassed waterways are useful in undulating and gently rolling areas. They help to control channel erosion on sloping soils. They also stabilize areas that are already eroded. Subsurface drains are installed underneath the waterways to remove excess internal water. Removing this water enhances the growth of plants and facilitates the use of machinery.

Soil blowing is a hazard in areas of Annalake, Richter, and Mancelona soils. It can be controlled by maintaining a cover of vegetation or mulch, alternating strips of row crops with strips of hay, leaving crop residue on the surface, and keeping the surface rough through proper tillage methods. Field windbreaks of adapted trees and shrubs planted at right angles to the prevailing wind also help to control soil blowing.

Wetness is a limitation on some of the cropland in the county. Some areas of poorly drained Springport and Caffey soils can be adequately drained. Other areas of these soils and other poorly drained soils, however, cannot be economically drained. The poorly drained soils are in low areas and depressions where ponding occurs and where suitable gravity outlets are not readily available. These soils have low soil temperatures and are subject to extended periods of frost, which can hinder seed germination. In areas of Algonquin, Richter, and other somewhat poorly drained soils, a drainage system is needed. Tillage, seed germination, and plant growth are adversely affected unless excess water is removed from these areas.

Subsurface tile drainage systems are the primary methods of removing excess water. Spacing of tile drains should be based on the permeability of the soils. In some areas open ditches are needed as outlets for the tile drains. Small areas of wetter soils in swales are commonly included with the well drained soils in mapping. Fieldwork can be delayed in some of these areas unless a drainage system is installed.

Soil fertility is naturally low in the sandy soils in the county and medium in the loamy soils. On all soils, additions of fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kind and amount of fertilizer to be applied.

Soil tilth is an important factor affecting the germination of seeds and the infiltration of water into the soil. Soils that have good tilth are granular and porous. The use of machinery on wet soils results in compaction and surface crusting. Preparing a good seedbed is difficult in severely eroded areas. The soils in these areas have a low moisture content and are susceptible to surface crusting, which hinders seedling germination. An adequate drainage system, timely fieldwork, conservation tillage, and measures that maintain the content of organic matter improve soil structure, minimize compaction, and help to prevent crusting.

Further information about managing cropland is available at the local offices of the Cooperative Extension Service and the Natural Resources Conservation Service.

Pasture is important in some areas of the county because of the number of dairy and beef enterprises. Much of the permanent pasture is in areas of Ossineke and Bamfield soils, where erosion can be a hazard. Other pastures are in areas of Algonquin and Richter soils, where soil compaction can be a problem.

Measures that prevent overgrazing help to protect the plant cover and thus reduce the hazards of runoff and erosion. Grazing when the soils are wet can result in compaction and, consequently, poor forage production. The productivity of a pasture and its ability to protect the soil are influenced by the number of livestock in the pasture, the length of time that they graze, and the distribution of rainfall. Good pasture management includes proper stocking rates, pasture rotation, and deferred grazing.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of the map units in the survey area also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 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 Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forestland or 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 the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

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, 2e. 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 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by ***w, s,*** or ***c*** because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, forestland, wildlife habitat, or recreation.

The acreage of soils in each capability class or subclass is shown in table 6. The capability classification of map units in this survey area is given in the section “Detailed Soil Map Units” and in the yields table.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, 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. 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 16,393 acres, or nearly 4.6 percent of the survey area, would meet the requirements for prime farmland if adequate drainage were provided.

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 a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Forestland Management and Productivity

Bill O'Neil, forester, Michigan Department of Agriculture, helped prepare this section.

Forestland is the signature of recognition in Montmorency County, just as it has been since the survey area was first discovered. The beauty of the forests are as evident today as they must have been to the Chippewa Indians who hunted amid the bountiful aspens or traveled through the majestic pines long ago. Some of the best examples of the beauty of the forestland in the survey area are north of Rattlesnake Overlook and surrounding Old Baldy.

Woodlands cover more than 85 percent of Montmorency County, or about 302,300 acres. The soils are predominantly too wet or too poor for farming, and thus the landscape has remained largely forested. About 47 percent of the county is publicly owned, is managed by the Department of Natural Resources, and is part of the Mackinaw State Forest. The majority of the remaining land is privately owned by small, nonindustrial landowners. The notable exceptions are Canada Creek Ranch, a 12,000-acre development complete with residential and wilderness areas; Black River Ranch; and Turtle Lake Hunt Club.

A significant aspect of the forest cover in the county is its diversity. The county supports a wide range of cover types, including northern hardwoods (28 percent); lowland hardwoods (6 percent); jack pine, red pine, and white pine (14 percent); aspen (30 percent); northern whitecedar (4 percent); spruce/fir (3 percent); oak (13 percent); birch (1 percent); and exotics (1 percent).

The aspen complex covers more than 30 percent of the forested area. Aspen creates some of the best habitat for many wildlife species, especially white-tailed deer, ruffed grouse, and American woodcock. If proper management is applied, the survey area has the potential to provide quality habitat for these and many other wildlife species.

Northern hardwoods are scattered throughout the county, but a large pocket occurs in the northwest "Camp 30 Hills" area. This forest type is unusual in its makeup. It is not governed by sugar maple as it is on most sites. Instead, the dominant species of red oak, white ash, and basswood have developed a wonderful relationship with the morel mushroom.

These forests provide the raw material for a growing number of industries that contribute to employment opportunities in Montmorency County. Pulpwood supplies board plants in Alpena, Gaylord, and Grayling; fuel chips help supply the cogeneration plants in Hillman and Lincoln; and sawlogs are shipped throughout Michigan and beyond for lumber and veneer. Other products harvested on a smaller scale are cabin logs, firewood, fencing, Christmas boughs, and maple syrup.

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.

Suggested trees to plant are those that are suitable for commercial wood production.

Logging and harvesting of wood resources are important to the economy of Montmorency County. Table 9 provides expanded information concerning the operability of harvesting equipment. The table gives information about operating harvesting or thinning equipment in logging areas and on skid roads, log landings, and haul roads. Limitations are given for the most limiting season and for the preferred operating season. The most limiting season in this survey area generally is spring or late fall. In some areas, however, it is during dry periods in summer, when loose sand can limit trafficability on deep, well drained, sandy soils.

The preferred operating season is the period when harvesting or thinning causes the least amount of soil damage. This period generally is when the soil is not too wet or when the ground is frozen or partly frozen or has an adequate snow cover.

In table 9, a rating of ***slight*** indicates that the use of conventional logging equipment is not restricted if normal logging methods are used. A rating of ***moderate*** indicates that the use of equipment is restricted because of one or more soil factors. If wetness is a limitation, high flotation equipment or special procedures may be needed to prevent the formation of ruts. A rating of ***severe*** indicates that the kind of equipment that can be used is seriously restricted.

Haul roads are access roads leading from primary or surfaced roads to the logging areas. The logging roads serve as transportation routes for wheeled logging equipment and logging trucks. Generally, they are unpaved roads. Some are graveled.

Log landings are areas where logs are assembled for transportation. Wheeled equipment may be used more frequently in these areas than in any other areas affected by logging.

Logging areas and skid roads include areas where some or all of the trees are being cut. Generally, equipment traffic is least intensive in the logging areas. Skid roads, which generally are within the logging area, are roads or trails over which the logs are dragged or hauled from the stump to a log landing.

Plant Communities

Table 10 lists plants that are typically associated with the soils in the survey area. The information in table 10 is based on sample sites. 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 in areas that were relatively free from recent disturbances, such as fire, tree harvesting, or noticeable insect or disease infestations. The sample sites were in areas that exhibited typical stocking densities.

The plots sampled were approximately 10,000 square feet. Plant species were identified and recorded, and an ocular estimate was made of the percent coverage for each species. Tree species were recorded by estimating the percent canopy coverage, and other plants were recorded by estimating the percent ground coverage. Coverage values were grouped into seven classes for facilitation of compilation and clarification of results. The seven classes are: 1—less than 1 percent coverage; 2—1 to 5 percent coverage; 3—5 to 25 percent coverage; 4—25 to 50 percent coverage; 5—50 to 75 percent coverage; 6—75 to 95 percent coverage; and 7—95 to 100 percent coverage.

The number that follows each plant species in the table represents the mean coverage class for that species for the map unit or soil 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 that have a low number.

The plants listed in table 10 for each map unit are a composite of two to ten sample sites. They are considered the typical plants that occur in areas of a map unit, but they are not the only plants that may occur. Only common names are used for the plants in table 10 (USDA/NRCS, National Forestry Manual).

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, yards, fruit trees, gardens, and cropland from wind and snow; help to keep snow on fields; and provide food and cover for wildlife. Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 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 or of the Cooperative Extension Service or from a commercial nursery.

Michigan Soil Management Groups

Soils are often grouped for interpretive purposes. ***Michigan soil management groups*** have been developed to assist in planning for use and management (Mokma, 1978). The Michigan soil management groups of the soils in the county are given in the detailed soil map unit descriptions.

The groups are represented by symbols that can be a combination of numbers and letters. Mineral soils are given a number based on the dominant texture, as follows: 1—clay (40 to 60 percent clay); 1.5—clay loam and silty clay loam; 2.5—loam and silt loam; 3—sandy loam; 4—loamy sand; and 5—sand. Because of significant differences in the available water-holding capacity, the sands are further subdivided based on subsoil development and iron accumulation in the B horizon. The subdivisions are as follows: 5.0—sands that have strong subsoil development and a large accumulation of iron; 5.3—sands that have medium subsoil development; and 5.7—sands that have weak or no subsoil development and little or no iron accumulation. Soils that formed in uniform parent material are represented by one number. Soils that formed in two-storied parent material are represented by fractions. The numerator of the fraction represents the texture of the upper story, and the denominator represents the texture of the lower story. The symbol for alluvial soils is preceded by an uppercase L. Organic soils are indicated by an uppercase M. The organic soils are subdivided according to characteristics of the underlying mineral materials. Finally, natural drainage is indicated with lowercase letters, as follows: a—well drained or moderately well drained; b—somewhat poorly drained; and c—poorly drained and very poorly drained.

Recreation

Pete Petoskey, wildlife biologist (retired), Michigan Department of Natural Resources, helped prepare this section.

Montmorency County is a major source of year-round recreational opportunity. About half the county is publicly owned and is administered by the Michigan Department of Natural Resources. A state park and several forest campgrounds are available for public use. Almost every lake in the county has public access. There are many miles of trout streams; in fact, Montmorency County contains some of the best brook trout fishing areas, including the Black River, Gilchrist Creek, Hunt Creek, Canada Creek, Rattlesnake Creek, and Haymeadow Creek. Fishing for panfish, northern pike, largemouth bass, and smallmouth bass is good year round. Tiger muskellunge have been released in some of the larger lakes. Winter snow conditions in the county are very favorable for snowmobiles as a result of hundreds of miles of groomed trails and other county roads and trails. The survey area also provides opportunities for cross-country skiing and for snowshoeing. The clean waters of the county provide countless hours of summer recreation, including boating, swimming, canoeing, and fishing. Hunting for small game and deer is good; the opening day of deer season is second only to Christmas as a county holiday. Montmorency County is the home of Michigan's elk herd, the largest wild population east of the Mississippi River. The towns of Hillman, Atlanta, and Lewiston provide considerable opportunities for shopping and antique hunting. All of these features have made tourism an important element in the area's economy.

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 also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 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.

The information in table 12 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields, for dwellings without basements, and for local roads and streets.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Tom Carlson, wildlife biologist, Michigan Department of Agriculture, helped prepare this section.

The large variety of wildlife in Montmorency County can be attributed to the great diversity of forest and soil types in the survey area. The extensive aspen/oak forests provide excellent habitat for ruffed grouse, woodcock, and various squirrels and for the pine martens that have recently been introduced in the survey area. Elk have thrived here since their introduction in the early 1900's, especially in areas of large grassy meadows and on south-facing slopes. Bear and deer are also abundant and, because of the relatively low human population and extensive forested tracts, combine with elk to make the county a big-game hunter's paradise. The swamps and associated wetlands provide habitat for good numbers of snowshoe hares, which in turn result in a healthy bobcat population. Other furbearers, such as beaver, otter, mink, and muskrat, are found in good numbers along many creeks, streams, and rivers. The lakes and streams of the county also provide fishing opportunities for bluegill, perch, smallmouth bass, largemouth bass, northern pike, trout, and walleye. Sandhill cranes, great blue herons, American bitterns, little green herons, Canada geese, loons, mallards, black ducks, and wood ducks can be observed in the summer. Species of special concern, such as bald eagles and ospreys, nest on or near many lakes in the county. The endangered Kirtland's warbler can sometimes be found in immature stands of jack pine in the northern part of the county. Good numbers of predators also inhabit the county, including red fox, coyote, great horned owl, barred owl, saw-whet owl, red-shouldered hawk, red-tailed hawk, marsh hawk, rough-legged hawk, broad-winged hawk, American kestrel, sharp-shinned hawk, Cooper's hawk, and pigeon hawk.

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 also are considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

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, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, 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, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous and/or coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

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 and others, 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, 1998) 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 and others, 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).

13 Tawas-Lupton mucks
14 Dawson-Loxley peats
24A Kinross-Au Gres complex, 0 to 3 percent slopes
59B Algonquin-Springport complex, 0 to 6 percent slopes
72 Dorval muck
86 Histosols and Aquents, ponded
87 Ausable muck, frequently flooded
351A Allendale-Wakeley-Dorval complex, 0 to 3 percent slopes
352B Deford-Au Gres-Croswell complex, 0 to 6 percent slopes
359C Algonquin-Negwegon-Dorval complex, 0 to 12 percent slopes
360 Wakeley muck
361B Allendale-Dorval-Blue Lake complex, 0 to 6 percent slopes
369 Deford muck
371 Springport silt loam
392 Caffey mucky sand
421A Richter-Caffey complex, 0 to 3 percent slopes
422B Morganlake-Iosco-Deford complex, 0 to 6 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.

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 estimated data in the tables described under the heading “Soil Properties.”

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 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, or other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and ***small commercial buildings*** are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, 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.

The table also shows the suitability of the soils for use as daily cover for landfill. A rating of ***good*** indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; ***fair*** indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and ***poor*** indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

The table gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in the table are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium 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 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated ***good*** contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated ***fair*** are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated ***poor*** have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and ***gravel*** are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 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 toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated ***good*** have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, 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, stones, or soluble salts, 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, stones, or soluble salts, 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, organic matter, or salts or sodium. 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, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. 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 salts, sodium, and 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 wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, 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.

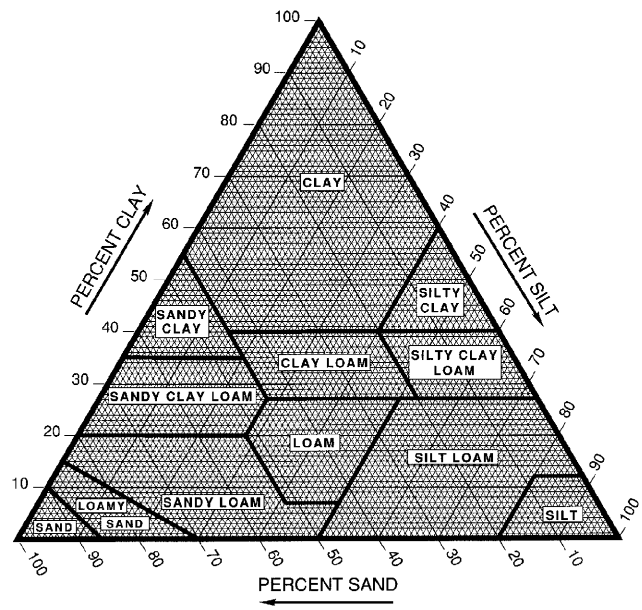


Figure 12.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 18 gives estimates of the engineering classification and of the range of index 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. The range in depth and information on other properties of each layer are given for each soil series under the heading “Soil Series and Their Morphology.”

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 12). “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 (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 physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the table, the estimated clay content of each 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 affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^{1}/_{3}$- or $^{1}/_{10}$-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each 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. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability (K_{sat}) refers to the ability of a soil to transmit water or air. The term “permeability,” as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. 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 refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. 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. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 19, 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.

Erosion factors are shown in the table as the ***K factor*** 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 several factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter 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 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 susceptibility to wind erosion in cultivated areas. 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 as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

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 chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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.

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.

Soil Moisture Status

Soil moisture greatly influences vegetation type, root growth, and germination; excavation, construction, and trafficability; chemical interactions, transport, and contamination; and soil strength, shrinking, swelling, and frost action. It is important in the classification of soils, wetlands, and habitats and in crop management.

Table 22 shows the hydrologic soil group and gives estimates of soil moisture for each map unit at various depths for every month of the year. ***Moist*** signifies the moisture condition under which soil water is most available for plant growth. ***Dry*** signifies the moisture status under which most plants (especially crops) cannot extract water for growth. ***Wet*** indicates a condition under which free water will stand in an unlined hole or under which the soil is at least too wet for the growth of agricultural species.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to 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.

Water Features

Table 23 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to 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*** in the table 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 23 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.

Table 23 also indicates the kind of water table. An ***apparent*** water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A ***perched*** water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

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 23 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.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1998 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 "true," 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***, a suborder of the Spodosols that does not have an aquic moisture regime).

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. An example is Lamellic 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, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is sandy, mixed, frigid Lamellic 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.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (Soil Survey Staff, 1999) and in "Keys to Soil Taxonomy" (Soil Survey Staff, 1998). 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, very slowly permeable soils on lake plains. These soils formed in silty and clayey lacustrine deposits. Slope ranges from 0 to 6 percent.

Taxonomic classification: Fine, mixed, semiactive, frigid Aquic Hapludalfs

Typical pedon of Algonquin silt loam, in an area of Algonquin-Springport complex, 0 to 6 percent slopes, 4,410 feet north and 1,200 feet west of the southeast corner of sec. 3, T. 31 N., R. 4 E., Hillman Township; USGS Hillman, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 6 minutes 55 seconds N. and long. 83 degrees 55 minutes 35 seconds W.

A—0 to 5 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure parting to weak medium granular; friable; many very fine and fine roots and common medium roots; slightly alkaline; clear wavy boundary.

E—5 to 10 inches; light brownish gray (10YR 6/2) fine sandy loam, white (10YR 8/1) dry; moderate medium subangular blocky structure; firm; common very fine, fine, and medium roots; common tongues of material from the A horizon following root channels and worm burrows; slightly acid; clear wavy boundary.

Bt1—10 to 17 inches; brown (7.5YR 4/4) silty clay; moderate medium prismatic structure parting to strong medium angular blocky; very firm; few very fine roots; common distinct brown (7.5YR 4/4) clay films on faces of peds; common medium distinct grayish brown (10YR 5/2) iron depletions and few medium distinct yellowish brown (10YR 5/4) masses of iron accumulation in the matrix; few black (10YR 2/1) organic stains on faces of peds and lining pores and root channels; neutral; gradual wavy boundary.

Bt2—17 to 24 inches; pinkish gray (7.5YR 6/2) clay; moderate fine and medium angular blocky structure; very firm; few very fine roots; few faint brown (7.5YR 4/4) clay films on faces of peds; many medium distinct light reddish brown (5YR 6/4) masses of iron accumulation and common distinct light gray (N 7/0) iron depletions in the matrix; a 2-inch lens of pale brown (10YR 6/3) sand; few black (10YR 2/1) organic stains on faces of peds; violently effervescent; moderately alkaline; gradual wavy boundary.

BC—24 to 80 inches; light reddish brown (5YR 6/4) clay; moderate thick platy structure inherent from deposition; very firm; many medium distinct brown (7.5YR 4/4) and many medium prominent yellowish brown (10YR 5/4) masses of iron accumulation in the matrix; light gray (10YR 7/1) carbonates on faces of peds; violently effervescent; moderately alkaline.

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 to 3. It is dominantly silt loam, but the range includes loam.

The E horizon has hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 2. It is fine sandy loam or silt loam.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. It is silty clay loam, clay, or silty clay. It has few organic stains.

The BC horizon has hue of 5YR or 7.5YR and value of 4 to 6. It is clay, silty clay loam, or silty clay.

Some pedons have a C horizon.

Allendale Series

The Allendale series consists of somewhat poorly drained soils in lake basins, on outwash plains, and on ground moraines. These soils formed in sandy deposits underlain by clayey deposits. Permeability is rapid in the upper sandy layers and very slow in the underlying clayey layers. Slope ranges from 0 to 3 percent.

Taxonomic classification: Sandy over clayey, mixed, semiactive, frigid Alfic Epiaquods

Typical pedon of Allendale loamy sand, 0 to 3 percent slopes, 1,278 feet east and 1,370 feet south of the northwest corner of sec. 26, T. 30 N., R. 4 E., Rust Township; USGS Rust, Michigan, 7.5-minute topographic quadrangle; lat. 44 degrees 58 minutes 1 second N. and long. 83 degrees 55 minutes 31 seconds W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loamy sand, light brownish gray (10YR 6/2) dry; moderate medium and coarse subangular blocky structure parting to moderate fine and very fine subangular blocky; very friable; many fine and few medium roots; strongly acid; abrupt smooth boundary.

Bs—10 to 18 inches; reddish brown (5YR 4/4) loamy sand; weak fine subangular blocky structure; very friable; 10 to 40 percent of the horizon is composed of ortstein; common fine and medium distinct red (2.5YR 4/6) and few fine distinct dark red (2.5YR 3/6) masses of iron accumulation in the matrix; about 2 to 5 percent gravel; moderately acid; gradual wavy boundary.

E—18 to 25 inches; yellowish brown (10YR 5/4) sand, very pale brown (10YR 7/3) dry; single grain; loose; about 2 to 5 percent gravel; moderately acid; abrupt wavy boundary.

2Bt—25 to 45 inches; brown (7.5YR 5/4) silty clay; weak medium subangular blocky structure; very firm; many fine prominent light greenish gray (5GY 7/1) iron depletions in the matrix; common fine distinct black (N 2.5/0) iron and manganese accumulations in the matrix; neutral; diffuse wavy boundary.

2C—45 to 80 inches; light reddish brown (5YR 6/4) silty clay; massive; very firm; common fine and medium faint yellowish red (5YR 5/6) masses of iron accumulation in the matrix; many fine and few coarse prominent light greenish gray (5GY 7/1) and few fine prominent white (N 8/0) iron depletions in the matrix; strongly effervescent; moderately alkaline.

The content of gravel ranges from 0 to 5 percent throughout the profile.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 or 4.

The Bs horizon has hue of 5YR to 10YR. In some pedons it has common weakly cemented to strongly cemented fragments of ortstein.

The 2Bt horizon is silty clay or clay.

The 2C horizon has hue of 7.5YR or 5YR and chroma of 3 or 4.

Annalake Series

The Annalake series consists of moderately well drained soils on lake plains, outwash plains, and moraines. These soils formed in loamy, calcareous, stratified glaciofluvial deposits. Permeability is moderate. Slope ranges from 0 to 12 percent.

Taxonomic classification: Coarse-loamy, mixed, superactive, frigid Alfic Oxyaquic Haplorthods

Typical pedon of Annalake loamy fine sand, 0 to 6 percent slopes, 2,550 feet north and 2,350 feet east of the southwest corner of sec. 16, T. 32 N., R. 4 E., Montmorency Township; USGS Royston, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 9 minutes 51 seconds N. and long. 83 degrees 57 minutes 20 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy fine sand, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure parting to weak fine granular; very friable; common very fine, fine, and medium roots; about 1 percent gravel; strongly acid; abrupt wavy boundary.

E—9 to 11 inches; pinkish gray (7.5YR 6/2) fine sand, light gray (10YR 7/2) dry; weak fine subangular blocky structure parting to weak fine granular; very friable; few very fine and fine roots; about 1 percent gravel; strongly acid; abrupt broken boundary.

Bs—11 to 16 inches; brown (7.5YR 4/4) loamy fine sand; moderate fine and medium subangular blocky structure; friable; common very fine and fine roots; 25 percent of the horizon is composed of weakly cemented tongues and chunks of dark reddish brown (5YR 3/2) and strong brown (7.5YR 4/6) ortstein; about 1 percent gravel; strongly acid; clear irregular boundary.

E/B—16 to 30 inches; about 60 percent light brown (7.5YR 6/4) loamy sand, pinkish white (7.5YR 8/2) dry (E); surrounding reddish brown (5YR 4/4) sandy loam (Bt); weak fine and medium subangular blocky structure; friable; common very fine and fine roots; many distinct reddish brown (5YR 4/4) clay films on faces of peds; about 1 percent gravel; strongly acid; abrupt wavy boundary.

Bt—30 to 37 inches; reddish brown (5YR 4/4) sandy loam; moderate medium and coarse subangular blocky structure; friable; common very fine and fine roots; many faint reddish brown (5YR 4/4) clay films on faces of peds; common fine prominent yellowish brown (10YR 5/6) masses of iron accumulation in the matrix; about 1 percent gravel; slightly acid; clear wavy boundary.

BC—37 to 46 inches; reddish brown (5YR 5/4) sandy loam; weak coarse subangular blocky structure; very friable; many medium and coarse prominent yellowish brown (10YR 5/8) masses of iron accumulation and common fine and medium prominent light greenish gray (5GY 7/1) iron depletions in the matrix; about 1 percent gravel; slightly effervescent; neutral; clear wavy boundary.

C—46 to 70 inches; light brown (7.5YR 6/4), stratified sandy loam, fine sandy loam, silt loam, and loamy sand; massive; very friable; many fine, medium, and coarse prominent yellowish brown (10YR 5/8) masses of iron accumulation and many fine, medium, and coarse prominent light gray (5Y 7/1) iron depletions in the matrix; about 1 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cg—70 to 85 inches; light brownish gray (2.5Y 6/2), stratified silt, silt loam, sandy loam, sand, and fine sand; massive; very friable; many fine and medium prominent yellowish brown (10YR 5/8) and light brown (7.5YR 6/4) masses of iron accumulation in the matrix; about 1 percent gravel; violently effervescent; strongly alkaline.

The content of gravel ranges from 0 to 5 percent throughout the profile.

The A or Ap horizon has value of 2 or 3 and chroma of 1 or 2. The A horizon is dominantly loamy fine sand, but the range includes fine sandy loam.

The E horizon and the E part of the E/B horizon have hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 4. The texture is dominantly fine sand, but the range includes loamy fine sand and sand.

The Bs horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6.

The B part of the E/B horizon and the Bt horizon have hue of 7.5YR or 5YR and chroma of 4 to 6. The texture is dominantly sandy loam, but the range includes fine sandy loam and very fine sandy loam.

The C horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 4 to 7, and chroma of 2 to 4. It is stratified sand, fine sand, sandy loam, silt loam, silt, loamy sand, fine sandy loam, very fine sand, and silty clay loam.

Aquents

Aquents consist of very poorly drained soils on outwash plains and moraines. These soils formed in sandy to clayey glaciofluvial material. Permeability ranges from rapid to slow. Slopes are 0 to 1 percent.

Taxonomic classification: Mixed, frigid Aquents

Typically, the surface layer is black (10YR 2/1) muck or mucky peat. It is 3 to 16 inches thick.

The upper part of the mineral layers has hue of 10YR, 2.5YR, or 5Y, value of 5 or 6, and chroma of 1 to 3. The texture of the mineral layers ranges from sand to clay.

Au Gres Series

The Au Gres series consists of somewhat poorly drained soils on stream terraces, lake terraces, low dunes, outwash plains, lake plains, and ground moraines. These soils formed in sandy deposits. Permeability is rapid. Slope ranges from 0 to 3 percent.

Taxonomic classification: Sandy, mixed, frigid Typic Endoaquods

Typical pedon of Au Gres sand, 0 to 3 percent slopes, 15 feet west and 1,155 feet south of the northeast corner of sec. 22, T. 32 N., R. 2 E., Montmorency Township; USGS Lake Geneva, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 9 minutes 11 seconds N. and long. 84 degrees 9 minutes 52 seconds W.

Oe—0 to 2 inches; black (N 2.5/0), partially decomposed organic material.

E—2 to 8 inches; pinkish gray (7.5YR 6/2) sand, pinkish gray (7.5YR 7/2) dry; weak fine and medium subangular blocky structure; very friable; many very fine, fine, medium, and coarse roots; very strongly acid; abrupt wavy boundary.

Bhs1—8 to 13 inches; dark reddish brown (5YR 2.5/2) sand; weak fine and medium subangular blocky structure; very friable; many medium and common very fine, fine, and coarse roots; few fine prominent strong brown (7.5YR 5/6) masses of iron accumulation in the matrix; about 40 percent of the horizon is ortstein; very strongly acid; clear wavy boundary.

Bhs2—13 to 18 inches; dark reddish brown (5YR 3/4) sand; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots and few medium roots; few fine and medium distinct brown (7.5YR 4/4) masses of iron accumulation and common fine and medium distinct dark reddish brown (5YR 2.5/2) iron depletions in the matrix; about 20 percent of the horizon consists of chunks and pieces of ortstein; moderately acid; clear wavy boundary.

Bs—18 to 35 inches; dark brown (7.5YR 3/4) sand; single grain; loose; few fine distinct strong brown (7.5YR 4/6) and few fine prominent yellowish brown (10YR 5/4) masses of iron accumulation in the matrix; moderately acid; gradual wavy boundary.

C1—35 to 50 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; few fine prominent strong brown (7.5YR 4/6) and common medium and coarse prominent strong brown (7.5YR 5/6) masses of iron accumulation in the matrix; moderately acid; diffuse wavy boundary.

C2—50 to 80 inches; brown (10YR 5/3) sand; single grain; loose; moderately acid.

The thickness of the solum ranges from 25 to 35 inches. The content of gravel ranges from 0 to 6 percent. Reaction in the solum ranges from very strongly acid to neutral.

Some pedons have an A horizon. This horizon has hue of 10YR to 5YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly sand, but the range includes loamy sand.

The E horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 1 to 3.

The Bhs horizon has hue of 5YR and value and chroma of 2 or 3. The content of ortstein in this horizon commonly ranges from 0 to 40 percent.

The Bs horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. The content of ortstein in this horizon commonly ranges from 0 to 20 percent.

Some pedons have a BC horizon.

The C horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 3 to 6.

Ausable Series

The Ausable series consists of very poorly drained soils on flood plains. These soils formed in thin organic layers over sandy alluvium. Permeability is moderate or moderately rapid in the organic material and rapid in the sandy material. Slope ranges from 0 to 2 percent.

Taxonomic classification: Sandy, mixed, frigid Histic Humaquepts

Typical pedon of Ausable muck, 2,484 feet south of the northwest corner of sec. 2, T. 32 N., R. 2 E., Montmorency Township; USGS Lake Geneva, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 11 minutes 33 seconds N. and long. 84 degrees 9 minutes 52 seconds W.

Oa—0 to 10 inches; muck (sapric material), black (N 2.5/0) broken face, rubbed, and pressed; about 30 percent fiber, 5 percent rubbed; moderate fine and medium granular structure; friable; fibers are primarily herbaceous; many fine and common medium roots; about 1 percent mineral content; strongly acid; abrupt smooth boundary.

C1—10 to 20 inches; brown (10YR 4/3) sand; single grain; loose; few fine roots; common fine distinct very dark grayish brown (10YR 3/2) organic bands and stains; slightly acid; clear wavy boundary.

C2—20 to 80 inches; brown (10YR 5/3) sand; single grain; loose; neutral.

The thickness of the organic material ranges from 9 to 12 inches.

The Oa horizon has hue of 7.5YR or 5YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 or 1 (unrubbed).

The C horizon has hue of 2.5Y or 10YR, value of 4 to 6, and chroma of 2 or 3. It is sand, loamy sand, or the gravelly analogs of these textures. The content of gravel ranges from 0 to 20 percent. In some pedons this horizon has organic bands.

Bamfield Series

The Bamfield series consists of well drained soils on ground moraines and disintegration moraines. These soils formed in loamy glacial till overlying sandy glaciofluvial material. Permeability is moderate or moderately slow in the loamy material and rapid in the underlying sandy substratum. Slope ranges from 12 to 45 percent.

Taxonomic classification: Fine-loamy, mixed, active, frigid Haplic Glossudalfs

Typical pedon of Bamfield fine sandy loam, sandy substratum, 12 to 18 percent slopes, 2,750 feet north and 1,335 feet west of the southeast corner of sec. 5, T. 30 N., R. 1 E., Vienna Township; USGS Hetherton, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 1 minute 16 seconds N. and long. 84 degrees 20 minutes 24 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate fine subangular blocky structure parting to moderate fine granular; very friable; many very fine and fine roots and common medium roots; 6 percent gravel and 1 percent cobbles; very strongly acid; clear wavy boundary.

Bw—9 to 10 inches; strong brown (7.5YR 4/6) sandy loam; moderate fine subangular blocky structure parting to moderate fine granular; very friable; many very fine and fine roots; 6 percent gravel and 1 percent cobbles; very strongly acid; clear wavy boundary.

E/B—10 to 14 inches; about 70 percent pinkish gray (7.5YR 6/2) loamy sand, pinkish white (7.5YR 8/2) dry (E); weak coarse subangular blocky structure; friable; common distinct pinkish gray (7.5YR 6/2) silt coatings; surrounding peds of yellowish red (5YR 4/6) clay loam (Bt); weak coarse subangular blocky structure; firm; common very fine and fine roots; common very fine continuous random tubular pores within and around peds; common distinct yellowish red (5YR 4/6) clay films on faces of peds; 6 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

Bt1—14 to 23 inches; reddish brown (5YR 4/4) clay loam (30 percent clay); moderate medium subangular blocky structure; firm; common very fine and fine roots; common very fine continuous random tubular pores within peds; many prominent reddish brown (5YR 4/4) and yellowish red (5YR 4/6) clay films on faces of peds; 6 percent gravel and 1 percent cobbles; moderately acid; clear wavy boundary.

Bt2—23 to 29 inches; reddish brown (5YR 5/4) loam; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; common very fine and fine roots; common very fine continuous random tubular pores within peds; common prominent reddish brown (5YR 4/3) clay films on faces of peds; 6 percent gravel and 1 percent cobbles; slightly effervescent; neutral; gradual wavy boundary.

BC—29 to 61 inches; light reddish brown (5YR 6/4) loam; moderate coarse subangular blocky structure; firm; few very fine and fine roots; few prominent pink (5YR 7/3) carbonate accumulations; 6 percent gravel and 1 percent cobbles; strongly effervescent; moderately alkaline; abrupt wavy boundary.

2C—61 to 80 inches; pale brown (10YR 6/3), stratified sand and gravelly sand; single grain; loose; few fine prominent yellowish red (5YR 4/6) masses of iron accumulation in the matrix; few discontinuous bands (1/2 inch to 2 inches thick) of light reddish brown (5YR 6/4) loam till; 15 percent gravel and 3 percent cobbles; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 29 to more than 60 inches. The content of gravel ranges from 3 to 10 percent throughout the solum and from 2 to 25 percent in the 2C horizon. The content of cobbles ranges from 0 to 4 percent throughout the profile.

The Ap horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 to 3. It is fine sandy loam or sandy loam.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is sandy loam or fine sandy loam.

The E horizon, if it occurs, has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. It is dominantly loamy sand, but the range includes sandy loam, loamy fine sand, and fine sandy loam.

The E/B or B/E horizon has E material surrounding peds of Bt material. The E part of the horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. It is loamy sand, sandy loam, or fine sandy loam. The Bt part of the horizon has hue of 5YR or 7.5YR and value and chroma of 3 to 6. It is clay loam or sandy clay loam.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 3 to 5. It is dominantly clay loam, but the range includes sandy clay loam. In the lower part of the horizon, the range includes loam. The content of clay in the argillic horizon ranges from 27 to 35 percent. In some pedons the lower part of the Bt horizon contains free carbonates.

The BC horizon has hue of 5YR or 7.5YR and value of 5 or 6. It is dominantly loam, but the range includes clay loam, fine sandy loam, sandy loam, and sandy clay loam.

The C horizon, if it occurs, has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 4 to 6. It is dominantly loam, but the range includes clay loam, fine sandy loam, sandy loam, and sandy clay loam. This horizon contains free carbonates.

The 2C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 to 6. It is sand, loamy sand, or the gravelly analogs of these textures.

Blue Lake Series

The Blue Lake series consists of well drained soils on ground moraines, outwash plains, and end moraines. These soils formed in sandy deposits. Permeability is moderately rapid. Slope ranges from 0 to 50 percent.

Taxonomic classification: 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., Hillman Township; USGS Hillman, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 5 minutes 41 seconds N. and long. 83 degrees 56 minutes 30 seconds W.

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 roots 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 roots 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 roots 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); weak coarse subangular blocky structure; friable; the bands are 1/8 inch to 3 inches thick, and the total accumulation is 8 inches; clay bridging between 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 to 3 and chroma of 0 to 2.

The E horizon has hue of 7.5YR or 10YR and value of 5 or 6.

The Bs horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4 to 6. In some pedons this horizon has few or common, weakly to strongly cemented fragments of ortstein.

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. 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 sandy loam or loamy sand. In some pedons this horizon contains thin bands of sandy clay loam. The individual 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.

Caffey Series

The Caffey series consist of poorly drained and very poorly drained soils in depressions and along drainageways on lake plains and deltas. These soils formed in sandy materials underlain by loamy and sandy, stratified lacustrine sediments. Permeability is rapid in the upper part and moderately slow in the lower part. Slope ranges from 0 to 2 percent.

Taxonomic classification: Sandy over loamy, mixed, semiactive, nonacid, frigid Aeric Endoaquents

Typical pedon of Caffey mucky sand, 430 feet south and 1,070 feet east of the northwest corner of sec. 24, T. 32 N., R. 4 E., Montmorency Township; USGS Royston, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 9 minutes 28 seconds N. and long. 83 degrees 53 minutes 58 seconds W.

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; contains 15 percent Ap material in vertical and horizontal channels and 10 percent pockets of grayish brown (2.5Y 5/2) sandy loam material; slightly alkaline; abrupt wavy boundary.

Bw—14 to 21 inches; light yellowish brown (10YR 6/4) 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) masses of iron accumulation, and few fine prominent grayish brown (2.5Y 5/2) iron depletions in the matrix; a few discontinuous lenses of light brown (7.5YR 6/4) loamy sand along the lower boundary of the horizon; slightly alkaline; clear smooth boundary.

2C—21 to 50 inches; pale brown (10YR 6/3), stratified very fine sand to silty clay loam; massive with laminar bedding inherent 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) masses of iron accumulation in the matrix; 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; a layer 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) masses of iron accumulation in the matrix ; violently effervescent; moderately alkaline.

The content of gravel and cobbles 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 to 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.

Chinwhisker Series

The Chinwhisker series consists of moderately well drained soils on stream terraces, lake terraces, and outwash plains. These soils formed in sandy deposits. Permeability is rapid. Slope ranges from 0 to 4 percent.

Taxonomic classification: Sandy, mixed, frigid Lamellic Haplorthods

Typical pedon of Chinwhisker sand, 0 to 4 percent slopes, 2,640 feet south and 495 feet west of the northeast corner of sec. 13, T. 32 N., R. 2 E., Montmorency Township; USGS Lake Geneva, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 9 minutes 48 seconds N. and long. 84 degrees 7 minutes 32 seconds W.

A—0 to 2 inches; black (N 2.5/0) sand, dark gray (10YR 4/1) dry; weak fine and medium granular structure; very friable; common fine, medium, and coarse roots and many very fine roots; very strongly acid; abrupt wavy boundary.

E—2 to 7 inches; brown (7.5YR 5/2) sand, white (5YR 8/1) dry; weak coarse granular structure parting to weak fine and medium granular; very friable; common very fine and fine roots and few medium roots; very strongly acid; abrupt wavy boundary.

Bs1—7 to 18 inches; brown (7.5YR 4/4) sand; moderate coarse subangular blocky structure parting to moderate fine and medium subangular blocky; very friable; few very fine, fine, and coarse roots and common medium roots; few (5 to 15 percent) chunks and pieces of ortstein; about 1 percent gravel; strongly acid; gradual wavy boundary.

Bs2—18 to 27 inches; strong brown (7.5YR 5/6) sand; weak coarse subangular blocky structure parting to weak fine and medium subangular blocky; very friable; few very fine, fine, medium, and coarse roots; many fine and medium distinct brownish yellow (10YR 6/6) and common fine faint strong brown (7.5YR 5/8) iron accumulations in the matrix; few (5 to 15 percent) chunks and pieces of ortstein; about 1 percent gravel; slightly acid; gradual wavy boundary.

E and Bt1—27 to 48 inches; light yellowish brown (10YR 6/4) sand (E); lamellae ($^1/_8$ to $^1/_2$ inch thick) of brown and reddish brown (7.5YR 5/4 and 5YR 4/4) loamy sand (Bt) with a total accumulation less than 6 inches thick (one side of the pedon has an area of a band that is nearly 4 inches thick, but the total accumulation of lamellae is still less than 6 inches thick); weak fine and medium subangular blocky structure (Bt); single grain (E); very friable (Bt); loose (E); few very fine, fine, medium, and coarse roots in the upper part of the horizon; common fine and medium distinct yellowish brown (10YR 5/6) masses of iron accumulation in the matrix; about 1 percent gravel; slightly acid; diffuse wavy boundary.

E and Bt2—48 to 80 inches; 95 percent light yellowish brown (10YR 6/4) sand (E); single grain; loose; lamellae ($^1/_8$ to $^1/_2$ inch thick) of brown (7.5YR 5/4) loamy sand (Bt); single grain; loose; common fine and medium prominent strong brown (7.5YR 5/6 and 5/8) masses of iron accumulation in the matrix; about 1 percent gravel; neutral.

The thickness of the solum ranges from 40 to more than 80 inches. The content of gravel ranges from 0 to 14 percent throughout the profile. The depth to redoximorphic features ranges from 20 to 40 inches.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to 2.

The E horizon has value of 5 to 7.

The Bs1 horizon has value of 3 or 4, and the Bs2 horizon has value of 4 or 5.

The E part of the E and Bt horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 or 4. The Bt part of the E and Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. Reaction in the E and Bt horizon ranges from very strongly acid to neutral.

Colonville Series

The Colonville series consists of somewhat poorly drained soils on flood plains. These soils formed in loamy and sandy, calcareous alluvium. Permeability is moderately rapid. Slope ranges from 0 to 2 percent.

Taxonomic classification: Coarse-loamy, mixed, calcareous, active, frigid Fluvaquentic Endoaquolls

Typical pedon of Colonville very fine sandy loam, occasionally flooded, 1,750 feet west and 2,600 feet north of the southeast corner of sec. 24, T. 31 N., R. 4 E., Hillman Township; USGS Hillman, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 3 minutes 59 seconds N. and long. 83 degrees 53 minutes 14 seconds W.

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 in the matrix; 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) masses of iron accumulation in the matrix; 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) masses of iron accumulation in the matrix; 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) masses of iron accumulation in the matrix; 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) masses of iron accumulation in the matrix; 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 the range includes fine sandy loam and 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.

Croswell Series

The Croswell series consists of moderately well drained soils on stream terraces, lake terraces, low dunes, outwash plains, lake plains, and ground moraines. These soils formed in sandy deposits. Permeability is rapid. Slope ranges from 0 to 6 percent.

Taxonomic classification: Sandy, mixed, frigid Oxyaquic Haplorthods

Typical pedon of Croswell sand, 0 to 6 percent slopes, 633 feet south and 916 feet east of the northwest corner of sec. 13, T. 32 N., R. 2 E., Montmorency Township; USGS Lake Geneva, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 10 minutes 8 seconds N. and long. 84 degrees 8 minutes 27 seconds W.

Oi—0 to 2 inches; slightly decomposed organic material.

A—2 to 5 inches; black (10YR 2/1) sand, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; common fine roots and many medium and coarse roots; about 1 percent gravel; extremely acid; abrupt wavy boundary.

E—5 to 11 inches; grayish brown (10YR 5/2) sand, very pale brown (10YR 7/3) dry; single grain; loose; common fine roots and many medium and coarse roots; about 1 percent gravel; strongly acid; clear wavy boundary.

Bs1—11 to 17 inches; strong brown (7.5YR 4/6) sand; weak coarse subangular blocky structure; friable; many very fine, fine, medium, and coarse roots; few faint brown (7.5YR 4/4) masses of iron accumulation ($^1/_4$ to $^1/_2$ inch) in the matrix; common faint dark brown (7.5YR 3/2) iron-filled root channels; about 1 percent gravel; strongly acid; clear wavy boundary.

Bs2—17 to 27 inches; strong brown (7.5YR 4/6) sand; weak coarse subangular blocky structure; friable; common very fine, fine, medium, and coarse roots; common faint dark brown (7.5YR 3/2) iron-filled root channels; about 1 percent gravel; strongly acid; clear wavy boundary.

BC—27 to 33 inches; brownish yellow (10YR 6/6) sand; single grain; loose; few fine and common medium roots; about 1 percent gravel; strongly acid; clear wavy boundary.

C1—33 to 49 inches; yellow (10YR 7/6) sand; single grain; loose; few fine roots; common medium and few fine prominent dark red (2.5YR 3/6) masses of iron accumulation in the matrix; common prominent dark red (2.5YR 3/6) weakly cemented veins about $^1/_4$ to $^1/_2$ inch in thickness; about 1 percent gravel; moderately acid; gradual wavy boundary.

C2—49 to 80 inches; pale brown (10YR 6/3) sand; single grain; loose; few medium prominent dark red (2.5YR 3/6) masses of iron accumulation in the matrix; about 1 percent gravel; neutral.

The thickness of the solum ranges from 20 to 45 inches. The content of gravel ranges from 0 to 14 percent throughout the profile. The depth to redoximorphic features ranges from 24 to 40 inches.

The A horizon has hue of 10YR to 5YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to 2.

The E horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 1 or 2.

The Bs1 horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. It has few or common weakly cemented fragments of ortstein. Some pedons have a Bhs horizon.

The Bs2 horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6.

The BC horizon has hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 4 to 6.

The C horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 3 to 6.

Dawson Series

The Dawson series consists of very poorly drained soils in depressions on moraines, lake plains, and outwash plains. These soils formed in herbaceous organic material over sandy deposits. Permeability is moderately slow to moderately rapid in the organic material and rapid in the underlying sandy material. Slope ranges from 0 to 2 percent.

Taxonomic classification: Sandy or sandy-skeletal, mixed, dysic, frigid Terric Haplosaprists

Typical pedon of Dawson peat, in an area of Dawson-Loxley peats, 900 feet south and 1,800 feet east of the northwest corner of sec. 6, T. 32 N., R. 2 E., Montmorency Township; USGS Lake Geneva, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 11 minutes 46 seconds N. and long. 84 degrees 14 minutes 23 seconds W.

Oi—0 to 4 inches; peat (fibric material), yellow (2.5Y 7/6) broken face, yellowish brown (10YR 5/6) rubbed, yellow (2.5Y 8/6) pressed; 95 percent fiber, 85 percent rubbed; very friable; common very fine and fine roots; fibers consist of sphagnum moss; extremely acid; abrupt smooth boundary.

Oe—4 to 8 inches; mucky peat (hemic material), very dusky red (2.5YR 2.5/2) broken face, black (5YR 2.5/1) rubbed, dark reddish brown (5YR 3/2) pressed; about 45 percent fiber, 30 percent rubbed; weak thick platy structure; very friable; common very fine and fine roots; fibers are woody and herbaceous; common highly decomposed wood fragments; extremely acid; gradual smooth boundary.

Oa—8 to 28 inches; muck (sapric material), very dusky red (2.5YR 2.5/2) broken face and pressed, dusky red (2.5YR 3/2) rubbed; about 70 percent fiber, 10 percent rubbed; weak very thick platy structure; very friable; fibers are herbaceous; common black (10YR 2/1) bands ranging in thickness from $^1/_8$ to $^1/_2$ inch throughout the horizon; extremely acid; abrupt smooth boundary.

C—28 to 80 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; extremely acid.

The thickness of the organic material ranges from 16 to 51 inches.

The Oi horizon is predominantly peat. The content of fiber (unrubbed) ranges from 85 to 95 percent.

The Oa horizon has hue of 2.5YR or 5YR and value of 2, 2.5, or 3. It is predominantly muck. The content of fiber (unrubbed) ranges from 30 to 75 percent.

Deford Series

The Deford series consists of poorly drained soils on outwash plains and in lake basins and glacial drainageways. These soils formed in sandy deposits. Permeability is rapid. Slope ranges from 0 to 2 percent.

Taxonomic classification: Mixed, frigid Typic Psammaquents

Typical pedon of Deford muck, 1,667 feet east and 1,267 feet south of the northwest corner of sec. 14, T. 32 N., R. 2 E., Montmorency Township; USGS Lake Geneva, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 10 minutes 2 seconds N. and long. 84 degrees 9 minutes 28 seconds W.

Oa—0 to 6 inches; black (N 2.5/0) muck, very dark gray (N 3/0) dry; weak fine and medium granular structure; friable; many fine roots and common medium and coarse roots; about 1 percent gravel; strongly acid; abrupt wavy boundary.

Cg—6 to 9 inches; light brownish gray (10YR 6/2) sand; single grain; loose; common fine roots and few medium and coarse roots; about 8 percent gravel and 3 percent cobbles; neutral; clear wavy boundary.

C1—9 to 38 inches; brown (10YR 5/3) sand; single grain; loose; few fine roots; about 7 percent gravel; slightly acid; diffuse wavy boundary.

C2—38 to 45 inches; pale brown (10YR 6/3) sand; single grain; loose; about 4 percent gravel; moderately acid; diffuse wavy boundary.

C3—45 to 80 inches; brown (10YR 5/3) sand; single grain; loose; about 6 percent gravel; slightly acid.

The content of gravel ranges from 0 to 8 percent throughout the profile, and the content of cobbles ranges from 0 to 3 percent.

The Oa horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to 2. It is dominantly muck.

The C horizons have hue of 10YR, value of 5 or 6, and chroma of 2 or 3.

Dorval Series

The Dorval series consists of 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 moderate in the organic layers and very slow in the underlying clayey deposits. Slope ranges from 0 to 2 percent.

Taxonomic classification: 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., Montmorency Township; USGS Hillman, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 7 minutes 20 seconds N. and long. 83 degrees 54 minutes 9 seconds W.

Oa1—0 to 10 inches; muck (sapric material), black (N 2.5/0) broken face; 40 percent fiber, 7 percent rubbed; moderate medium subangular blocky structure; friable; common medium and coarse roots and few fine roots; neutral; clear wavy boundary.

Oa2—10 to 18 inches; muck (sapric material), black (N 2.5/0) broken face; 35 percent fiber, 7 percent rubbed; moderate medium subangular blocky structure; friable; common fine, medium, and coarse roots; common thin lenses of sand 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 roots and few coarse roots in the upper part; common very fine and few fine continuous vertical pores; clay films on cleavage planes and in root channels; common shell fragments; slightly effervescent; slightly alkaline.

The thickness of the organic material over mineral material ranges from 18 to 21 inches.

The Oa horizon has hue of 7.5YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to 2. The content of fiber (unrubbed) ranges from 10 to 35 percent. The horizon contains pieces of dead wood ranging 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. It has free carbonates.

Graycalm Series

The Graycalm series consists of somewhat excessively drained soils on moraines and outwash plains. These soils formed in sandy deposits. Permeability is rapid. Slope ranges from 0 to 45 percent.

Taxonomic classification: Mixed, frigid Lamellic Udipsamments

Typical pedon of Graycalm sand, 0 to 6 percent slopes, 960 feet east and 1,880 feet south of the northwest corner of sec. 17, T. 29 N., R. 3 E., Loud Township; USGS Avery, Michigan, 7.5-minute topographic quadrangle; lat. 44 degrees 54 minutes 29 seconds N. and long. 84 degrees 6 minutes 34 seconds W.

A—0 to 2 inches; black (10YR 2/1) sand, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; many fine and few medium roots; some white (10YR 8/1) uncoated sand grains give the horizon a salt-and-pepper appearance; strongly acid; abrupt smooth boundary.

Bw1—2 to 16 inches; strong brown (7.5YR 5/6) sand; weak very fine and fine subangular blocky structure; very friable; many fine roots and common medium and coarse roots; about 3 percent gravel and 1 percent cobbles; very strongly acid; clear smooth boundary.

Bw2—16 to 27 inches; reddish yellow (7.5YR 6/6) sand; weak fine and medium subangular blocky structure; very friable; few fine roots and many medium and coarse roots; about 3 percent gravel and 2 percent cobbles; strongly acid; gradual wavy boundary.

E and Bt—27 to 80 inches; yellow (10YR 7/6) sand (E); lamellae ($^1/_8$ to $^1/_4$ inch thick) of yellowish red (5YR 5/6) loamy sand (Bt); total accumulation of lamellae is less than 4 inches; single grain; loose;

few fine and medium roots in the upper 20 inches of the horizon; about 3 percent gravel and 1 percent cobbles; strongly acid.

The thickness of the solum ranges from 40 to more than 80 inches. The depth to the E and Bt horizon ranges from 25 to 42 inches. The content of gravel ranges from 0 to 14 percent throughout the profile. The content of cobbles ranges from 0 to 3 percent.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3.

Some pedons have an E horizon above the Bw horizon. The E horizon, if it occurs, is 1 to 4 inches thick. It has hue of 7.5YR, value of 4 to 6, and chroma of 1 to 3.

The Bw horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 6.

Some pedons have an E horizon below the Bw horizon. The E horizon, if it occurs, and the E part of the E and Bt horizon have hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 2 to 6.

The Bt part of the E and Bt horizon consists of lamellae $^{1}/_{16}$ inch to 3 inches thick. The total accumulation of the lamellae within a depth of 60 inches is less than 6 inches. The Bt horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 4 to 6. It is loamy sand or sandy loam.

Grayling Series

The Grayling series consists of excessively drained soils on outwash plains, deltas, and lake plains. These soils formed in sandy deposits. Permeability is rapid. Slope ranges from 0 to 35 percent.

Taxonomic classification: Mixed, frigid Typic Udipsamments

Typical pedon of Grayling sand, 0 to 6 percent slopes, 150 feet south and 1,420 feet east of the northwest corner of sec. 5, T. 31 N., R. 2 E., Briley Township; USGS Atlanta, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 6 minutes 45 seconds N. and long. 84 degrees 13 minutes 13 seconds W.

A—0 to 5 inches; black (10YR 2/1) sand, very dark gray (10YR 3/1) dry; uncoated light gray (10YR 7/2) sand grains mixed throughout the horizon result in a salt-and-pepper appearance; weak fine granular structure; very friable; many fine and medium roots and common coarse roots; strongly acid; abrupt wavy boundary.

Bw—5 to 17 inches; yellowish red (5YR 4/6) sand; weak fine and medium subangular blocky structure; very friable; common fine and medium roots and few coarse and very coarse roots; about 2 percent gravel; moderately acid; gradual wavy boundary.

C—17 to 80 inches; brownish yellow (10YR 6/6) sand; single grain; loose; few fine and medium roots; two fine strong brown (7.5YR 5/6) color bands at a depth of about 65 inches; about 2 percent gravel; strongly acid.

The thickness of the solum ranges from 15 to 37 inches. The content of gravel ranges from 0 to 7 percent throughout the profile.

The A horizon has hue of 10YR or 7.5YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to 2. It is dominantly sand, but the range includes loamy sand.

Some pedons have an E horizon.

The Bw horizon has hue of 5YR to 10YR and value and chroma of 4 to 6.

The C horizon has hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 2 to 6. It is sand or coarse sand.

Histosols

Histosols consist of very poorly drained soils on outwash plains and moraines. These soils formed in organic material. Permeability ranges from moderately rapid to moderately slow. Slopes are 0 to 1 percent.

Taxonomic classification: Histosols

The thickness of the organic materials ranges from 16 to more than 50 inches. The surface tiers are dominantly muck or mucky peat, but the range includes peat. Subsurface tiers are dominantly muck, but the range includes mucky peat. The organic materials typically have hue of 5YR, 7.5YR, or 10YR or are neutral in hue. They have value of 2 or 3 and chroma of 0 to 3.

The texture of the mineral substratum horizons ranges from sand to clay. These horizons have hue of 5YR to 5Y, value of 5 or 6, and chroma of 1 to 3.

Horsehead Series

The Horsehead series consists of somewhat excessively drained soils on outwash plains, in outwash channels, and on river and stream terraces, eskers, deltas, and moraines. These soils formed in gravelly and sandy glaciofluvial deposits. Permeability is rapid or very rapid. Slope ranges from 0 to 70 percent.

Taxonomic classification: Sandy-skeletal, mixed, frigid Arenic Hapludalfs

Typical pedon of Horsehead sand, 0 to 6 percent slopes, 1,500 feet south and 2,650 feet west of the northeast corner of sec. 36, T. 29 N., R. 1 E., Albert

Township; USGS Comstock Hills, Michigan, 7.5-minute topographic quadrangle; lat. 44 degrees 51 minutes 56 seconds N. and long. 84 degrees 15 minutes 45 seconds W.

A—0 to 2 inches; very dark gray (10YR 3/1) sand, dark gray (10YR 4/1) dry; weak medium granular structure; very friable; many very fine and fine roots and common medium roots; about 1 percent gravel and 1 percent cobbles; strongly acid; abrupt smooth boundary.

Bw1—2 to 10 inches; dark yellowish brown (10YR 4/6) gravelly sand; weak medium subangular blocky structure; very friable; many very fine, fine, medium, and coarse roots; 25 percent gravel and 2 percent cobbles; moderately acid; abrupt wavy boundary.

Bw2—10 to 19 inches; yellowish brown (10YR 5/8) gravelly sand; weak fine and medium subangular blocky structure; very friable; many very fine and fine roots and common medium and coarse roots; 25 percent gravel and 2 percent cobbles; moderately acid; clear wavy boundary.

Bw3—19 to 27 inches; yellowish brown (10YR 5/6) gravelly sand; weak fine, medium, and coarse subangular blocky structure; very friable; few fine and very fine roots; 30 percent gravel and 3 percent cobbles; moderately acid; clear wavy boundary.

2Bt—27 to 36 inches; dark yellowish brown (10YR 3/4) very gravelly loamy sand; weak fine and medium subangular blocky structure; very friable; many very fine and fine roots and common medium roots; few clay bridges between sand grains; 55 percent gravel and 5 percent cobbles; neutral; abrupt wavy boundary.

2C—36 to 80 inches; light yellowish brown (10YR 6/4) very gravelly sand; single grain; loose; few very fine and fine roots; 46 percent gravel and 5 percent cobbles; slightly alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 45 inches, but the typical range is from 23 to 39 inches. Reaction ranges from very strongly acid to moderately alkaline in the solum. The content of gravel ranges from 0 to 55 percent throughout the profile, and the content of cobbles ranges from 0 to 20 percent. The content of stones ranges from 0 to 5 percent throughout the profile. In some pedons the content of gravel in the solum and substratum ranges from 0 to 65 percent by volume. The content of rock fragments in thin subhorizons and lenses can range as high as 90 percent by volume. The average content of rock fragments in the particle-size control section is 45 percent by volume.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1. It is dominantly sand, but the range includes loamy sand. Some pedons have a thin (1 to 2 inches thick) Oe horizon above the A horizon. The Oe horizon, if it occurs, has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2.

Some pedons have an E horizon above the Bw horizon. The E horizon, if it occurs, is 1 to 3 inches thick. It has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 or 3. It is sand or gravelly sand.

The Bw horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 4 to 8. It is dominantly sand, but the range includes loamy sand, gravelly sand, and very gravelly sand.

Some pedons have an E/B horizon above the Bt horizon. The E part of the E/B horizon has hue of 10YR or 7.5YR, value of 6, and chroma of 4. It is gravelly sand or very gravelly sand. The Bt part of this horizon has hue of 7.5YR, value of 4, and chroma of 4 to 6. It is gravelly loamy sand or very gravelly loamy sand.

The 2Bt horizon has hue of 10YR to 5YR, value of 3 or 4, and chroma of 4 to 6. It is dominantly very gravelly loamy sand or gravelly loamy sand, but the range includes extremely gravelly loamy sand. Some pedons have thin subhorizons and lenses of extremely gravelly sandy loam, very gravelly sandy loam, and gravelly sandy loam.

The 2C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. It is commonly stratified extremely gravelly sand, very gravelly sand, gravelly sand, or sand.

Iosco Series

The Iosco series consists of somewhat poorly drained soils on ground moraines, outwash plains, and lake plains. These soils formed in sandy deposits underlain by loamy deposits. Permeability is rapid in the upper sandy layers and moderate or moderately slow in the underlying loamy layers. Slope ranges from 0 to 6 percent.

Taxonomic classification: Sandy over loamy, mixed, active, frigid Argic Endoaquods

Typical pedon of Iosco sand, 0 to 6 percent slopes, 1,350 feet south and 1,000 feet west of the northeast corner of sec. 18, T. 31 N., R. 1 E., Vienna Township; USGS Hetherton, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 4 minutes 50 seconds N. and long. 84 degrees 21 minutes 9 seconds W.

A—0 to 3 inches; black (N 2.5/0) sand, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; many very fine, fine, medium, and coarse roots; uncoated sand grains (30 percent) result in a salt-and-pepper appearance; about 1 percent gravel; strongly acid; abrupt wavy boundary.

E—3 to 12 inches; pinkish gray (7.5YR 6/2) sand, light gray (10YR 7/2) dry; single grain; loose; common very fine and fine roots and few medium and coarse roots; about 1 percent gravel; strongly acid; abrupt smooth boundary.

Bhs—12 to 15 inches; dark reddish brown (5YR 3/2) sand; moderate medium subangular blocky structure; firm; few fine distinct strong brown (7.5YR 5/8) masses of iron accumulation in the matrix; few fragments of weakly cemented ortstein; about 1 percent gravel; strongly acid; clear wavy boundary.

Bs—15 to 18 inches; strong brown (7.5YR 4/6) sand; moderate medium subangular blocky structure; firm; few fine faint strong brown (7.5YR 5/8) masses of iron accumulation in the matrix; about 1 percent gravel; strongly acid; abrupt wavy boundary.

E´—18 to 20 inches; pale brown (10YR 6/3) loamy sand, light gray (10YR 7/2) dry; massive; firm; few fine and medium roots; about 2 percent gravel; neutral; abrupt irregular boundary.

2B/E—20 to 30 inches; about 75 percent reddish brown (5YR 4/4) sandy clay loam (Bt); surrounded by yellowish brown (10YR 5/4) loamy sand (E); moderate medium and coarse subangular blocky structure; firm; few fine and medium roots; few fine prominent strong brown (7.5YR 5/8) masses of iron accumulation in the matrix; about 2 percent gravel; neutral; gradual wavy boundary.

2Bt—30 to 42 inches; reddish brown (5YR 4/4) sandy clay loam; moderate medium and coarse subangular blocky structure; firm; few fine and medium roots; few fine prominent strong brown (7.5YR 5/8) masses of iron accumulation in the matrix; about 2 percent gravel; neutral; gradual wavy boundary.

2C—42 to 80 inches; brown (7.5YR 5/4) loam; massive; firm; few fine and medium roots; many medium distinct gray (7.5YR 6/1) iron depletions and strong brown (7.5YR 5/8) masses of iron accumulation in the matrix; about 5 percent gravel; slightly effervescent; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 34 to 48 inches. The content of gravel ranges from 0 to 14 percent throughout the profile.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 or 1. It is dominantly sand, but the range includes loamy sand.

The E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 or 3.

The Bhs horizon has hue of 7.5YR or 5YR, value of 3, and chroma of 2 or 3.

The Bs horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 4 to 6.

The E´ horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 or 3.

Some pedons have a B/E horizon. The E part of the B/E horizon occurs as thick coatings on peds and fillings in cracks and root channels in the upper part of the horizon.

The 2Bt horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 3 to 6. It is sandy clay loam, clay loam, loam, or silty clay loam.

The 2C horizon has hue of 7.5YR or 5YR, value of 5 or 6, and chroma of 2 to 4. It is loam, sandy loam, clay loam, or silty clay loam.

Kellogg Series

The Kellogg series consists of moderately well drained soils on lake plains and on smaller lake plains within outwash areas and ground moraines. These soils formed in sandy materials underlain by clayey lacustrine materials. Permeability is rapid in the upper sandy layers and very slow in the underlying clayey layers. Slope ranges from 0 to 6 percent.

Taxonomic classification: Sandy over clayey, mixed, active, frigid Alfic Oxyaquic Haplorthods

Typical pedon of Kellogg sand, 0 to 6 percent slopes, 1,410 feet east and 55 feet south of the northwest corner of sec. 26, T. 30 N., R. 4 E., Rust Township; USGS Rust, Michigan, 7.5-minute topographic quadrangle; lat. 44 degrees 58 minutes 21 seconds N. and long. 83 degrees 55 minutes 29 seconds W.

A—0 to 3 inches; black (N 2.5/0) sand, very dark grayish brown (10YR 3/2) dry; moderate fine and medium granular structure; very friable; many fine and few medium roots; moderately acid; abrupt wavy boundary.

E—3 to 10 inches; pinkish gray (7.5YR 6/2) sand, pinkish gray (7.5YR 7/2) dry; weak fine and medium subangular blocky structure; very friable; common fine roots; slightly acid; abrupt wavy boundary.

Bs1—10 to 16 inches; dark brown (7.5YR 3/4) sand; weak fine and medium subangular blocky structure; very friable; common fine roots; slightly acid; clear wavy boundary.

Bs2—16 to 30 inches; strong brown (7.5YR 4/6) sand; weak fine and medium subangular blocky structure; very friable; about 20 percent chunks and pieces of strong brown (7.5YR 4/6) and brownish yellow (10YR 6/6) ortstein; few fine roots; slightly acid; diffuse wavy boundary.

E´—30 to 39 inches; light yellowish brown (10YR 6/4) fine sand, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; very friable; few fine and medium distinct strong brown (7.5YR 5/6) masses of iron accumulation in the matrix; neutral; abrupt wavy boundary.

2Bt—39 to 46 inches; brown (7.5YR 5/4) silty clay; moderate fine subangular blocky structure; firm; common faint brown (7.5YR 5/4) clay films on faces of peds; common fine and medium faint strong brown (7.5YR 5/6) masses of iron accumulation and common fine prominent light gray (5Y 6/1) iron depletions in the matrix; about 1 percent fine gravel; neutral; gradual wavy boundary.

2C—46 to 80 inches; brown (7.5YR 5/4) silty clay; massive; very firm; common fine and medium distinct strong brown (7.5YR 5/6) masses of iron accumulation and common fine prominent light gray (5Y 6/1) iron depletions in the matrix; about 1 percent fine gravel; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 46 to 49 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, 2.5, or 3 and chroma of 0 or 1. It is dominantly sand, but the range includes loamy sand.

The E horizon has hue of 7.5YR, value of 6, and chroma of 2 or 3.

The Bs horizon has hue of 7.5YR, value of 3 or 4, and chroma of 4 to 6. It has fragments of weakly to strongly cemented ortstein in some pedons.

The E´ horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 3 to 6.

The 2Bt horizon has hue of 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is clay, silty clay, or silty clay loam.

The 2C horizon has hue of 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is clay, silty clay, or silty clay loam.

Kinross Series

The Kinross series consists of poorly drained soils on lake terraces, outwash plains, lake plains, and ground moraines. These soils formed in sandy deposits. Permeability is rapid. Slope ranges from 0 to 2 percent.

Taxonomic classification: Sandy, mixed, frigid Typic Endoaquods

Typical pedon of Kinross mucky peat, in an area of Kinross-Au Gres complex, 0 to 3 percent slopes, 675 feet north and 3,140 feet west of the southeast corner of sec. 35, T. 32 N., R. 3 E., Montmorency Township; USGS Atlanta SE, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 6 minutes 52 seconds N. and long. 84 degrees 2 minutes 1 second W.

Oe—0 to 2 inches; black (5YR 2.5/1) mucky peat (hemic material); about 45 percent fiber, 30 percent rubbed; weak very fine granular structure; very friable; many very fine, fine, medium, and coarse roots; extremely acid; abrupt smooth boundary.

Oa—2 to 4 inches; black (N 2.5/0) muck (sapric material); 75 percent fiber, 10 percent rubbed; moderate fine granular structure; very friable; many very fine, fine, medium, and coarse roots; 10 percent uncoated sand grains; extremely acid; clear wavy boundary.

E—4 to 11 inches; grayish brown (10YR 5/2) sand, gray (7.5YR 6/1) dry (upper part); light brownish gray (10YR 6/2) sand, light gray (10YR 7/1) dry (lower part); weak fine and medium subangular blocky structure; very friable; common very fine and fine roots and few medium roots; common fine prominent reddish yellow (7.5YR 6/8) masses of iron accumulation in the matrix; common black (N 2.5/0) organic stains and deposits from the overlying organic layers in the upper 2 inches of the horizon; about 1 percent gravel; extremely acid; abrupt wavy boundary.

Bhs—11 to 13 inches; dark reddish brown (5YR 3/3) sand; moderate fine and medium subangular blocky structure; friable; common very fine and fine roots; some areas of black (5YR 2.5/1) organic accumulations; common fine distinct yellowish red (5YR 5/8) masses of iron accumulation in the matrix; about 9 percent of the horizon consists of a column of weakly cemented ortstein extending into the Bs horizon; about 1 percent gravel; extremely acid; abrupt wavy boundary.

Bs—13 to 21 inches; dark brown (7.5YR 3/4) sand; moderate fine and medium subangular blocky structure; friable; common very fine and fine roots; common fine and medium distinct yellowish brown (10YR 5/8) masses of iron accumulation in the matrix; about 29 percent of the horizon consists of a column of weakly cemented ortstein; about 1 percent gravel; extremely acid; clear wavy boundary.

BC—21 to 30 inches; dark yellowish brown (10YR 4/6) sand; weak medium subangular blocky structure; friable; about 1 percent gravel; extremely acid; diffuse wavy boundary.

C—30 to 80 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; about 1 percent gravel; extremely acid.

The thickness of the solum ranges from 30 to 55 inches. The content of gravel ranges from 0 to 6 percent throughout the profile.

The E horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 1 or 2.

The Bhs horizon, if it occurs, has hue of 5YR, value of 2 or 3, and chroma of 1 to 3. The content of ortstein in this horizon commonly ranges from 0 to 40 percent.

The Bs horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. The content of ortstein in this horizon commonly ranges from 0 to 20 percent.

Some pedons have a BC horizon.

The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6.

Klacking Series

The Klacking series consists of well drained soils on outwash plains, kames, and moraines. These soils formed in sandy glacial deposits. Permeability is moderately rapid. Slope ranges from 0 to 35 percent.

Taxonomic classification: Loamy, mixed, semiactive, frigid Arenic Glossudalfs

Typical pedon of Klacking sand, 6 to 18 percent slopes, 840 feet east and 13 feet north of the southwest corner of sec. 31, T. 32 N., R. 2 E., Montmorency Township; USGS Atlanta, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 6 minutes 47 seconds N. and long. 84 degrees 14 minutes 35 seconds W.

A—0 to 4 inches; very dark gray (10YR 3/1) sand, grayish brown (10YR 5/2) dry; weak fine and medium granular structure; very friable; many fine and medium roots and common coarse roots; 10 percent white (10YR 8/1) uncoated sand grains; about 6 percent gravel and 3 percent cobbles; very strongly acid; abrupt wavy boundary.

Bw—4 to 23 inches; strong brown (7.5YR 4/6) sand; weak fine and medium subangular blocky structure; very friable; common fine, medium, coarse, and very coarse roots; about 2 percent stones, 3 percent cobbles, and 6 percent gravel; moderately acid; gradual wavy boundary.

E—23 to 30 inches; brownish yellow (10YR 6/6) sand, very pale brown (10YR 7/3) dry; weak fine and medium subangular blocky structure; very friable; few fine, medium, and coarse roots; about 3 percent cobbles and 3 percent gravel; moderately acid; gradual wavy boundary.

E and Bt—30 to 40 inches; about 75 percent light brown (7.5YR 6/4) sand (E); weak fine and medium subangular blocky structure; very friable; lamellae of yellowish red (5YR 4/6) sandy loam and loamy sand (Bt); weak fine and medium subangular blocky structure; friable; some clay bridging between sand grains; the lamellae (Bt) range in thickness from $^{1}/_{2}$ to $^{3}/_{4}$ inch; individual bands also vary in thickness; few fine and medium roots in the upper part of the horizon; about 2 percent gravel; moderately acid; clear wavy boundary.

Bt and E—40 to 80 inches; about 65 percent yellowish red (5YR 4/6) sandy loam and loamy sand (Bt); weak medium subangular blocky structure; friable; some clay bridging between sand grains; Bt material occurs as bands ranging in thickness from $^{1}/_{2}$ inch to 3 inches; light brown (7.5YR 6/4) sand (E); single grain; loose; few fine roots; about 3 percent gravel; moderately acid.

The thickness of the solum ranges from 46 to more than 80 inches. The content of gravel ranges from 0 to 12 percent throughout the profile, and the content of cobbles ranges from 0 to 2 percent.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to 2. It is dominantly sand, but the range includes loamy sand.

Some pedons have an E horizon above the Bw horizon. The E horizon, if it occurs, has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 or 3.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. It is sand or loamy sand.

The E horizon below the Bw horizon and the E part of the E and Bt and Bt and E horizons have hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4.

The Bt part of the E and Bt and Bt and E horizons occurs as bands or lamellae $^{1}/_{2}$ inch to 3 inches thick. The combined thickness of the bands ranges from 6 to 11 inches. The depth to the top of the lamellae ranges from 16 to 30 inches. The Bt part of the E and Bt and Bt and E horizons has hue of 5YR, 7.5YR, or 10YR and value and chroma of 4 to 6. It is loamy sand or sandy loam.

The C horizon, if it occurs, has hue of 10YR, value of 5 to 7, and chroma of 3 to 6. It is sand.

Lindquist Series

The Lindquist series consists of somewhat excessively drained, rapidly permeable soils on moraines and outwash plains. These soils formed in sandy deposits. Slope ranges from 0 to 35 percent.

Taxonomic classification: Sandy, mixed, frigid Lamellic Haplorthods

Typical pedon of Lindquist sand, 0 to 6 percent slopes, 1,300 feet north and 100 feet east of the southwest corner of sec. 18, T. 32 N., R. 1 E., Montmorency Township; USGS Silver Lake, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 9 minutes 34 seconds N. and long. 84 degrees 21 minutes 58 seconds W.

A—0 to 1 inch; black (N 2.5/0) sand, black (10YR 2/1) dry; moderate medium granular structure; very friable; many very fine and fine roots and common medium roots; 30 percent light brownish gray (10YR 6/2) uncoated sand grains; about 2 percent gravel; very strongly acid; abrupt smooth boundary.

E—1 to 3 inches; light brownish gray (10YR 6/2) sand, light gray (10YR 7/2) dry; weak fine subangular blocky structure; very friable; many very fine and fine, common medium, and few coarse roots; about 2 percent gravel; very strongly acid; clear wavy boundary.

Bs1—3 to 10 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; friable; many fine, medium, and coarse roots; about 3 percent gravel; strongly acid; clear wavy boundary.

Bs2—10 to 16 inches; dark yellowish brown (10YR 4/6) sand; weak medium subangular blocky structure; very friable; many fine, medium, and coarse roots; about 3 percent gravel; strongly acid; clear wavy boundary.

Bs3—16 to 22 inches; yellowish brown (10YR 5/6) sand; weak medium subangular blocky structure; very friable; common medium and coarse roots; about 3 percent gravel; strongly acid; clear wavy boundary.

E´—22 to 34 inches; pale brown (10YR 6/3) sand, very pale brown (10YR 7/3) dry; single grain; loose; few medium and coarse roots; about 3 percent gravel; moderately acid; gradual wavy boundary.

E and Bt—34 to 100 inches; pale brown (10YR 6/3) sand (E), very pale brown (10YR 7/3) dry; lamellae (1/8 to 1 inch thick) of strong brown (7.5YR 4/6) loamy sand (Bt); total accumulation of lamellae is less than 5 inches; single grain; loose; few medium and coarse roots; about 3 percent gravel; moderately acid.

The thickness of the solum ranges from 40 to more than 80 inches. The content of gravel ranges from 0 to 14 percent throughout the profile, and the content of cobbles ranges from 0 to 3 percent.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to 3.

The E horizon, if it occurs, is 1 to 4 inches thick. It has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 or 3.

The Bs1 horizon has hue of 10YR or 7.5YR and value and chroma of 4. The Bs2 and Bs3 horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6.

The E´ horizon, if it occurs, 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 2 to 4.

The Bt part of the E and Bt horizon consists of lamellae 1/16 inch to 3 inches thick. The total accumulation of lamellae within a depth of 80 inches is less than 6 inches. The Bt part of the E and Bt horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 4 to 6. It is loamy sand or sandy loam.

Loxley Series

The Loxley series consists of very poorly drained soils in depressions on outwash plains, till plains, and lake plains. These soils formed in herbaceous organic deposits. Permeability ranges from moderately slow to moderately rapid. Slope ranges from 0 to 2 percent.

Taxonomic classification: Dysic, frigid Typic Haplosaprists

Typical pedon of Loxley peat, in an area of Dawson-Loxley peats, 250 feet south and 1,750 feet east of the northwest corner of sec. 14, T. 32 N., R. 2 E., Montmorency Township; USGS Lake Geneva, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 10 minutes 11 seconds N. and long. 84 degrees 9 minutes 28 seconds W.

Oi—0 to 5 inches; peat, yellow (10YR 7/6) broken face, brownish yellow (10YR 6/6) rubbed, very pale brown (10YR 8/4) pressed; about 95 percent fibers, 80 percent rubbed; very friable; common medium and coarse roots and many fine roots; about 80 percent sphagnum, 20 percent herbaceous; common partially decomposed woody stems; extremely acid; clear smooth boundary.

Oe—5 to 10 inches; mucky peat (hemic material), very dusky red (2.5YR 2.5/2) broken face, black (N 2.5/0) rubbed, very dusky red (2.5YR 2.5/2) pressed; about 55 percent fibers, 20 percent rubbed; weak fine and medium granular structure;

very friable; common very fine and fine roots and few medium roots; about 80 percent sphagnum, 20 percent herbaceous; common moderately decomposed woody fragments; extremely acid; clear smooth boundary.

Oa1—10 to 38 inches; muck (sapric material), dusky red (2.5YR 3/2) broken face, very dusky red (2.5YR 2.5/2) rubbed; about 30 percent fibers, 10 percent rubbed; moderate medium and thick platy structure; very friable; few very fine roots; few highly decomposed woody fragments; common black (N 2.5/0) horizontal bands 1/8 to 1/4 inch in thickness; extremely acid; diffuse smooth boundary.

Oa2—38 to 80 inches; muck (sapric material), dark reddish brown (5YR 3/2) broken face, very dusky red (2.5YR 2/2) rubbed, dark reddish brown (5YR 3/2) pressed; about 30 percent fibers, 7 percent rubbed; moderate medium and thick platy structure; very friable; extremely acid.

The thickness of the organic material ranges from 51 to more than 80 inches.

The Oe horizon is predominantly mucky peat and contains 2 to 25 percent moderately decomposed woody fragments. The fiber content (unrubbed) ranges from 55 to 65 percent.

The Oa horizon has hue of 2.5YR or 5YR and value of 2 or 3. It is predominantly muck and contains 0 to 2 percent highly decomposed woody fragments. The fiber content (unrubbed) ranges from 25 to 30 percent.

Lupton Series

The Lupton series consists of very poorly drained soils in depressions on moraines, outwash plains, and lake plains. These soils formed in highly decomposed organic deposits. Permeability ranges from moderately slow to moderately rapid. Slope ranges from 0 to 2 percent.

Taxonomic classification: Euic, frigid Typic Haplosaprists

Typical pedon of Lupton muck, in an area of Tawas-Lupton mucks, 1,270 feet east and 2,310 feet north of the southwest corner of sec. 8, T. 32 N., R. 1 E., Montmorency Township; USGS Silver Lake, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 10 minutes 36 seconds N. and long. 84 degrees 20 minutes 39 seconds W.

Oa1—0 to 8 inches; muck (sapric material), dark reddish brown (5YR 2.5/2) broken face, black (5YR 2.5/1) rubbed and pressed; about 30 percent fiber, 5 percent rubbed; weak fine granular structure; very friable; few fine, medium, and coarse roots; primarily woody fibers; many highly decomposed woody fragments; slightly alkaline; clear smooth boundary.

Oa2—8 to 34 inches; muck (sapric material), black (N 2.5/0) broken face, black (5YR 2.5/1) rubbed, very dusky red (2.5YR 2.5/2) pressed; about 25 percent fiber, 5 percent rubbed; moderate very coarse and medium granular structure; very friable; few fine roots; herbaceous and woody fibers; about 8 percent highly decomposed woody fragments; slightly alkaline; diffuse smooth boundary.

Oa3—34 to 48 inches; muck (sapric material), black (5YR 2.5/1) broken face and rubbed, very dark gray (5YR 3/1) pressed; about 30 percent fiber, 5 percent rubbed; moderate coarse and medium granular structure; very friable; herbaceous and woody fibers; common highly decomposed woody fragments; neutral; diffuse smooth boundary.

Oa4—48 to 80 inches; muck (sapric material), black (5YR 2.5/1) broken face, rubbed, and pressed; about 40 percent fiber, 10 percent rubbed; massive; herbaceous fibers; neutral.

The thickness of the organic material ranges from 51 to more than 80 inches.

The Oa horizon has hue of 5YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to 2. It is predominantly muck and contains 15 to 30 percent highly decomposed woody fragments. The fiber content ranges from 25 to 40 percent unrubbed and from 5 to 10 percent rubbed.

Mancelona Series

The Mancelona series consists of somewhat excessively drained soils on outwash plains, moraines, river and stream terraces, and old beach ridges. These soils formed in sandy and gravelly glacial outwash deposits. Permeability is moderately rapid in the upper part and very rapid in the lower part. Slope ranges from 0 to 70 percent.

Taxonomic classification: 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., Montmorency Township; USGS Atlanta, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 6 minutes 47 seconds N. and long. 84 degrees 10 minutes 21 seconds W.

A—0 to 3 inches; black (N 2.5/0) 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, very pale brown (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 roots 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 roots 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; thin lamellae of yellowish red (5YR 5/6) loamy sand ranging in thickness from $^1/_4$ to $^1/_2$ inch 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; continuous prominent reddish brown (5YR 4/4) clay bridges between sand grains and coatings on the surfaces of coarse fragments; neutral; clear wavy boundary.

3C—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.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to 2. It is dominantly sand, but the range includes 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 or loamy sand or the gravelly analogs of these 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 or loamy sand or the gravelly analogs of these textures.

The E´ horizon has hue of 7.5YR or 10YR, value of 6, and chroma of 4. It is sand or loamy sand or the gravelly analogs of these 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, or sandy clay loam or the gravelly analogs of these textures.

The 3C 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, moderately permeable soils on ground moraines. These soils formed in loamy glacial till. Slope ranges from 0 to 50 percent.

Taxonomic classification: Coarse-loamy, mixed, semiactive, frigid Haplic Glossudalfs

Typical pedon of McGinn loamy sand, 6 to 12 percent slopes, 150 feet south and 1,980 feet west of the northeast corner of sec. 23, T. 28 N., R. 6 E.; USGS Hubbard Lake Southwest, Michigan, 7.5-minute topographic quadrangle; lat. 44 degrees 48 minutes 53.50 seconds N. and long. 83 degrees 40 minutes 19.78 seconds W.

Oi—0 to 1 inch; black (5YR 2.5/1), partially decomposed forest litter; strongly acid; abrupt smooth boundary.

A—1 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 3 percent gravel and 1 percent cobbles; very strongly acid; abrupt broken boundary.

E—2 to 4 inches; light brownish gray (10YR 6/2) loamy sand; weak fine subangular blocky structure; friable; common fine roots; about 3 percent gravel and 1 percent cobbles; very strongly acid; abrupt broken boundary.

Bw1—4 to 6 inches; strong brown (7.5YR 4/6) loamy sand; weak medium subangular blocky structure; friable; many fine and few medium roots; about 3 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

Bw2—6 to 16 inches; dark yellowish brown (10YR 4/4) loamy sand; moderate coarse subangular blocky structure; friable (about 10 percent of the matrix is slightly brittle); common medium roots; about 3 percent gravel and 1 percent cobbles; strongly acid; abrupt wavy boundary.

E´—16 to 18 inches; grayish brown (10YR 5/2) loamy sand; weak thick platy structure; slightly brittle; about 3 percent gravel and 1 percent cobbles; moderately acid; abrupt broken boundary.

E/B—18 to 21 inches; about 75 percent grayish brown (10YR 5/2) loamy sand (E); weak thick platy structure; friable; surrounding peds of reddish brown (5YR 4/4) sandy loam (Bt); weak medium subangular blocky structure; slightly brittle; few medium roots; many very fine vesicular pores; few discontinuous faint reddish brown (5YR 4/4) clay films on faces of peds; about 3 percent gravel and 1 percent cobbles; moderately acid; abrupt irregular boundary.

B/E—21 to 25 inches; about 80 percent reddish brown (5YR 4/4) sandy loam (Bt); surrounded and coated by grayish brown (10YR 5/2) loamy sand (E); moderate medium subangular blocky structure; friable; few fine roots; many very fine vesicular pores; many continuous distinct dark reddish brown (5YR 3/4) clay films on faces of peds; about 3 percent gravel and 1 percent cobbles; slightly acid; abrupt irregular boundary.

Bt—25 to 35 inches; reddish brown (5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; common fine roots; many very fine vesicular pores; many continuous distinct dark reddish brown (5YR 3/4) clay films on faces of peds; about 3 percent gravel and 1 percent cobbles; slightly acid; clear wavy boundary.

C—35 to 80 inches; light reddish brown (5YR 6/3) sandy loam; massive but with weakly expressed thick platy structure inherited from the parent material; friable; few fine roots in vertical fractures; few continuous prominent white (10YR 8/2) carbonate coatings in vertical fractures; about 5 percent gravel and 1 percent cobbles; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches. The thickness of the sandy upper part of the profile ranges from 14 to 20 inches. The content of gravel ranges from 2 to 10 percent throughout the profile, and the content of cobbles ranges from 0 to 5 percent.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2, 2.5, or 3 and chroma of 0 or 1. Some pedons have an Ap horizon. This horizon, if it occurs, has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The E horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. Hue of 7.5YR and value and chroma of 4 do not occur together. Reaction is strongly acid.

The E´ horizon and the E part of the E/B and B/E horizons have hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2.

The 2Bt horizon and the B part of the E/B and B/E horizons have hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 4. They are sandy loam or loam.

The 2C horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4.

Melita Series

The Melita series consists of somewhat excessively drained soils on moraines, outwash plains, and lake plains. These soils formed in sandy material underlain by loamy material at a depth of 40 to 60 inches. Permeability is rapid in the upper sandy material and moderately slow in the underlying loamy material. Slope ranges from 0 to 6 percent.

Taxonomic classification: Sandy, mixed, frigid Alfic Haplorthods

Typical pedon of Melita sand, 0 to 6 percent slopes, 1,900 feet west and 2,450 feet south of the northeast corner of sec. 24, T. 30 N., R. 2 E., Briley Township; USGS Crooked Lake, Michigan, 7.5-minute topographic quadrangle; lat. 44 degrees 58 minutes 44 seconds N. and long. 84 degrees 8 minutes 24 seconds W.

A—0 to 4 inches; very dark gray (10YR 3/1) sand, very dark grayish brown (10YR 3/2) dry; moderate medium granular structure; very friable; common fine and very fine roots; about 2 percent gravel; 25 percent light gray (10YR 7/1) uncoated sand grains; strongly acid; abrupt smooth boundary.

E—4 to 8 inches; light brownish gray (10YR 6/2) sand, light gray (10YR 7/2) dry; weak medium granular structure; very friable; common fine and very fine roots; about 2 percent gravel; strongly acid; clear wavy boundary.

Bs—8 to 16 inches; brown (7.5YR 4/4) sand; weak fine subangular blocky structure; very friable; common very fine, fine, medium, and coarse roots; about 2 percent gravel; strongly acid; clear wavy boundary.

Bw1—16 to 26 inches; strong brown (7.5YR 5/6) sand; weak fine subangular blocky structure; very friable; common fine roots and few medium and coarse roots; about 2 percent gravel; strongly acid; clear wavy boundary.

Bw2—26 to 43 inches; very pale brown (10YR 7/4) sand; weak medium and fine subangular blocky structure; very friable; very few lamellae (1/8 inch thick) of strong brown (7.5YR 5/6) loamy sand; few medium and coarse roots; about 1 percent gravel; slightly acid; abrupt smooth boundary.

2Bt—43 to 47 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; common distinct reddish brown (5YR 4/3) clay films on faces of peds; few medium roots; neutral; abrupt wavy boundary.

2C—47 to 80 inches; 55 percent light reddish brown (5YR 6/3) and 45 percent light gray (5YR 7/1) silty clay loam; massive; very firm; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 45 to more than 60 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 A horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. Some pedons have an Ap horizon. This horizon, if it occurs, is dominantly sand, but the range includes loamy sand.

The E horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 1 or 2.

The Bs horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is dominantly sand, but the range includes loamy sand. In some pedons this horizon contains ortstein.

The Bw horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 6. It is dominantly sand, but the range includes loamy sand.

The 2Bt horizon has hue of 5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 3 to 6. It is clay loam, loam, or silt clay loam.

The 2C horizon has hue of 5YR to 10YR, value of 3 to 7, and chroma of 1 to 6. It is clay loam, loam, or silty clay loam.

Menominee Series

The Menominee series consists of well drained soils on moraines, till plains, outwash plains, and lake plains. These soils formed in sandy material underlain by loamy glacial till at a depth of 20 to 40 inches. Permeability is rapid in the upper sandy material and moderate or moderately slow in the underlying loamy material. Slope ranges from 12 to 35 percent.

Taxonomic classification: Sandy over loamy, mixed, active, frigid Alfic Haplorthods

Typical pedon of Menominee loamy sand, 12 to 18 percent slopes, 800 feet west and 150 feet north of the southeast corner of sec. 18, T. 30 N., R. 1 E., Vienna Township; USGS Lewiston, Michigan, 7.5-minute topographic quadrangle; lat. 44 degrees 59 minutes 36 seconds N. and long. 84 degrees 22 minutes 0 seconds W.

A—0 to 4 inches; very dark gray (10YR 3/1) loamy sand, dark gray (10YR 4/1) dry; weak medium granular structure; very friable; many very fine and fine roots and common medium and coarse roots; 15 percent gray (10YR 6/1) uncoated sand grains; about 2 percent gravel; strongly acid; abrupt smooth boundary.

E—4 to 6 inches; pinkish gray (7.5YR 6/2) sand, pinkish gray (7.5YR 7/2) dry; weak medium granular structure; very friable; many very fine and fine roots and common medium and coarse roots; about 2 percent gravel; moderately acid; clear wavy boundary.

2Bs—6 to 13 inches; dark brown (7.5YR 3/4) loamy sand; moderate medium subangular blocky structure; friable; common very fine roots and many fine, medium, and coarse roots; few dark brown (7.5YR 3/2) fragments of ortstein; about 3 percent gravel and 2 percent cobbles; moderately acid; clear wavy boundary.

2E—13 to 24 inches; yellowish brown (10YR 5/4) sand, pink (10YR 7/4) dry; weak medium subangular blocky structure; friable; few fine roots and many medium and coarse roots; about 4 percent gravel and 3 percent cobbles; moderately acid; clear wavy boundary.

2Bt—24 to 40 inches; reddish brown (5YR 4/4) sandy clay loam; moderate coarse angular blocky structure; firm; common medium and coarse roots; common distinct reddish brown (5YR 4/4) clay films on faces of peds and bridging of sand grains; a 5-inch lens of gravel at the very top of the horizon; about 10 percent gravel and 4 percent cobbles; slightly effervescent; slightly alkaline; clear wavy boundary.

2C—40 to 80 inches; light reddish brown (5YR 6/4) sandy clay loam; massive; firm; few medium and coarse roots; few distinct pink (5YR 7/3) carbonate streaks; about 7 percent gravel and 3 percent cobbles; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 33 to more than 60 inches. Sandy sediments are 22 to 37 inches thick over loamy glacial till. 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 10YR or 7.5YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to

2. The A horizon is dominantly loamy sand, but the range includes sand. Some pedons have an Ap horizon.

The E horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 2 or 3. It is sand or loamy sand.

The 2Bs horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4 to 6. It is dominantly loamy sand, but the range includes sand. In some pedons this horizon contains ortstein.

The 2E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 4. It is sand or loamy sand.

The 2Bt horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 or 5, and chroma of 3 or 4. It is clay loam, sandy clay loam, sandy loam, or silt loam.

The 2C horizon has hue of 5YR to 10YR, value of 5 or 6, and chroma of 2 to 4. It is clay loam, sandy clay loam, sandy loam, loam, silt loam, or silty clay loam. In some pedons the horizon has strata of sand and fine sand 1/2 inch to 2 inches thick. Free carbonates are present.

Millersburg Series

The Millersburg series consists of well drained soils on ground moraines, end moraines, disintegration moraines, and drumlins. These soils formed in sandy and loamy glacial till. Permeability is moderate or moderately rapid. Slope ranges from 0 to 70 percent.

Taxonomic classification: Coarse-loamy, mixed, active, frigid Haplic Glossudalfs

Typical pedon of Millersburg loamy sand, 0 to 6 percent slopes, 1,866 feet north and 333 feet west of the southeast corner of sec. 2, T. 32 N., R. 2 E., Montmorency Township; USGS Lake Geneva, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 11 minutes 24 seconds N. and long. 84 degrees 8 minutes 44 seconds W.

A—0 to 2 inches; black (N 2.5/0) loamy sand, black (N 2.5/0) dry; moderate medium granular structure; very friable; common fine and very fine roots and few medium roots; about 1 percent gravel; extremely acid; abrupt smooth boundary.

E—2 to 5 inches; brown (7.5YR 5/2) sand, pinkish gray (7.5YR 7/2) dry; weak fine subangular blocky structure; very friable; many fine and very fine roots and few medium and coarse roots; about 1 percent gravel; very strongly acid; clear wavy boundary.

Bw—5 to 10 inches; strong brown (7.5YR 4/6) loamy sand; moderate medium subangular blocky structure; very friable; common fine and very fine roots and few medium and coarse roots; about 2 percent gravel; strongly acid; clear wavy boundary.

E/B—10 to 18 inches; about 65 percent pale brown (10YR 6/3) sand, pinkish gray (7.5YR 7/2) dry (E); surrounding reddish brown (5YR 4/4) sandy loam (Bt); moderate medium subangular blocky structure parting to moderate very fine subangular blocky; very friable; common fine and very fine roots; about 4 percent gravel; very strongly acid; clear irregular boundary.

B/E—18 to 26 inches; about 75 percent reddish brown (5YR 4/4) sandy loam (Bt); surrounded by pinkish gray (7.5YR 7/2) loamy sand (E); moderate medium and coarse subangular blocky structure; firm (Bt); friable (E); many fine roots; clay bridging between sand grains; about 4 percent gravel; slightly acid; clear wavy boundary.

Bt—26 to 34 inches; yellowish red (5YR 4/6) sandy loam; moderate medium and coarse subangular blocky structure; friable; common fine roots; clay bridging between sand grains; about 1 percent cobbles and 1 percent gravel; slightly acid; clear broken boundary.

BC—34 to 43 inches; light reddish brown (5YR 6/3) sandy loam; moderate thick platy structure; friable; clay films around pebbles and clay bridging between sand grains; few fine roots; about 1 percent gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

C—43 to 80 inches; light yellowish brown (10YR 6/4) loamy sand; single grain; loose; some lenses of yellowish brown (10YR 5/4) sand about 2 inches long and 3/4 inch thick; few fine roots; about 12 percent gravel; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 31 to more than 60 inches. The depth to carbonates ranges from 30 to 60 inches. The content of cobbles ranges from 0 to 5 percent throughout the profile, and the content of gravel ranges from 0 to 14 percent.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to 3. It is dominantly loamy sand, but the range includes sand. Reaction ranges from extremely acid to strongly acid.

The E horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 or 3. It is loamy sand or sand. Reaction ranges from extremely acid to strongly acid.

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 or sand. Reaction ranges from very strongly acid to neutral.

The E part of the E/B horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. It is sand or loamy sand and makes up 55 to 75 percent of the horizon. The Bt part of the E/B horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is sandy loam.

The E part of the B/E horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 to 6. It is sand or loamy sand and makes up 15 to 25 percent of the horizon. The Bt part of the B/E horizon has hue of 5YR or 7.5YR, value of 4, and chroma of 4 to 6. It is dominantly sandy loam, but the range includes sandy clay loam.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam or loam. Some pedons have thin subhorizons of sandy clay loam. Reaction in the Bt horizon ranges from slightly acid to slightly alkaline.

The BC horizon has hue of 5YR, value of 6, and chroma of 3 or 4. It is sandy loam.

The C horizon has hue of 5YR, 7.5YR, or 10YR, value of 5 or 6, and chroma of 3 or 4. It is predominantly loamy sand, but the range includes sandy loam. Some pedons have lenses of sand or gravel. Free carbonates are typical.

Morganlake Series

The Morganlake series consists of moderately well drained soils on moraines, till plains, outwash plains, and lake plains. These soils formed in sandy outwash underlain by loamy glacial till at a depth of 20 to 40 inches. Permeability is rapid in the upper sandy outwash and moderate or moderately slow in the lower loamy glacial till. Slope ranges from 0 to 12 percent.

Taxonomic classification: Sandy over loamy, mixed, active, frigid Alfic Oxyaquic Haplorthods

Typical pedon of Morganlake loamy sand, 0 to 6 percent slopes, 1,700 feet south and 1,800 feet east of the northwest corner of sec. 17, T. 29 N., R. 2 E., Albert Township; USGS Crooked Lake, Michigan, 7.5-minute topographic quadrangle; lat. 44 degrees 54 minutes 30 seconds N. and long. 84 degrees 13 minutes 36 seconds W.

Oa—0 to 4 inches; black (5YR 2.5/1), well decomposed forest litter; moderate fine and medium granular structure; very friable; common medium, many fine and very fine, and few coarse roots; 10 percent uncoated sand grains; strongly acid; abrupt wavy boundary.

E—4 to 8 inches; brown (7.5YR 5/2) loamy sand, pinkish gray (7.5YR 7/2) dry; weak fine and medium subangular blocky structure; very friable; common very fine, fine, medium, and coarse roots; 10 percent pinkish gray (7.5YR 6/2) color; about 3 percent fine and medium gravel, 2 percent coarse gravel, and 1 percent cobbles; strongly acid; abrupt smooth boundary.

Bs—8 to 17 inches; 60 percent brown (7.5YR 4/4) and 40 percent dark reddish brown (5YR 3/4) loamy sand; moderate fine and medium subangular blocky structure parting to weak fine granular; friable; common very fine, fine, and medium roots and few coarse roots; about 3 percent fine and medium gravel, 2 percent coarse gravel, and 1 percent cobbles; weakly cemented in places; strongly acid; abrupt wavy boundary.

E/B—17 to 32 inches; pinkish gray (7.5YR 6/2) loamy sand, pinkish gray (7.5YR 7/2) dry; weak coarse subangular blocky structure; friable; few very fine and fine roots; about 10 percent of the horizon is yellowish red (5YR 4/6) sandy clay loam from the Bt horizon; many fine vesicular pores; few distinct reddish brown (5YR 5/3) clay films on faces of peds; few fine and medium strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/8) masses of iron accumulation in the matrix; about 7 percent fine and medium gravel, 3 percent coarse gravel, and 1 percent cobbles; slightly acid; clear irregular boundary.

2B/E—32 to 36 inches; about 75 percent yellowish red (5YR 4/6) clay loam (Bt); moderate coarse subangular blocky structure; firm; surrounded by pinkish gray (7.5YR 6/2) loamy sand (E); moderate fine subangular blocky structure; friable; few very fine and fine roots; common fine vesicular pores; common prominent reddish brown (5YR 5/3) clay films on faces of peds; about 2 percent fine and medium gravel and 1 percent cobbles; moderately acid; abrupt wavy boundary.

2Bt1—36 to 43 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium and coarse subangular blocky structure; firm; few very fine, fine, and coarse roots; many distinct reddish brown (5YR 4/3) clay films on peds; many fine vesicular pores; about 2 percent fine and medium gravel and 1 percent cobbles; slightly acid; clear smooth boundary.

2Bt2—43 to 46 inches; reddish brown (5YR 5/4) silty clay loam; moderate medium and coarse subangular blocky structure; firm; few very fine, fine, and coarse roots; many distinct reddish brown (5YR 4/3) clay films on peds; many distinct brownish yellow (10YR 6/6) silt coatings on faces of peds; many fine vesicular pores; about 2 percent fine and medium gravel and 1 percent cobbles; neutral; abrupt wavy boundary.

2BC—46 to 66 inches; reddish brown (5YR 4/4) sandy loam with strata of sandy clay loam; weak coarse subangular blocky structure; friable; few very fine, fine, and medium roots; about 2 percent fine and medium gravel and 1 percent cobbles; slightly effervescent; slightly alkaline; gradual wavy boundary.

2C—66 to 80 inches; light reddish brown (5YR 6/4) loam; massive; firm; few very fine and fine roots; slightly effervescent; moderately alkaline.

The thickness of the solum ranges from 33 to more than 60 inches. Sandy sediments are 22 to 37 inches thick over loamy glacial till. The content of gravel ranges from 0 to 8 percent throughout the profile, and the content of cobbles ranges from 0 to 5 percent.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3. Some pedons have an undisturbed A horizon. This horizon, if it occurs, is dominantly loamy sand, but the range includes sand.

The E horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 2 or 3. It is dominantly sand, but the range includes loamy sand.

The Bs horizon has hue of 5YR or 7.5YR, value of 3 to 6, and chroma of 4 to 6. It is dominantly loamy sand, but the range includes sand. In some pedons this horizon contains ortstein.

The E part of the E/B and 2B/E horizons has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 2 or 3. It is loamy sand or sand. The Bt part of the E/B horizon and the 2Bt part of the 2B/E horizon have hue of 5YR, value of 3 to 6, and chroma of 4 to 6. They are sandy clay loam, clay loam, or silty clay loam.

The 2Bt horizon has hue of 5YR, value of 3 to 6, and chroma of 4 to 6. It is clay loam, sandy clay loam, or silty clay loam.

The 2C horizon has hue of 5YR or 7.5YR, value of 3 to 6, and chroma of 2 to 4. It is clay loam, sandy clay loam, sandy loam, loam, silt loam, or silty clay loam. Some pedons have strata of sand and fine sand 1/2 inch to 2 inches thick. Free carbonates are present.

Negwegon Series

The Negwegon series consists of moderately well drained soils on lake plains. These soils formed in silty and clayey lacustrine sediments. Permeability is very slow. Slope ranges from 2 to 12 percent.

Taxonomic classification: Fine, mixed, semiactive, frigid Oxyaquic Glossudalfs

Typical pedon of Negwegon silt loam, 6 to 12 percent slopes, 400 feet west and 50 feet south of the northeast corner of sec. 24, T. 31 N., R. 4 E., Hillman Township; USGS Hillman, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 4 minutes 14 seconds N. and long. 83 degrees 52 minutes 55 seconds W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure; friable; many very fine and fine roots and common medium roots; about 1 percent gravel; slightly acid; abrupt wavy boundary.

E/B—5 to 8 inches; about 80 percent pinkish gray (7.5YR 6/2) silt loam (E); occurring as tongues extending into or completely surrounding reddish brown (5YR 4/4) silty clay (Bt); moderate medium and fine subangular blocky structure; firm; many very fine and fine roots and common medium roots; about 1 percent gravel; slightly acid; clear wavy boundary.

B/E—8 to 13 inches; about 80 percent reddish brown (5YR 4/4) silty clay (Bt); penetrated by tongues of pinkish gray (7.5YR 6/2) silt loam (E); moderate medium and fine angular blocky structure; firm; many very fine and fine roots; few distinct reddish brown (5YR 4/4) clay films on faces of peds; about 1 percent gravel; slightly acid; clear wavy boundary.

Bt1—13 to 20 inches; reddish brown (5YR 4/4) silty clay; strong medium and fine angular blocky structure; firm; many very fine and fine roots; many prominent reddish brown (5YR 4/4) clay films on faces of peds; few fine prominent strong brown (7.5YR 5/6) masses of iron accumulation in the matrix; about 1 percent gravel; slightly acid; clear wavy boundary.

Bt2—20 to 34 inches; reddish brown (5YR 5/4) silty clay; moderate medium and fine angular blocky structure; firm; many very fine and fine roots; many prominent reddish brown (5YR 4/4) clay films on faces of peds; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation and common medium prominent light gray (10YR 7/2) iron depletions in the matrix; about 1 percent gravel; slightly effervescent; neutral; gradual wavy boundary.

C—34 to 80 inches; light reddish brown (5YR 6/4) silty clay; massive; firm; common very fine and fine roots; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation and common medium prominent light gray (2.5Y 7/2) iron depletions in the matrix; about 3 percent gravel; violently effervescent; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 22 to 36 inches. The content of gravel ranges from 0 to 3 percent throughout the profile.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3.

Some pedons have an E or E/B horizon. The E part of the E/B and B/E horizons has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 or 3.

The Bt part of the E/B and B/E horizons and the underlying Bt horizon have hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. They are silty clay loam, clay, or silty clay.

Some pedons have a BC horizon. This horizon, if it occurs, has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4.

The C horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is silty clay loam, silty clay, or silt loam. It is stratified in some pedons.

Ocqueoc Series

The Ocqueoc series consists of well drained soils in outwash areas and on lake plains. These soils formed in sandy material underlain by loamy material at a depth of 20 to 40 inches. Permeability is rapid in the upper sandy material and moderate or moderately slow in the lower loamy material. Slope ranges from 0 to 6 percent.

Taxonomic classification: Sandy over loamy, mixed, active, frigid Entic Haplorthods

Typical pedon of Ocqueoc sand, 0 to 6 percent slopes, 2,640 feet east and 2,200 feet north of the southwest corner of sec. 14, T. 30 N., R. 2 E., Briley Township; USGS Crooked Lake, Michigan, 7.5-minute topographic quadrangle; lat. 44 degrees 59 minutes 29 seconds N. and long. 84 degrees 9 minutes 47 seconds W.

Ap—0 to 4 inches; black (N 2.5/0) sand, very dark gray (10YR 3/1) dry; moderate medium granular structure; very friable; many fine and very fine roots; about 2 percent gravel; 8 percent pinkish gray (7.5YR 6/2) uncoated sand grains; strongly acid; abrupt smooth boundary.

E—4 to 7 inches; brown (7.5YR 5/2) sand, pinkish gray (7.5YR 6/2) dry; single grain; loose; many fine and very fine roots; about 2 percent gravel; moderately acid; clear broken boundary.

Bs1—7 to 16 inches; brown (7.5YR 4/4) sand; weak fine subangular blocky structure; very friable; few fine roots and common medium and coarse roots; about 2 percent gravel; strongly acid; clear smooth boundary.

Bs2—16 to 23 inches; yellowish brown (10YR 5/6) sand; weak fine subangular blocky structure; very friable; few medium and coarse roots; about 2 percent gravel; strongly acid; clear wavy boundary.

BC—23 to 28 inches; brownish yellow (10YR 6/6) sand; single grain; loose; few fine roots; about 2 percent gravel; slightly acid; abrupt smooth boundary.

2C1—28 to 61 inches; pale brown (10YR 6/3), light yellowish brown (10YR 6/4), and strong brown (7.5YR 5/6), stratified very fine sand and silt; massive; friable; few fine roots; about 2 percent gravel; slightly acid; clear wavy boundary.

2C2—61 to 80 inches; light yellowish brown (10YR 6/4), light gray (10YR 7/2), and very pale brown (10YR 7/3), stratified very fine sand, sand, and fine sand; single grain; loose; slightly effervescent; slightly alkaline.

The thickness of the solum ranges from 15 to 30 inches. The depth to the 2C horizon is less than 40 inches. The content of gravel ranges from 0 to 5 percent in the solum. The solum is predominantly sand, but the range includes fine sand, loamy sand, and loamy fine sand. Reaction ranges from very strongly acid to slightly acid in the solum and from moderately acid to slightly alkaline in the 2C horizon.

The A or Ap horizon has hue of 5YR to 10YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to 3.

The E horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 1 or 2.

The Bs horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 4 to 6.

The BC horizon has hue of 5YR to 10YR, value of 3 to 6, and chroma of 4 to 6.

The 2C horizon has hue of 2.5YR to 10YR, value of 4 to 7, and chroma of 2 to 6. Textures include very fine sand, loamy very fine sand, silt, and silt loam. In some pedons this horizon has strata of fine sand, loamy fine sand, very fine sandy loam, silty clay loam, or silty clay.

Ossineke Series

The Ossineke series consists of moderately well drained soils on ground moraines, disintegration moraines, and drumlins. These soils formed in loamy glacial till. Permeability is slow. Slope ranges from 0 to 12 percent.

Taxonomic classification: Fine-loamy, mixed, semiactive, frigid Oxyaquic Glossudalfs

Typical pedon of Ossineke fine sandy loam, 6 to 12 percent slopes, 800 feet north and 1,550 feet west of the southeast corner of sec. 35, T. 31 N., R. 3 E., Hillman Township; USGS Atlanta Southeast, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 1 minute 55 seconds N. and long. 84 degrees 1 minute 42 seconds W.

Ap—0 to 6 inches; very dark gray (10YR 3/1) fine sandy loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; common fine and very fine roots and few medium roots; about 4 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

Bw—6 to 10 inches; dark brown (10YR 4/3) sandy loam; weak fine and medium subangular blocky structure; friable; common fine and very fine roots and few medium roots; about 4 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

E—10 to 16 inches; yellowish brown (10YR 5/4) loamy sand, very pale brown (10YR 7/3) dry; weak fine and medium subangular blocky structure; firm; few fine and very fine roots; about 4 percent gravel and 1 percent cobbles; strongly acid; clear irregular boundary.

B/E—16 to 22 inches; about 70 percent reddish brown (5YR 4/4) clay loam (Bt); moderate medium subangular blocky structure; firm; about 30 percent tongues of yellowish brown (10YR 5/4) loamy sand (E); weak fine and medium subangular blocky structure; friable; few fine and very fine roots; about 4 percent gravel and 1 percent cobbles; moderately acid; gradual wavy boundary.

Bt1—22 to 29 inches; reddish brown (5YR 4/4) clay loam; moderate coarse angular blocky structure; firm; few fine roots; many continuous distinct reddish brown (5YR 4/3) clay films on faces of peds; common fine distinct yellowish red (5YR 4/6) masses of iron accumulation in the matrix; about 4 percent gravel and 1 percent cobbles; neutral; gradual wavy boundary.

Bt2—29 to 38 inches; reddish brown (5YR 4/4) clay loam; moderate coarse angular blocky structure parting to moderate fine subangular blocky; firm; few fine roots; common continuous faint reddish brown (5YR 4/3) clay films on faces of peds; about 4 percent gravel and 1 percent cobbles; slightly effervescent; slightly alkaline; gradual wavy boundary.

BC—38 to 80 inches; brown (7.5YR 5/4) clay loam; moderate medium prismatic structure parting to weak medium angular blocky; firm; many brown (7.5YR 5/4) pressure faces between peds; about 4 percent gravel and 1 percent cobbles; strongly effervescent; strongly alkaline.

The thickness of the solum ranges from 31 to more than 60 inches. The content of gravel ranges from 3 to 10 percent throughout the profile, and the content of cobbles ranges from 0 to 4 percent. A sandy substratum phase is recognized.

The Ap or A horizon has hue of 10YR or 7.5YR, value of 2 to 3, and chroma of 1 to 3. It is fine sandy loam or sandy loam.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is sandy loam or fine sandy loam.

The E horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. It is dominantly loamy sand, but the range includes loamy fine sand, sandy loam, and fine sandy loam. This horizon ranges from 4 to 24 inches in thickness.

The B/E horizon consists of coatings and tongues of E material surrounding peds of Bt material. The Bt part of the horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. It is clay loam or sandy clay loam. The E part of the horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. It is loamy sand, sandy loam, or fine sandy loam.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly clay loam, but the range includes loam and sandy clay loam. In some pedons the lower part of the Bt horizon contains free carbonates.

The BC horizon has hue of 5YR or 7.5YR and value of 5 or 6. It is dominantly clay loam, but the range includes loam, fine sandy loam, sandy loam, and sandy clay loam.

The C horizon, if it occurs, has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 4 to 6. It is dominantly loam, but the range includes clay loam, fine sandy loam, sandy loam, and sandy clay loam. Free carbonates are present.

The 2C horizon, if it occurs, has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 to 5. It is sand or loamy sand or the gravelly analogs of these textures. The content of gravel ranges from 2 to 25 percent.

Otisco Series

The Otisco series consists of somewhat poorly drained soils on outwash plains, lake plains, and moraines. These soils formed in sandy deposits. Permeability is moderately rapid or rapid. Slope ranges from 0 to 3 percent.

Taxonomic classification: 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., Briley Township; USGS Atlanta, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 3 minutes 54 seconds N. and long. 84 degrees 13 minutes 45 seconds W.

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 roots 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 roots and few medium roots; common medium prominent strong brown (7.5YR 5/8) and few medium prominent brownish yellow (10YR 6/6) masses of iron accumulation in the matrix; 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) masses of iron accumulation in the matrix; 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) masses of iron accumulation in the matrix; 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) masses of iron accumulation in the matrix; 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) masses of iron accumulation in the matrix; thin lenses 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; thin lenses 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 throughout the profile. Reaction ranges from very strongly acid to neutral in the solum.

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 the range includes sand and 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 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.

Richter Series

The Richter series consists of somewhat poorly drained, moderately permeable soils on lake plains and in glacial drainageways. These soils formed in loamy and sandy lacustrine deposits. Slope ranges from 0 to 6 percent.

Taxonomic classification: Coarse-loamy, mixed, semiactive, frigid Argic Endoaquods

Typical pedon of Richter loamy fine sand, 0 to 6 percent slopes, 1,050 feet south and 580 feet west of the northeast corner of sec. 23, T. 32 N., R. 4 E., Montmorency Township; USGS Royston, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 9 minutes 51 seconds N. and long. 83 degrees 54 minutes 20 seconds W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loamy fine sand, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure parting to weak medium granular; very friable; many very fine, fine, and medium roots; about 1 percent gravel; strongly acid; abrupt wavy boundary.

E—7 to 11 inches; pinkish gray (7.5YR 6/2) loamy fine sand, light gray (10YR 7/2) dry; weak fine subangular blocky structure; very friable; common very fine, fine, and medium roots; few medium prominent strong brown (7.5YR 5/8) masses of iron accumulation in the matrix; about 1 percent gravel; slightly acid; abrupt broken boundary.

Bs1—11 to 15 inches; brown (7.5YR 4/4) loamy fine sand; moderate fine and medium subangular blocky structure; friable; common very fine and fine roots; common fine and medium prominent strong brown (7.5YR 5/8) masses of iron accumulation in the matrix; 25 percent of the horizon has weakly cemented tongues of dark reddish brown (5YR 3/4) and brown (7.5YR 4/4) ortstein; about 1 percent gravel; moderately acid; clear irregular boundary.

Bs2—15 to 19 inches; strong brown (7.5YR 4/6) loamy fine sand; moderate medium and coarse subangular blocky structure; friable; few fine roots; many medium faint strong brown (7.5YR 5/6) and many coarse distinct strong brown (7.5YR 5/8) masses of iron accumulation in the matrix; about 1 percent gravel; moderately acid; abrupt wavy boundary.

E/B—19 to 25 inches; 80 percent pale brown (10YR 6/3) loamy fine sand, white (10YR 8/2) dry (E); surrounding brown (7.5YR 5/4) fine sandy loam (Bt); weak medium subangular blocky structure; very friable; common fine prominent strong brown (7.5YR 5/8) masses of iron accumulation in the matrix; about 1 percent gravel; strongly acid; clear wavy boundary.

B/E—25 to 29 inches; about 85 percent brown (7.5YR 5/4) fine sandy loam (Bt); weak medium subangular blocky structure; very friable; surrounded by pale brown (10YR 6/3) loamy fine sand, white (10YR 8/2) dry (E); common medium prominent strong brown (7.5YR 5/8) masses of iron accumulation in the matrix; about 1 percent gravel; slightly acid; clear wavy boundary.

C—29 to 80 inches; reddish brown (5YR 5/4), stratified very fine sand to silt loam; massive; very friable; common fine prominent reddish yellow (7.5YR 6/8) and yellowish brown (10YR 5/8) masses of iron accumulation and common medium prominent greenish gray (5GY 6/1) iron depletions in the matrix; common fine prominent pink (5YR 7/3) carbonate accumulations at a depth of 60 inches; about 1 percent gravel; slightly effervescent; neutral.

The content of gravel ranges from 0 to 2 percent throughout the profile.

The A or Ap horizon has chroma of 1 to 3. The A horizon is dominantly loamy fine sand, but the range includes fine sandy loam.

The E horizon and the E part of the E/B and B/E horizons have hue of 7.5YR or 10YR and chroma of 2 or 3. They are dominantly loamy fine sand, but the range includes fine sandy loam.

The Bs horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is loamy fine sand or fine sandy loam.

The Bt part of the E/B and B/E horizons and the Bt horizon have hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. They are dominantly fine sandy loam, but the range includes loam and clay loam.

Some pedons have a BC horizon.

The C horizon has hue of 5YR, 7.5YR, or 10YR, value of 5 or 6, and chroma of 2 to 4. Reaction ranges from neutral to moderately alkaline. The horizon is stratified fine sand to silt loam with thin bands of silty clay loam.

Rubicon Series

The Rubicon series consists of excessively drained, rapidly permeable soils on ground moraines, disintegration moraines, end moraines, lake plains, outwash plains, stream terraces, sand dunes, and beach ridges. These soils formed in sandy deposits. Slope ranges from 0 to 70 percent.

Taxonomic classification: Sandy, mixed, frigid Entic Haplorthods

Typical pedon of Rubicon sand, 0 to 6 percent slopes, 1,200 feet south and 600 feet east of the northwest corner of sec. 8, T. 32 N., R. 1 E., Montmorency Township; USGS Silver Lake, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 10 minutes 50 seconds N. and long. 84 degrees 20 minutes 48 seconds W.

A—0 to 4 inches; black (N 2.5/0) sand, dark gray (N 4/0) dry; 8 percent gray (N 6/0) uncoated sand grains; weak medium granular structure; very friable; many fine roots and common medium and coarse roots; about 2 percent gravel and 1 percent cobbles; very strongly acid; abrupt wavy boundary.

E—4 to 9 inches; brown (7.5YR 5/2) sand, pinkish white (7.5YR 8/2) dry; single grain; loose; common fine, medium, and coarse roots; about 2 percent gravel and 1 percent cobbles; very strongly acid; clear wavy boundary.

Bs1—9 to 16 inches; dark brown (7.5YR 3/4) sand; weak medium subangular blocky structure; very friable; common fine and medium roots and few coarse roots; about 2 percent gravel and 1 percent cobbles; very strongly acid; gradual wavy boundary.

Bs2—16 to 22 inches; strong brown (7.5YR 4/6) sand; weak medium subangular blocky structure; very friable; few fine and medium roots; about 2 percent gravel and 1 percent cobbles; strongly acid; gradual wavy boundary.

BC—22 to 47 inches; yellowish brown (10YR 5/6) sand; single grain; loose; about 3 percent gravel and 1 percent cobbles; strongly acid; gradual wavy boundary.

C—47 to 80 inches; yellowish brown (10YR 5/4) sand;

single grain; loose; about 6 percent gravel and 2 percent cobbles; strongly acid.

The thickness of the solum ranges from 27 to 47 inches. The content of gravel ranges from 0 to 6 percent throughout the profile, and the content of cobbles ranges from 0 to 2 percent.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 to 4 and chroma of 0 to 2. It is dominantly sand, but the range includes loamy sand.

The E horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 1 to 3. It is dominantly sand, but the range includes loamy sand.

The Bs1 horizon has hue of 5YR or 7.5YR and value and chroma of 3 or 4. It has few or common, weakly to strongly cemented chunks and pieces of ortstein in some pedons. The Bs2 horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 to 8.

The BC horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 6 to 8.

The C horizon has hue of 10YR, value of 5 to 7, and chroma of 3 to 8.

Springport Series

The Springport series consists of poorly drained, very slowly permeable soils on lake plains and in depressional areas on moraines. These soils formed in silty and clayey lacustrine deposits. Slope ranges from 0 to 2 percent.

Taxonomic classification: Fine, mixed, semiactive, frigid Typic Epiaquolls

Typical pedon of Springport silt loam, 1,200 feet north and 250 feet west of the southeast corner of sec. 35, T. 31 N., R. 4 E., Hillman Township; USGS Hillman, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 2 minutes 1 second N. and long. 83 degrees 54 minutes 7 seconds W.

A1—0 to 3 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; friable; many very fine, fine, and medium roots; slightly alkaline; abrupt wavy boundary.

A2—3 to 9 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium angular blocky structure parting to moderate fine and very fine angular blocky; friable; many very fine, common fine, and few medium roots; many very fine tubular pores; few fine distinct grayish brown (2.5Y 5/2) iron depletions in the matrix; slightly alkaline; abrupt wavy boundary.

Eg—9 to 13 inches; light brownish gray (2.5Y 6/2) silty clay loam, light gray (2.5Y 7/2) dry; moderate medium angular blocky structure parting to moderate fine angular blocky; friable; many very fine and few fine roots; many very fine tubular pores; common fine and medium prominent strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) masses of iron accumulation in the matrix; slightly effervescent; slightly alkaline; abrupt wavy boundary.

Bt—13 to 35 inches; reddish brown (5YR 5/4) silty clay; moderate medium and fine angular blocky structure; friable; common very fine and fine roots; many very fine tubular pores; few distinct light reddish brown (5YR 6/4) clay films on vertical faces of peds; few fine prominent gray (5Y 5/1) and many medium and coarse prominent light gray (5Y 6/1) iron depletions and common fine and medium prominent reddish yellow (7.5YR 6/6) masses of iron accumulation in the matrix; strongly effervescent; moderately alkaline; gradual wavy boundary.

C1—35 to 60 inches; light reddish brown (5YR 6/3) silty clay; massive; firm; common fine and medium prominent light greenish gray (5GY 7/1) iron depletions and many medium and coarse prominent strong brown (7.5YR 5/6) masses of iron accumulation in the matrix; violently effervescent; moderately alkaline; gradual wavy boundary.

C2—60 to 80 inches; reddish brown (5YR 5/3) silty clay loam; massive; firm; common fine and medium prominent light bluish gray (5B 7/1) iron depletions and many coarse prominent yellowish brown (10YR 5/6) masses of iron accumulation in the matrix; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 15 to 40 inches. The content of gravel is 0 to 1 percent throughout the profile.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to 2. It is dominantly silt loam, but the range includes silty clay loam.

The Eg horizon has hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 1 or 2. It is silt loam or silty clay loam.

The Bt horizon has hue of 5YR, value of 5 or 6, and chroma of 3 or 4. It is silty clay.

Some pedons have a Bg horizon. This horizon, if it occurs, has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 1 or 2. It is silty clay or silty clay loam.

The C horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 2 to 4. It is silty clay or silty clay loam.

Tawas Series

The Tawas series consists of very poorly drained soils in depressions on moraines, outwash plains, and lake plains. These soils formed in highly decomposed organic materials over sandy deposits. Permeability is moderately slow to moderately rapid in the organic material and rapid in the underlying sandy material. Slope ranges from 0 to 2 percent.

Taxonomic classification: Sandy or sandy-skeletal, mixed, euic, frigid Terric Haplosaprists

Typical pedon of Tawas muck, in an area of Tawas-Lupton mucks, 667 feet north and 816 feet east of the southwest corner of sec. 12, T. 32 N., R. 2 E., Montmorency Township; USGS Lake Geneva, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 10 minutes 21 seconds N. and long. 84 degrees 8 minutes 28 seconds W.

Oa1—0 to 10 inches; muck (sapric material), black (N 2.5/0) broken face, rubbed, and pressed; about 10 percent fiber, 1 percent rubbed; moderate very thick platy structure parting to moderate medium and coarse granular; few fine and medium roots; fibers are primarily woody and herbaceous; common highly decomposed wood fragments; moderately acid; abrupt smooth boundary.

Oa2—10 to 22 inches; muck (sapric material), black (5YR 2.5/1) broken face, rubbed, and pressed; about 15 percent fiber, 3 percent rubbed; moderate thick platy structure parting to moderate medium granular; fibers are primarily woody and herbaceous; 8 percent highly decomposed wood fragments; slightly acid; gradual smooth boundary.

C—22 to 80 inches; pale brown (10YR 6/3) sand; single grain; loose; neutral.

The thickness of the organic material ranges from 16 to 50 inches.

The Oa horizon has hue of 5YR to 10YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 or 1. The fiber content (unrubbed) ranges from 10 to 15 percent.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. It may contain free carbonates.

Udipsamments

Udipsamments are well drained, somewhat excessively drained, and excessively drained, rapidly permeable soils on outwash plains, moraines, deltas, and lake plains. These soils formed in sandy deposits. Slope ranges from 0 to 8 percent.

Taxonomic classification: Udipsamments

Typical pedon of Udipsamments, nearly level and undulating, 1,950 feet west and 500 feet south of the northeast corner of sec. 16, T. 32 N., R. 2 E., Montmorency Township; USGS Lake Geneva, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 10 minutes 9 seconds N. and long. 84 degrees 11 minutes 36 seconds W.

Bw—0 to 7 inches; dark yellowish brown (10YR 4/4) sand; weak fine subangular blocky structure; very friable; common very fine and fine roots and few medium and coarse roots; 5 percent gravel; extremely acid; clear wavy boundary.

BC—7 to 13 inches; yellowish brown (10YR 5/6) sand; weak fine and medium subangular blocky structure; very friable; few very fine roots; 1 percent gravel; extremely acid; clear wavy boundary.

C1—13 to 65 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; 1 percent gravel; extremely acid; clear wavy boundary.

C2—65 to 81 inches; pale brown (10YR 6/3) sand; single grain; loose; a few bands ($^1/_{16}$ inch thick) of strong brown (7.5YR 5/6); 1 percent gravel; very strongly acid.

Udorthents

Udorthents are well drained, somewhat excessively drained, and excessively drained, rapidly permeable soils on outwash plains, moraines, deltas, and lake plains. These soils formed in loamy deposits. Slope ranges from 0 to 8 percent.

Taxonomic classification: Udorthents

Typical pedon of Udorthents, loamy, nearly level and undulating, 2,600 feet east and 1,600 feet north of the southwest corner of sec. 24, T. 31 N., R. 4 E., Hillman Township; USGS Hillman, Michigan, 7.5-minute topographic quadrangle; lat. 45 degrees 3 minutes 49 seconds N. and long. 83 degrees 53 minutes 20 seconds W.

A—0 to 42 inches; dark grayish brown (10YR 4/2) sandy loam; moderate medium granular structure; very friable; 8 percent gravel and 5 percent cobbles; neutral; clear irregular boundary.

B/E—42 to 48 inches; 70 percent reddish brown (5YR 4/4) clay loam (Bt); strong medium subangular blocky structure; friable; surrounded by pinkish gray (5YR 6/2) loamy sand (E); weak medium subangular blocky structure; friable; 8 percent gravel and 5 percent cobbles; neutral; clear wavy boundary.

Bt—48 to 54 inches; reddish brown (5YR 4/4) clay loam; strong medium subangular blocky structure; firm; many prominent reddish brown (5YR 4/3) clay films on faces of peds; 8 percent gravel and 5 percent cobbles; slightly alkaline; clear wavy boundary.

C—54 to 80 inches; brown (10YR 5/3) sandy loam; weak medium subangular blocky structure; very friable; 8 percent gravel and 5 percent cobbles; moderately alkaline.

Wakeley Series

The Wakeley series consists of poorly drained soils in depressions on lake plains, outwash plains, and moraines. These soils formed in sandy material underlain by clayey sediments. Permeability is rapid in the upper part and slow or very slow in the lower clayey lacustrine material. Slope ranges from 0 to 2 percent.

Taxonomic classification: Sandy over clayey, mixed, nonacid, frigid Aeric Epiaquents

Typical pedon of Wakeley muck, 2,030 feet south and 30 feet west of the northeast corner of sec. 27, T. 30 N., R. 4 E., Rust Township; USGS Rust, Michigan, 7.5-minute topographic quadrangle; lat. 44 degrees 58 minutes 2 seconds N. and long. 83 degrees 55 minutes 48 seconds W.

Oa—0 to 3 inches; black (N 2.5/0) muck (sapric material); moderate fine and medium granular structure; friable; many fine and medium roots and few coarse roots; neutral; clear wavy boundary.

A—3 to 7 inches; black (N 2.5/0) mucky sand, black (N 2.5/0) dry; moderate medium and coarse granular structure; friable; many fine and medium roots and few coarse roots; neutral; clear wavy boundary.

Cg1—7 to 12 inches; grayish brown (2.5Y 5/2) loamy sand; weak fine subangular blocky structure; very friable; common fine prominent dark yellowish brown (10YR 4/6) masses of iron accumulation in the matrix and common medium distinct light brownish gray (10YR 6/2) iron depletions in the matrix; few fine and medium roots; common very dark gray (10YR 3/1) root channels; slightly alkaline; gradual wavy boundary.

Cg2—12 to 41 inches; light brownish gray (2.5Y 6/2) sand; single grain; nonsticky and nonplastic; common dark gray (10YR 4/1) organic stains in horizontal streaks; slightly alkaline; abrupt wavy boundary.

2Cg3—41 to 80 inches; gray (5Y 5/1), stratified sandy clay and silty clay loam; massive; slightly sticky and slightly plastic; common strong brown (7.5YR 4/6) organic stains between strata; few fine buried organic materials, mostly small twigs; strongly effervescent; moderately alkaline.

The depth to the clayey material ranges from 20 to 41 inches. The content of gravel ranges from 0 to 2 percent throughout the profile.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 to 3 and chroma of 0 to 2.

Some pedons 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 loamy sand or sand.

The 2Cg horizon has hue of 7.5YR, 10YR, or 5Y, value of 5 or 6, and chroma of 1 or 2. It is clay, sandy clay, silty clay, or silty clay loam. It has organic stains.

Formation of the Soils

This section relates the five major factors of soil formation to the soils in the survey area. It also describes the processes of soil formation.

Factors of Soil Formation

Soil formation is the result of the interaction of five major soil-forming factors. These soil-forming factors are the physical, chemical, and mineralogical composition of the parent material; the climate under which the parent material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land, which determines slope aspect and the surface and subsurface movement of water; and the length of time that the processes of soil formation have acted on the parent material (Jenny, 1941). Human activities also affect soil formation.

Climate and plant and animal life are the active forces in 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 affects the kind of soil profile that forms; in extreme cases, it determines the soil profile entirely. Finally, time is needed for the transformation of parent material into a soil that has differentiated soil horizons.

The factors of soil formation are so closely interrelated and conditioned by each other that few generalizations can be made regarding the effect of any one factor unless the effects of the other factors are understood.

Parent Material

Parent material is the geologic material in which a soil forms. It has a profound influence on the chemical, physical, and mineralogical composition of the soil. The parent materials of the soils of Montmorency County were deposited by glaciers or by glacial meltwater. Some of these parent materials have been reworked and redeposited by the subsequent action of water and wind. Although most of the parent materials are of common glacial origin, their properties vary greatly, sometimes within small areas, depending on how the materials were deposited. The dominant parent materials in Montmorency County were deposited as glacial till, outwash material, lake sediment, wind-deposited sediment, alluvium, or organic material.

Glacial till was deposited directly by glaciers with minimal reworking by meltwater. Glacial till consists of a mixture of clay, silt, sand, gravel, and larger rocks of various shapes and sizes. The small pebbles in glacial till have sharp corners, which indicates that they have not been worn by water. The glacial till in Montmorency County generally is calcareous sandy loam and loamy sand. Millersburg soils are examples of soils that formed in glacial till.

Outwash material was deposited by running water that carried a sediment load from melting glaciers. The size of the particles deposited depends on the speed of the stream that carried the material. The water deposited the coarser particles first as it slowed down. As the water slowed further, finer particles, such as sand and fine sand, settled out. As the velocity of the meltwater slowed further, even finer particles, such as silt and clay, settled out of the stream. Outwash deposits generally occur as layers of similar sized particles, such as sand, coarse sand, and gravel. Grayling soils are examples of soils that formed in sandy outwash material.

Lake sediment was deposited from still or very slowly moving lake water. Springport soils are examples of fine textured soils that formed in clayey material deposited on a lake bottom.

Wind-deposited sediment was transported from the land surface and redeposited as windspeed diminished. The particles are generally sand and fine sand. The sediments form dunes across broad sandy plains and accumulate on the lee side of ridges and hills.

Alluvium is material recently deposited by floodwater from streams. This material varies in texture, depending on the speed of water from which it was deposited. Ausable soils are examples of soils that formed in alluvium.

Organic material occurs as deposits of plant residue. After the glaciers withdrew from the area, water remained standing in depressions on outwash plains, flood plains, and moraines. Grasses and sedges grew around the edges of these lakes. When these plants died, their residue sank into the water and did not decompose because of the wetness. Later, water-tolerant trees grew in these areas. After the trees died, their residue became part of the organic accumulation. Eventually the lakes were filled with organic material and developed into areas of muck. Lupton soils are examples of soils that formed in organic material.

Climate

Climate 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 translocation of soil material. Through its influence on soil temperature, climate also determines the rate of chemical reaction in the soil.

The climate of Montmorency County is cool and humid. Presumably, it is similar to that under which the soils formed. The climate generally is uniform in all areas, but its effect is modified locally by the proximity of the area to large lakes and by the aspect of slopes. Only minor differences among the soils in the county are the result of differences in climate.

Plant and Animal Life

Green plants are the principal organisms affecting the soils in Montmorency County. Bacteria, fungi, earthworms, and humans have also been important. The chief contribution of plant and animal life is the addition of organic material and nitrogen to the soil. The kind of organic material depends on the kinds of plants that grow on the soil. Plant roots provide channels for the downward movement of water through the soil and add organic material as they decay. Bacteria in the soil help break down the organic material into elements that can be used by the plants.

The native vegetation of Montmorency County was a mixture of coniferous and deciduous forest. Differences in natural soil drainage and changes in parent material affect the composition of forests. In general, the well drained upland soils, such as Klacking and Millersburg soils, supported vast stands of sugar maple and white pine. Rubicon soils supported red pine, aspen, and red maple. The very poorly drained soils, such as Lupton and Tawas soils, supported cedar, black spruce, and aspen.

Relief

Relief influences soil formation through its effect on drainage, runoff, erosion, plant cover, and soil temperature. In Montmorency County, the slopes range from 0 to 70 percent and the average slope is around 6 percent. Natural drainage varies considerably in the county. Soils on hilltops are typically excessively drained, and soils in depressions are very poorly drained (figs. 13, 14, and 15).

Through its effect on soil aeration, drainage determines the color of the soil. Water and air move freely through well drained soils and slowly through very poorly drained soils. In well aerated soils, the iron and aluminum compounds that give most soils their color are bright and oxidized. Poorly aerated soils are dull gray and mottled. Blue Lake soils are examples of well drained, well aerated soils. Deford soils are examples of poorly drained, poorly aerated soils. Both of these soils formed in similar parent material.

Time

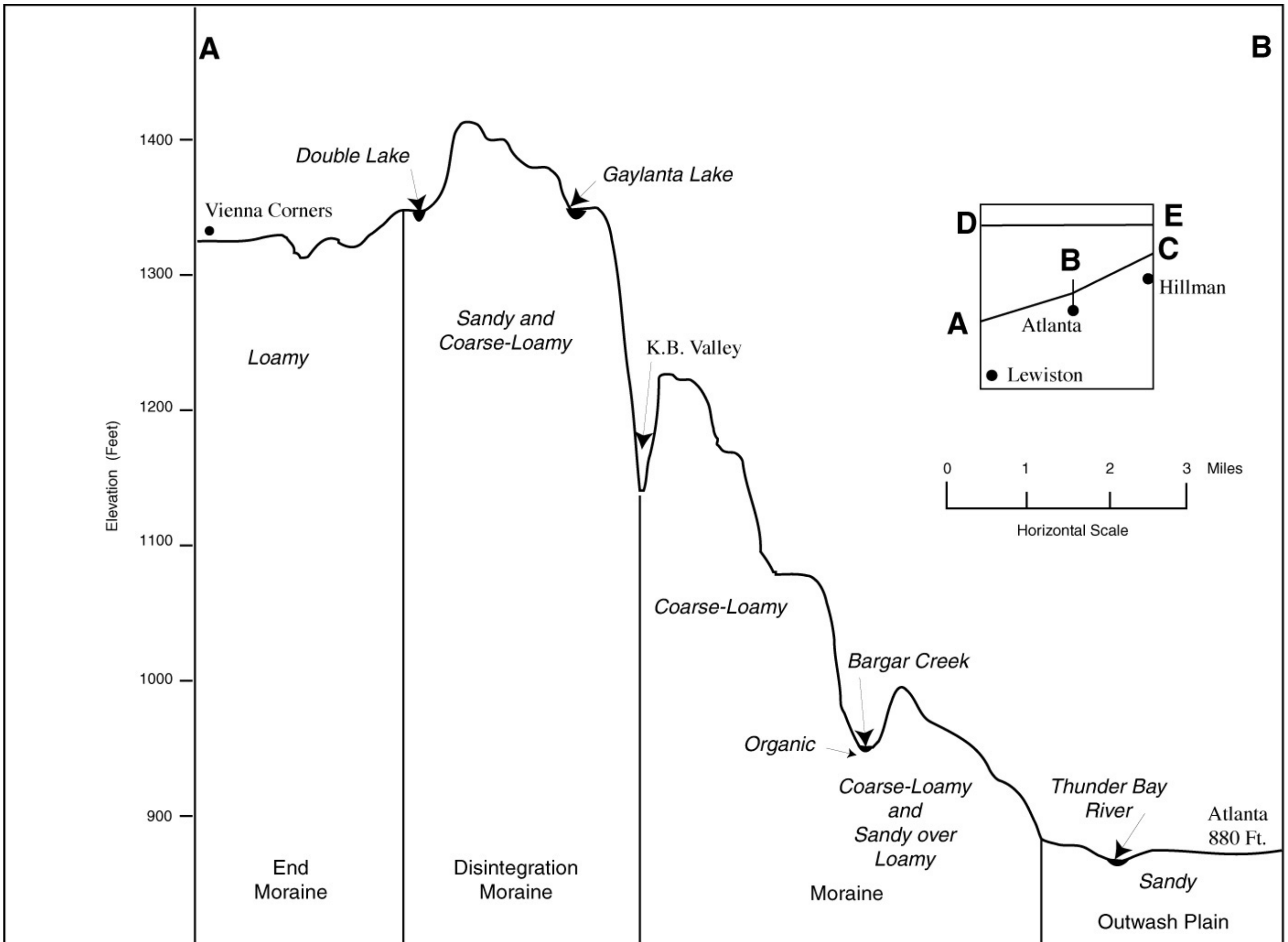
Generally, a long time is needed for the development of distinct horizons. The degree of profile development commonly reflects the length of time that the parent material has been in place. Some soils form rapidly. Others form slowly.

The soils of Montmorency County range from young to mature. Most of the soils that formed in glacial deposits have been exposed to the soil-forming factors long enough for the development of distinct horizons.

Processes of Soil Formation

The processes responsible for the development of the soil horizons in the unconsolidated parent material are referred to as soil genesis. Several processes were involved in the development of horizons in the soils of Montmorency County. These are the accumulation of organic matter, the leaching of lime (calcium carbonate) and other bases, the reduction and transfer of iron, and the formation and translocation of silicate clay minerals. More than one of these processes have helped to differentiate horizons in most of the soils.

As organic matter accumulates at the surface, a



Dominant Soil Series	Morganlake Ossineke Blue Lake	Mancelona Millersburg Blue Lake	Millersburg Klacking Horsehead	Lupton	Menominee Millersburg Lupton	Rubicon Croswell Lupton
Drainage Class	Moderately Well Drained and Well Drained	Well Drained	Somewhat Excessively Drained and Well Drained	Very Poorly Drained	Well Drained to Very Poorly Drained	Excessively Drained to Very Poorly Drained

Figure 13.—A diagrammatic cross section of Montmorency County showing the topography, elevation, general soil texture, landforms, and dominant soil series and their drainage classes.

dark A horizon forms. Directly below the A horizon, commonly an eluviated, or leached, E horizon develops. Most of the bases, iron and aluminum compounds, and silicate clays have been leached out of the E horizon.

Below the E horizon, an illuviated, or accumulated, B horizon forms. The iron and aluminum compounds and the silicate clays accumulate in this horizon, which as a result has brighter colors and heavier textures than the horizons above it.

In some soils in Montmorency County, iron, aluminum, and humus have been transferred from the surface layer to the B horizon. The B horizon in such soils is dark brown or dark reddish brown. Rubicon and Croswell soils are examples.

Gleying, or the reduction and transfer of iron, is

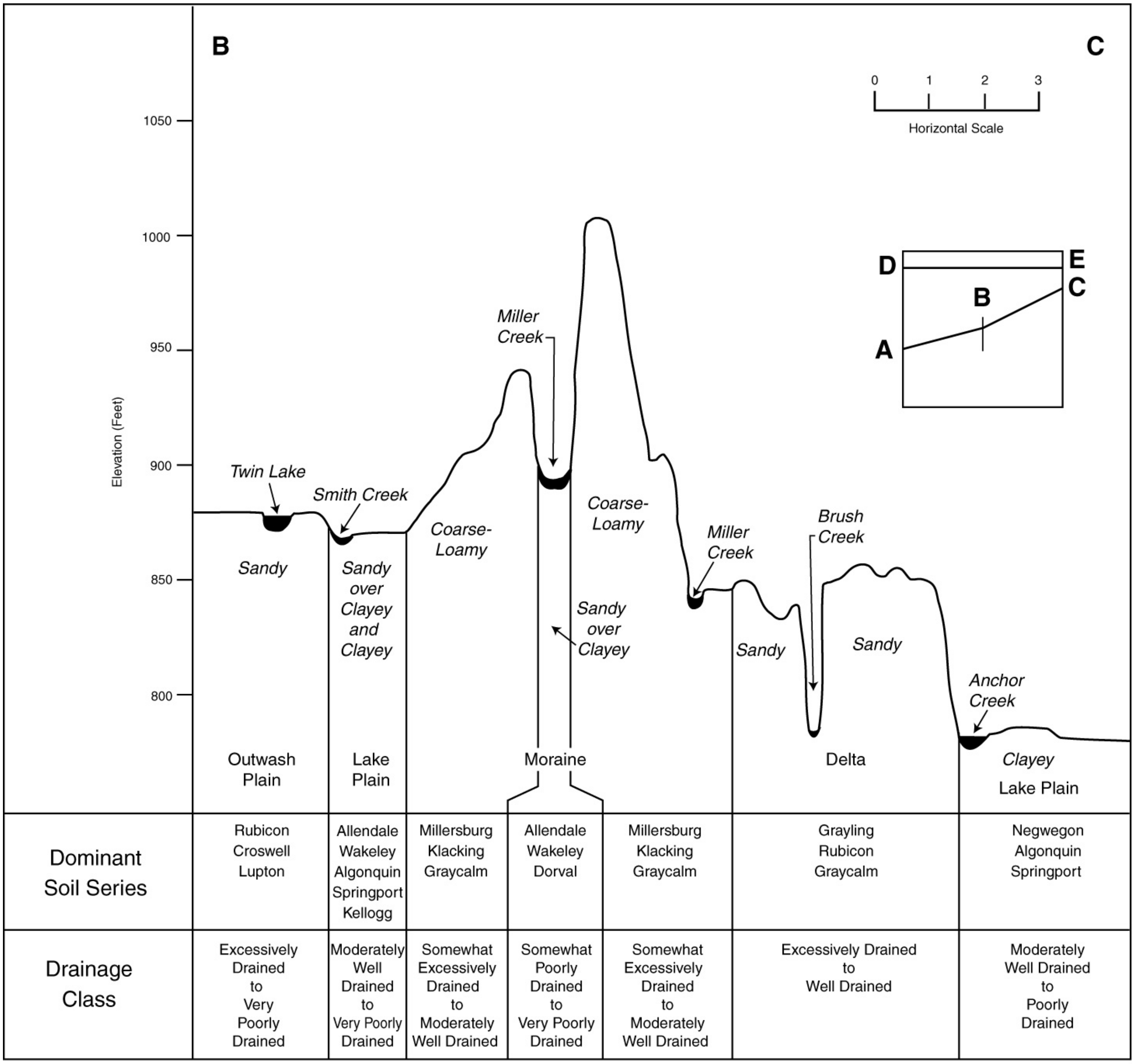


Figure 14.—A diagrammatic cross section of Montmorency County showing the topography, elevation, general soil texture, landforms, and dominant soil series and their drainage classes.

evident in somewhat poorly drained, poorly drained, and very poorly drained soils. A gray color in the subsoil indicates the reduction of iron and therefore is a good indicator of wetness. Deford soils are good examples of soils in which this process has occurred.

The translocation or movement of clay-sized minerals from upper to lower soil horizons is a process that has played a major role in the development of some soils in the county. The horizon from which the clay has been removed, an eluvial or E horizon, typically has a lower clay content and is generally lighter colored than the underlying illuviated B horizon. The illuviated B horizon typically exhibits an increase in clay content, or “clay skins” in soil pores

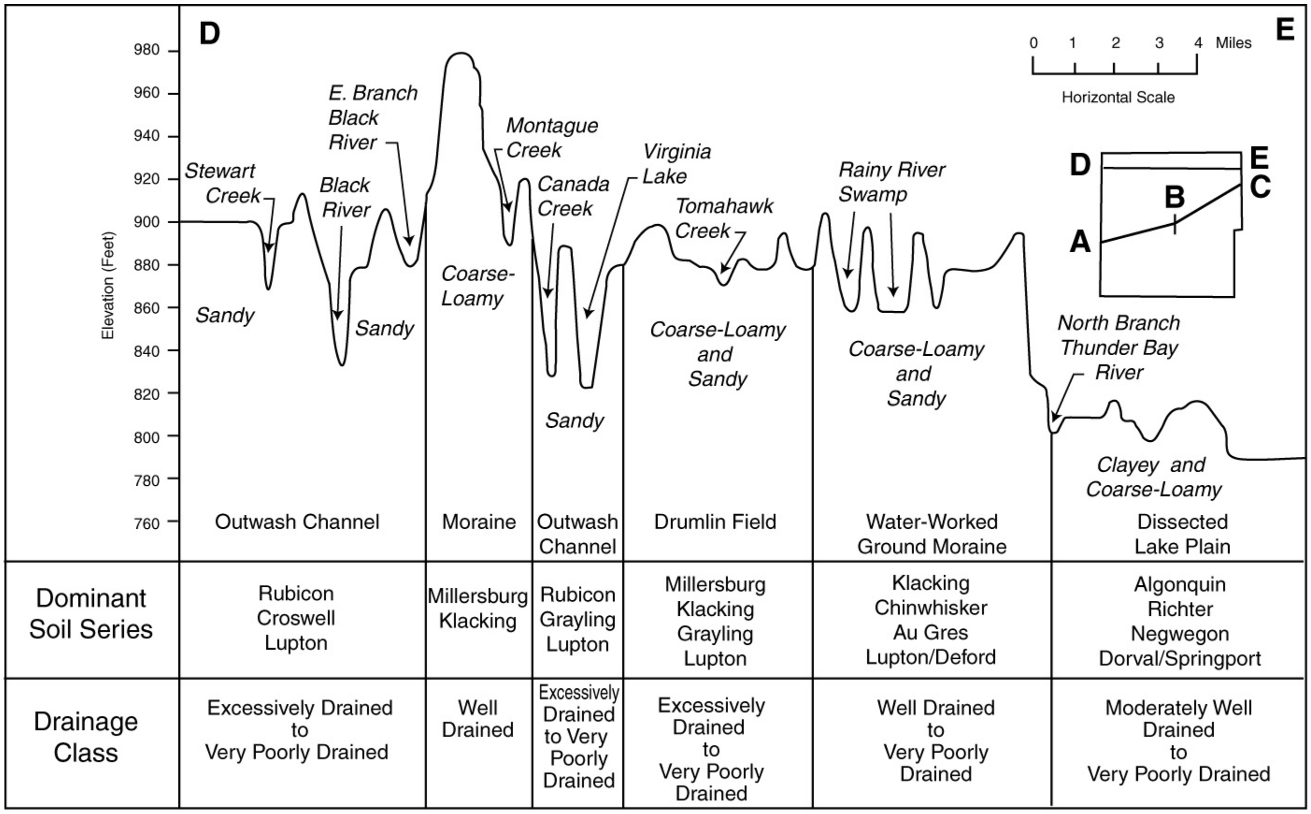


Figure 15.—A diagrammatic cross section of Montmorency County showing the topography, elevation, general soil texture, landforms, and dominant soil series and their drainage classes.

and on the faces of soil peds. This horizon was probably leached of carbonates and soluble salts to a considerable extent before the translocation of silicate clay minerals. Bamfield soils are examples of soils in which the eluviation and subsequent illuviation and accumulation of silicate clay have occurred and continue to occur.

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Additional References

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.

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.

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

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

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.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

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 (special symbol on soil maps). A general term for a small saucer-, cup-, or trough-shaped hollow or depression formed by wind erosion in an area of loose soil where protective vegetation is disturbed or no protective cover of vegetation exists. Generally less than 3 acres in size.

Bog (special symbol on soil maps). Waterlogged, spongy ground consisting primarily of acidic vegetation. Normally occurs in small, closed depressions within areas of mineral soils. Generally less than 3 acres in size.

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.

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.

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.

Clayey soil. Silty clay, sandy clay, or clay.

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.

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.

Clay spot (special symbol on soil maps). An area in which the surface layer is silty clay or clay.

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.

COLE (coefficient of linear extensibility). See Linear extensibility.

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 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.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cut and fill (special symbol on soil maps). Areas where native soil has been removed or buried. Generally less than 3 acres in size.

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 (in tables). 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.

Depression (special symbol on soil maps). A dry, low area, the middle of which is at least 4 feet deeper than the surrounding area. Generally less than 3 acres in size.

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.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—***excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,*** and ***very poorly drained***. These classes are defined in the “Soil Survey Manual.”

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may 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.

Dump (special symbol on soil maps). An area of nonsoil material. Generally less than 3 acres in size.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

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.

Escarpment (special symbol on soil maps). An elevation change of at least 15 feet in areas too narrow to delineate and where the soil above and below is two drainage classes slower. Slope is more than 18 percent (symbol points downslope).

Esker. A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

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.

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***.

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An 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.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flat. A general term for a level or nearly level surface, 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.

Gilgai. Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial 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.

Glaciated uplands. Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

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.

Gravel at depth (special symbol on soil maps). An area in which the subsoil has strata of gravel. Generally less than 3 acres in size.

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.

Gravelly spot (special symbol on soil maps). An area in which the surface layer is very gravelly or extremely gravelly and the surface layer of the surrounding soil is not gravelly. Generally less than 3 acres in size.

Gravel pit (special symbol on soil maps). An area where gravel is being excavated. Generally less than 3 acres in size.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

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.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-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.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

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.

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.

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.

Lamellae. Thin layers in the soil where illuviated clay particles have accumulated. These layers generally form in sandy soils and are typically irregular or discontinuous.

Landfill (special symbol on soil maps). Areas of nonsoil material. Generally less than 3 acres in size.

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.

Loam at depth (special symbol on soil maps). An area of sandy soil that has loamy material between the depths of 20 and 60 inches. Generally less than 3 acres in size.

Loamy soil. 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.

Loamy spot (special symbol on soil maps). An area of sandy soil that has loamy material at the surface. Less than 3 acres in size.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

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.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Marl spot (special symbol on soil maps). An area of marl. Generally less than 3 acres in size.

Marsh spot (special symbol on soil maps). A water-saturated, very poorly drained area, intermittently or permanently water covered, having aquatic and grasslike vegetation, essentially without the formation of peat. Generally less than 3 acres in size.

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.

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.

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 intermediate in degree of decomposition between the less decomposed peat and the more decomposed muck.

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.

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic mat. A zone of accumulation of organic material, 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

Organic spot (special symbol on soil maps). An area of nonacid organic soil more than 9 inches thick surrounded by soil that has a mineral surface layer. Generally less than 3 acres in size.

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 plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace. An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

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:

Impermeable	less than 0.0015 inch
Very slow	0.0015 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

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 and the subsequent thaw of the ice and collapse of the surface materials.

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.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential 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.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

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.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

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, normally 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.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant 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 soil. Sand or loamy sand.

Sandy spot (special symbol on soil maps). A small area in which the surface layer is sandy but the surface layer of the surrounding soils is loamy or finer textured. Generally less than 3 acres in size.

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.

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.

Severely eroded spot (special symbol on soil maps). An area in which an average of 75 percent or more of the original surface layer has been lost as a result of accelerated erosion.

Shallow bedrock (special symbol on soil maps). An area in which bedrock is within a depth of 20 inches. Generally less than 3 acres in size.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short steep slope (special symbol on soil maps). A narrow area in which the slope typically ranges from 8 to 18 percent. The soils above and below are nearly level or gently sloping.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

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.

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 onto a logging truck.

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.

Slow intake (in tables). The slow movement of water into the soil.

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.

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil 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.

Spring (special symbol on soil maps). A specific site where ground water flows from the surface for at least 6 months of the year.

Stone line. A concentration of rock 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.

Stony spot (special symbol on soil maps). An area in which 0.1 to 3.0 percent of the surface is covered with stones and in which the surrounding area is not stony. Generally less than 3 acres in size.

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 annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

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.

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.

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.

Understory. Any 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.

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.

Very stony spot (special symbol on soil maps). An area in which more than 3 percent of the surface is covered with stones and in which the surrounding area is not stony. Generally less than 3 acres in size.

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.

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.

Wet spot (special symbol on soil maps). An area that is usually ponded in spring or after rainfall or seeps and is at least two drainage classes wetter than the surrounding soils. Generally less than 3 acres in size.

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 Gaylord, 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----	25.4	9.4	17.4	46	-23	0	2.65	1.70	3.52	8	38.1
February---	28.4	8.9	18.7	50	-22	0	1.81	1.05	2.49	5	23.2
March------	39.0	18.2	28.6	65	-16	3	2.32	1.38	3.15	6	18.6
April------	53.8	30.5	42.2	82	6	46	2.38	1.48	3.19	6	7.0
May--------	67.7	40.9	54.3	88	22	197	2.99	1.60	4.21	6	1.0
June-------	76.2	50.0	63.1	92	30	397	2.87	1.68	3.94	6	.0
July-------	80.9	55.2	68.0	94	37	557	2.96	1.50	4.23	5	.0
August-----	77.5	53.5	65.5	92	34	480	3.60	1.94	5.06	7	.0
September--	68.9	46.7	57.8	86	26	258	4.20	2.10	6.03	9	.0
October----	57.2	37.3	47.3	79	17	83	3.33	2.09	4.45	8	3.1
November---	42.2	27.3	34.7	68	3	7	3.44	2.24	4.53	9	22.9
December---	29.4	15.5	22.5	53	-14	0	3.07	2.21	3.88	9	36.0
Yearly:											
Average---	53.9	32.8	43.3	---	---	---	---	---	---	---	---
Extreme---	97	-37	---	95	-26	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,029	35.63	28.51	40.15	84	150.1

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Gaylord, 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 16	May 29	June 15
2 years in 10 later than--	May 10	May 24	June 9
5 years in 10 later than--	Apr. 28	May 13	May 28
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 29	Sept. 17	Aug. 30
2 years in 10 earlier than--	Oct. 6	Sept. 24	Sept. 5
5 years in 10 earlier than--	Oct. 19	Oct. 7	Sept. 18

Table 3.--Growing Season

(Recorded in the period 1961-90 at Gaylord, 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	145	117	82
8 years in 10	154	127	92
5 years in 10	171	146	112
2 years in 10	188	165	131
1 year in 10	196	174	141

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
13	Tawas-Lupton mucks	38,003	10.6
14	Dawson-Loxley peats	992	0.3
16B	Graycalm sand, 0 to 6 percent slopes	21,538	6.0
17B	Croswell sand, 0 to 6 percent slopes	8,864	2.5
18A	Au Gres sand, 0 to 3 percent slopes	2,049	0.6
24A	Kinross-Au Gres complex, 0 to 3 percent slopes	313	*
32B	Kellogg sand, 0 to 6 percent slopes	2,331	0.6
32C	Kellogg sand, 6 to 12 percent slopes	186	*
37B	Richter loamy fine sand, 0 to 6 percent slopes	1,582	0.4
41B	McGinn loamy sand, 0 to 6 percent slopes	17	*
41C	McGinn loamy sand, 6 to 12 percent slopes	57	*
44B	Ossineke fine sandy loam, 0 to 6 percent slopes	5,466	1.5
44C	Ossineke fine sandy loam, 6 to 12 percent slopes	1,411	0.4
47D	Graycalm sand, 6 to 18 percent slopes	10,900	3.0
47F	Graycalm sand, 18 to 45 percent slopes	4,796	1.3
53B	Negwegon silt loam, 2 to 6 percent slopes	4,105	1.1
53C	Negwegon silt loam, 6 to 12 percent slopes	1,228	0.3
54A	Algonquin silt loam, 0 to 3 percent slopes	3,004	0.8
59B	Algonquin-Springport complex, 0 to 6 percent slopes	4,195	1.2
62A	Allendale loamy sand, 0 to 3 percent slopes	2,041	0.6
72	Dorval muck	1,127	0.3
75B	Rubicon sand, 0 to 6 percent slopes	11,933	3.3
75D	Rubicon sand, 6 to 18 percent slopes	4,868	1.4
75E	Rubicon sand, 18 to 35 percent slopes	1,356	0.4
75F	Rubicon sand, 35 to 70 percent slopes	421	0.1
78	Pits, borrow	354	*
81B	Grayling sand, 0 to 6 percent slopes	31,179	8.7
81D	Grayling sand, 6 to 18 percent slopes	4,188	1.2
81E	Grayling sand, 18 to 35 percent slopes	1,027	0.3
82B	Udorthents, loamy, nearly level and undulating	255	*
83B	Udipsamments, nearly level and undulating	260	*
86	Histosols and Aquents, ponded	2,550	0.7
87	Ausable muck, frequently flooded	4,001	1.1
90B	Chinwhisker sand, 0 to 4 percent slopes	4,270	1.2
94F	Klacking-McGinn loamy sands, 8 to 50 percent slopes, dissected	167	*
95D	Menominee loamy sand, 12 to 18 percent slopes	1,241	0.3
97	Colonville very fine sandy loam, occasionally flooded	76	*
116B	Mancelona sand, 0 to 6 percent slopes	2,876	0.8
116C	Mancelona sand, 6 to 12 percent slopes	1,019	0.3
116D	Mancelona sand, 12 to 18 percent slopes	869	0.2
116E	Mancelona sand, 18 to 35 percent slopes	396	0.1
116F	Mancelona sand, 35 to 50 percent slopes	661	0.2
123D	Klacking sand, 6 to 18 percent slopes	8,407	2.3
125B	Melita sand, 0 to 6 percent slopes	326	*
147B	Lindquist sand, 0 to 6 percent slopes	2,430	0.7
147E	Lindquist sand, 18 to 35 percent slopes	468	0.1
307B	Klacking sand, 0 to 6 percent slopes	8,621	2.4
307E	Klacking sand, 18 to 35 percent slopes	1,968	0.5
307F	Klacking sand, 35 to 70 percent slopes	129	*
350B	Blue Lake sand, 0 to 6 percent slopes	2,532	0.7
350D	Blue Lake sand, 6 to 18 percent slopes	1,772	0.5
350E	Blue Lake sand, 18 to 35 percent slopes	241	*
351A	Allendale-Wakeley-Dorval complex, 0 to 3 percent slopes	3,950	1.1
352B	Deford-Au Gres-Croswell complex, 0 to 6 percent slopes	5,089	1.4
353B	Mancelona-Ossineke-Blue Lake complex, 0 to 6 percent slopes	479	0.1
354F	Mancelona-Blue Lake sands, 15 to 70 percent slopes, dissected	470	0.1
359C	Algonquin-Negwegon-Dorval complex, 0 to 12 percent slopes	1,470	0.4
360	Wakeley muck	2,534	0.7
361B	Allendale-Dorval-Blue Lake complex, 0 to 6 percent slopes	4,224	1.2
362B	Millersburg loamy sand, 0 to 6 percent slopes	15,138	4.2
362D	Millersburg loamy sand, 6 to 18 percent slopes	10,830	3.0
362E	Millersburg loamy sand, 18 to 35 percent slopes	1,083	0.3

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
363D	Mancelona-Millersburg-Blue Lake complex, 6 to 18 percent slopes	6,408	1.8
364E	Mancelona-Millersburg-Blue Lake complex, 8 to 35 percent slopes, dissected	2,551	0.7
369	Deford muck	5,172	1.4
371	Springport silt loam	959	0.3
380	Access denied	878	0.2
384B	Iosco sand, 0 to 6 percent slopes	1,678	0.5
385D	Lindquist sand, 6 to 18 percent slopes	917	0.3
386B	Mancelona-Rubicon sands, 0 to 6 percent slopes	473	0.1
386D	Mancelona-Rubicon sands, 6 to 18 percent slopes	1,179	0.3
387E	Mancelona-Rubicon sands, 8 to 35 percent slopes, dissected	745	0.2
387F	Mancelona-Rubicon sands, 15 to 70 percent slopes, dissected	580	0.2
388B	Millersburg-Klacking-Graycalm complex, 0 to 6 percent slopes	10,769	3.0
388D	Millersburg-Klacking-Graycalm complex, 6 to 18 percent slopes	9,259	2.6
388E	Millersburg-Klacking-Graycalm complex, 18 to 35 percent slopes	3,042	0.8
389B	Horsehead gravelly sand, 0 to 6 percent slopes	406	0.1
389D	Horsehead gravelly sand, 6 to 18 percent slopes	996	0.3
389E	Horsehead gravelly sand, 18 to 35 percent slopes	480	0.1
390B	Horsehead-Graycalm sands, 0 to 6 percent slopes	4,602	1.3
390D	Horsehead-Graycalm sands, 6 to 18 percent slopes	4,278	1.2
390E	Horsehead-Graycalm sands, 18 to 35 percent slopes	2,959	0.8
390F	Horsehead-Graycalm sands, 35 to 70 percent slopes	1,681	0.5
391B	Horsehead sand, 0 to 6 percent slopes	4,522	1.3
391D	Horsehead sand, 6 to 18 percent slopes	1,286	0.4
392	Caffey mucky sand	1,489	0.4
393B	Morganlake loamy sand, 0 to 6 percent slopes	3,798	1.1
393C	Morganlake loamy sand, 6 to 12 percent slopes	909	0.3
394B	Ocqueoc sand, 0 to 6 percent slopes	901	0.3
399D	Menominee-Bamfield, sandy substratum-Blue Lake complex, 12 to 18 percent slopes	1,513	0.4
400F	Menominee-Bamfield, sandy substratum-Blue Lake complex, 18 to 70 percent slopes, dissected	475	0.1
420A	Otisco mucky sand, 0 to 3 percent slopes	1,074	0.3
421A	Richter-Caffey complex, 0 to 3 percent slopes	293	*
422B	Morganlake-Iosco-Deford complex, 0 to 6 percent slopes	1,642	0.5
423B	Richter-Algonquin complex, 0 to 6 percent slopes	1,256	0.3
424B	Morganlake-Ossineke, sandy substratum-Blue Lake complex, 0 to 6 percent slopes	4,015	1.1
424C	Morganlake-Ossineke, sandy substratum-Blue Lake complex, 6 to 12 percent slopes	2,286	0.6
450B	Millersburg-Blue Lake complex, 0 to 6 percent slopes	1,143	0.3
450D	Millersburg-Blue Lake complex, 6 to 18 percent slopes	1,033	0.3
450E	Millersburg-Blue Lake complex, 18 to 35 percent slopes	727	0.2
451B	Annalake loamy fine sand, 0 to 6 percent slopes	802	0.2
451C	Annalake loamy fine sand, 6 to 12 percent slopes	224	*
452D	Bamfield fine sandy loam, sandy substratum, 12 to 18 percent slopes	668	0.2
452E	Bamfield fine sandy loam, sandy substratum, 18 to 35 percent slopes	101	*
453B	Ossineke fine sandy loam, sandy substratum, 0 to 6 percent slopes	17	*
W	Water	9,245	2.6
	Total	359,764	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	Bromegrass-alfalfa hay	Corn	Corn silage	Oats	Winter wheat
		Tons	Bu	Tons	Bu	Bu
13:						
Tawas-Lupton	6w	---	---	---	---	---
14:						
Dawson-Loxley	7w	---	---	---	---	---
16B:						
Graycalm	4s	2.3	---	---	---	---
17B:						
Croswell	4s	---	---	---	---	---
18A:						
Au Gres	4w	---	---	---	---	---
24A:						
Kinross	6w	---	---	---	---	---
Au Gres	4w	---	---	---	---	---
32B:						
Kellogg	3s	---	---	---	---	---
32C:						
Kellogg	4s	---	---	---	---	---
37B:						
Richter	2e	---	80	13	80	35
41B:						
McGinn	3s	---	---	---	---	---
41C:						
McGinn	3e	---	---	---	---	---
44B:						
Ossineke	2e	4.0	85	14	76	---
44C:						
Ossineke	3e	4.0	85	14	76	---
47D:						
Graycalm	6s	---	---	---	---	---
47F:						
Graycalm	7s	2.3	---	---	---	---
53B:						
Negwegon	3e	3.5	75	12	70	---
53C:						
Negwegon	3e	3.5	75	12	70	---
54A:						
Algonquin	3w	3.0	80	13	75	35

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa hay	Corn	Corn silage	Oats	Winter wheat
		Tons	Bu	Tons	Bu	Bu
59B:						
Algonquin----------	3e	3.0	80	13	75	35
Springport---------	5w	---	---	---	---	---
62A:						
Allendale----------	3w	2.5	85	14	75	40
72:						
Dorval-------------	5w	---	---	---	---	---
75B:						
Rubicon------------	6s	---	---	---	---	---
75D:						
Rubicon------------	7s	---	---	---	---	---
75E:						
Rubicon------------	7s	---	---	---	---	---
75F:						
Rubicon------------	7s	---	---	---	---	---
78:						
Pits, borrow.						
81B:						
Grayling-----------	6s	---	---	---	---	---
81D:						
Grayling-----------	7s	---	---	---	---	---
81E:						
Grayling-----------	7s	---	---	---	---	---
82B:						
Udorthents.						
83B:						
Udipsamments.						
86:						
Histosols and Aquents.						
87:						
Ausable------------	7w	---	---	---	---	---
90B:						
Chinwhisker--------	4s	---	---	---	---	---
94F:						
Klacking-----------	7e	---	---	---	---	---
McGinn-------------	7e	---	---	---	---	---
95D:						
Menominee----------	4e	3.1	---	---	55	23
97:						
Colonville---------	5w	---	---	---	---	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa hay	Corn	Corn silage	Oats	Winter wheat
		Tons	Bu	Tons	Bu	Bu
116B:						
Mancelona----------	3s	2.6	65	11	55	24
116C:						
Mancelona----------	3e	2.6	65	11	55	24
116D:						
Mancelona----------	4e	---	---	---	---	---
116E:						
Mancelona----------	7e	---	---	---	---	---
116F:						
Mancelona----------	7e	---	---	---	---	---
123D:						
Klacking-----------	4e	---	---	---	---	---
125B:						
Melita-------------	4s	---	---	---	---	---
147B:						
Lindquist----------	4s	2.5	---	---	---	---
147E:						
Lindquist----------	7s	---	---	---	---	---
307B:						
Klacking-----------	3s	---	---	---	---	---
307E:						
Klacking-----------	7e	---	---	---	---	---
307F:						
Klacking-----------	7e	---	---	---	---	---
350B:						
Blue Lake----------	3s	---	---	---	---	---
350D:						
Blue Lake----------	4e	---	---	---	---	---
350E:						
Blue Lake----------	7e	---	---	---	---	---
351A:						
Allendale----------	3w	2.5	85	14	75	40
Wakeley------------	5w	---	---	---	---	---
Dorval-------------	5w	---	---	---	---	---
352B:						
Deford-------------	5w	---	---	---	---	---
Au Gres------------	4w	---	---	---	---	---
Croswell-----------	4s	---	---	---	---	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa hay	Corn	Corn silage	Oats	Winter wheat
		Tons	Bu	Tons	Bu	Bu
353B:						
Mancelona----------	3s	---	---	---	---	---
Ossineke-----------	3e	---	---	---	---	---
Blue Lake----------	3s	---	---	---	---	---
354F:						
Mancelona----------	7e	---	---	---	---	---
Blue Lake----------	7e	---	---	---	---	---
359C:						
Algonquin----------	3w	---	80	13	75	---
Negwegon-----------	3e	3.5	75	12	70	---
Dorval-------------	5w	---	---	---	---	---
360:						
Wakeley------------	5w	---	---	---	---	---
361B:						
Allendale----------	3w	2.5	85	14	75	40
Dorval-------------	5w	---	---	---	---	---
Blue Lake----------	3s	2.1	70	11	60	28
362B:						
Millersburg--------	3s	---	---	---	---	---
362D:						
Millersburg--------	4e	---	---	---	---	---
362E:						
Millersburg--------	7e	---	---	---	---	---
363D:						
Mancelona----------	4e	---	---	---	---	---
Millersburg--------	4e	---	---	---	---	---
Blue Lake----------	4e	---	---	---	---	---
364E:						
Mancelona----------	7e	---	---	---	---	---
Millersburg--------	7e	---	---	---	---	---
Blue Lake----------	7e	---	---	---	---	---
369:						
Deford-------------	5w	---	---	---	---	---
371:						
Springport---------	5w	---	---	---	---	---
380:						
Access denied.						
384B:						
Iosco--------------	3w	---	---	---	---	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa hay	Corn	Corn silage	Oats	Winter wheat
		Tons	Bu	Tons	Bu	Bu
385D:						
Lindquist----------	6s	---	---	---	---	---
386B:						
Mancelona----------	3s	---	---	---	---	---
Rubicon------------	6s	---	---	---	---	---
386D:						
Mancelona----------	4e	---	---	---	---	---
Rubicon------------	7s	---	---	---	---	---
387E:						
Mancelona----------	7e	---	---	---	---	---
Rubicon------------	7s	---	---	---	---	---
387F:						
Mancelona----------	7e	---	---	---	---	---
Rubicon------------	7s	---	---	---	---	---
388B:						
Millersburg--------	3s	---	---	---	---	---
Klacking-----------	3s	---	---	---	---	---
Graycalm-----------	4s	---	---	---	---	---
388D:						
Millersburg--------	4e	---	---	---	---	---
Klacking-----------	4e	---	---	---	---	---
Graycalm-----------	6s	---	---	---	---	---
388E:						
Millersburg--------	7e	---	---	---	---	---
Klacking-----------	7e	---	---	---	---	---
Graycalm-----------	7s	---	---	---	---	---
389B:						
Horsehead----------	4s	---	---	---	---	---
389D:						
Horsehead----------	6s	---	---	---	---	---
389E:						
Horsehead----------	7s	---	---	---	---	---
390B:						
Horsehead----------	4s	---	---	---	---	---
Graycalm-----------	4s	---	---	---	---	---
390D:						
Horsehead----------	6s	---	---	---	---	---
Graycalm-----------	6s	---	---	---	---	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capa- bility	Bromegrass- alfalfa hay	Corn	Corn silage	Oats	Winter wheat
		Tons	Bu	Tons	Bu	Bu
390E:						
Horsehead----------	7s	---	---	---	---	---
Graycalm-----------	7s	---	---	---	---	---
390F:						
Horsehead----------	7s	---	---	---	---	---
Graycalm-----------	7s	---	---	---	---	---
391B:						
Horsehead----------	6s	---	---	---	---	---
391D:						
Horsehead----------	6s	---	---	---	---	---
392:						
Caffey-------------	5w	---	---	---	---	---
393B:						
Morganlake---------	3s	3.5	75	12	70	35
393C:						
Morganlake---------	3e	3.5	75	12	70	35
394B:						
Ocqueoc------------	3s	2.5	---	12	70	---
399D:						
Menominee----------	4e	---	---	---	---	---
Bamfield-----------	4e	---	---	---	---	---
Blue Lake----------	4e	---	---	---	---	---
400F:						
Menominee----------	7e	---	---	---	---	---
Bamfield-----------	7e	---	---	---	---	---
Blue Lake----------	7e	---	---	---	---	---
420A:						
Otisco-------------	3w	---	---	---	---	---
421A:						
Richter------------	2w	---	80	13	80	35
Caffey-------------	5w	---	---	---	---	---
422B:						
Morganlake---------	3s	---	---	---	---	---
Iosco--------------	3w	---	---	---	---	---
Deford-------------	5w	---	---	---	---	---
423B:						
Richter------------	2e	---	80	13	80	35
Algonquin----------	3w	---	80	13	75	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa hay	Corn	Corn silage	Oats	Winter wheat
		Tons	Bu	Tons	Bu	Bu
424B:						
Morganlake---------	3s	3.5	75	12	70	35
Ossineke-----------	3e	---	85	14	80	---
Blue Lake----------	3s	2.1	70	11	60	28
424C:						
Morganlake---------	3e	3.5	75	12	70	35
Ossineke-----------	3e	---	85	14	80	---
Blue Lake----------	3e	2.1	70	11	60	28
450B:						
Millersburg--------	3s	---	---	---	---	---
Blue Lake----------	3s	---	---	---	---	---
450D:						
Millersburg--------	4e	---	---	---	---	---
Blue Lake----------	4e	---	---	---	---	---
450E:						
Millersburg--------	7e	---	---	---	---	---
Blue Lake----------	7e	---	---	---	---	---
451B:						
Annalake-----------	2e	3.5	85	14	70	40
451C:						
Annalake-----------	3e	3.5	85	14	70	40
452D:						
Bamfield-----------	4e	---	---	---	---	---
452E:						
Bamfield-----------	6e	---	---	---	---	---
453B:						
Ossineke-----------	3e	---	85	14	80	---

Table 6.--Capability Classes and Subclasses

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass) Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
1	---	---	---	---	---
2	9,501	8,031	1,470	---	---
3	83,827	10,709	17,918	55,200	---
4	95,641	43,744	8,638	43,259	---
5	10,961	---	10,961	---	---
6	107,928	286	41,094	66,548	---
7	40,321	12,642	4,957	22,722	---
8	---	---	---	---	---

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
37B	Richter loamy fine sand, 0 to 6 percent slopes (where drained)
44B	Ossineke fine sandy loam, 0 to 6 percent slopes
53B	Negwegon silt loam, 2 to 6 percent slopes
54A	Algonquin silt loam, 0 to 3 percent slopes (where drained)
421A	Richter-Caffey complex, 0 to 3 percent slopes (where drained)
423B	Richter-Algonquin complex, 0 to 6 percent slopes (where drained)
451B	Annalake loamy fine sand, 0 to 6 percent slopes
453B	Ossineke fine sandy loam, sandy substratum, 0 to 6 percent slopes

Table 8.--Forestland Management and Productivity

(Only the soils suitable for production of commercial trees are listed)

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
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	Black spruce--------	15	29	---
						Balsam fir----------	---	---	
						Tamarack------------	---	---	
16B:									
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	
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	Quaking aspen-------	70	86	Norway spruce, eastern white pine, red pine, white spruce.
						Bigtooth aspen------	---	---	
						Balsam fir----------	---	---	
						Red maple-----------	65	43	
						Yellow birch--------	---	---	
						Paper birch---------	---	---	
						Jack pine-----------	51	72	
						Eastern white pine--	---	---	
						Northern whitecedar	---	---	
						Eastern hemlock-----	---	---	

See footnote at end of table.

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
24A:									
Kinross	2W	Slight	Severe	Severe	Severe	Quaking aspen	45	29	---
						Balsam fir	---	---	
						Red maple	---	---	
						Paper birch	---	---	
						Tamarack	---	---	
						Jack pine	---	---	
						Black spruce	---	---	
						Eastern white pine	---	---	
						Northern whitecedar	---	---	
Au Gres	6W	Slight	Severe	Moderate	Severe	Quaking aspen	70	86	Norway spruce, eastern white pine, red pine, white spruce.
						Bigtooth aspen	---	---	
						Balsam fir	---	---	
						Red maple	65	43	
						Yellow birch	---	---	
						Paper birch	---	---	
						Jack pine	51	72	
						Eastern white pine	---	---	
						Northern whitecedar	---	---	
						Eastern hemlock	---	---	
37B:									
Richter	3W	Slight	Severe	Moderate	Severe	Red maple	65	43	Eastern white pine, northern whitecedar, white spruce.
						Sugar maple	61	43	
						Balsam fir	---	---	
						Paper birch	65	72	
						Black ash	---	---	
						Quaking aspen	---	---	
						Eastern hemlock	---	---	
41B:									
McGinn	4S	Slight	Slight	Slight	Slight	Northern red oak	67	57	Red pine, white spruce.
						Red pine	---	---	
						Bigtooth aspen	---	---	
						White oak	65	57	
41C:									
McGinn	4S	Slight	Slight	Slight	Slight	Northern red oak	67	57	Red pine, white spruce.
						Red pine	---	---	
						Bigtooth aspen	---	---	
						White oak	65	57	
44B:									
Ossineke	3L	Slight	Moderate	Slight	Moderate	Northern red oak	65	57	Norway spruce, eastern white pine, red pine, white spruce.
						Sugar maple	63	43	
						Paper birch	---	---	
						White ash	---	---	
						Bigtooth aspen	---	---	
						American basswood	---	---	
						Eastern hemlock	---	---	
44C:									
Ossineke	3L	Slight	Moderate	Slight	Moderate	Northern red oak	65	57	Norway spruce, eastern white pine, red pine, white spruce.
						Sugar maple	63	43	
						Paper birch	---	---	
						White ash	---	---	
						Bigtooth aspen	---	---	
						American basswood	---	---	
						Eastern hemlock	---	---	

See footnote at end of table.

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
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	
47F:									
Graycalm	6R	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:									
Negwegon	3L	Slight	Moderate	Slight	Moderate	Sugar maple	62	43	Eastern white pine, white spruce.
						Balsam fir	---	---	
						American beech	---	---	
						White ash	---	---	
						Bigtooth aspen	---	---	
						Northern red oak	---	---	
						Eastern hemlock	---	---	
53C:									
Negwegon	3L	Slight	Moderate	Slight	Moderate	Sugar maple	62	43	Eastern white pine, white spruce.
						Balsam fir	---	---	
						American beech	---	---	
						White ash	---	---	
						Bigtooth aspen	---	---	
						Northern red oak	---	---	
						Eastern hemlock	---	---	
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	---	---	
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.
						Balsam poplar	---	---	
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	

See footnote at end of table.

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	Quaking aspen-------	60	57	Eastern white pine, white spruce.
						Balsam fir----------	---	---	
						Red maple-----------	---	---	
						Paper birch---------	---	---	
						White ash-----------	---	---	
						White spruce--------	---	---	
						Eastern white pine--	---	---	
72:									
Dorval---------	2W	Slight	Severe	Severe	Severe	Red maple-----------	50	29	Northern whitecedar, white spruce.
						White ash-----------	---	---	
						Northern whitecedar	---	---	
						American elm--------	---	---	
75B:									
Rubicon--------	4S	Slight	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-----------	---	---	
75D:									
Rubicon--------	4S	Slight	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-----------	---	---	
75E:									
Rubicon--------	4R	Slight	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-----------	---	---	
75F:									
Rubicon--------	4R	Slight	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-----------	---	---	

See footnote at end of table.

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
81B:									
Grayling-------	4S	Slight	Moderate	Moderate	Slight	Jack pine-----------	48	57	Jack pine, red pine.
						Northern pin oak----	43	29	
						Quaking aspen-------	---	---	
						Red pine------------	---	---	
						White oak-----------	---	---	
81D:									
Grayling-------	4S	Slight	Moderate	Moderate	Slight	Jack pine-----------	48	57	Jack pine, red pine.
						Northern pin oak----	43	29	
						Quaking aspen-------	---	---	
						Red pine------------	---	---	
						White oak-----------	---	---	
81E:									
Grayling-------	4R	Moderate	Moderate	Moderate	Slight	Jack pine-----------	48	57	Jack pine, red pine.
						Northern pin oak----	43	29	
						Quaking aspen-------	---	---	
						Red pine------------	---	---	
						White oak-----------	---	---	
87:									
Ausable--------	2W	Slight	Severe	Severe	Severe	Northern whitecedar	15	29	---
						Paper birch---------	---	---	
						Black ash-----------	---	---	
						Balsam poplar-------	---	---	
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-----------	---	---	
94F:									
Klacking-------	6R	Moderate	Moderate	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---------	4R	Slight	Slight	Slight	Slight	Northern red oak----	67	57	Red pine, white spruce.
						Red pine------------	---	---	
						Bigtooth aspen------	---	---	
						White oak-----------	65	57	
95D:									
Menominee------	6A	Slight	Slight	Slight	Slight	Quaking aspen-------	74	86	Eastern white pine, white spruce.
						Bigtooth aspen------	76	86	
						Sugar maple---------	---	---	
						Paper birch---------	---	---	
						White ash-----------	77	72	
						Red pine------------	62	114	
						Black cherry--------	---	---	
						White oak-----------	77	72	
						Northern red oak----	63	57	
						American basswood---	---	---	

See footnote at end of table.

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
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	
116B:									
Mancelona	3S	Slight	Moderate	Moderate	Slight	Sugar maple	58	43	Eastern white pine, jack pine, red pine.
						Yellow birch	---	---	
						Jack pine	---	---	
						Red pine	---	---	
						Eastern white pine	---	---	
						Northern red oak	---	---	
116C:									
Mancelona	3S	Slight	Moderate	Moderate	Slight	Sugar maple	58	43	Eastern white pine, jack pine, red pine.
						Yellow birch	---	---	
						Jack pine	---	---	
						Red pine	---	---	
						Eastern white pine	---	---	
						Northern red oak	---	---	
116D:									
Mancelona	3S	Slight	Moderate	Moderate	Slight	Sugar maple	58	43	Eastern white pine, jack pine, red pine.
						Yellow birch	---	---	
						Jack pine	---	---	
						Red pine	---	---	
						Eastern white pine	---	---	
						Northern red oak	---	---	
116E:									
Mancelona	3R	Moderate	Moderate	Moderate	Slight	Sugar maple	58	43	Eastern white pine, jack pine, red pine.
						Yellow birch	---	---	
						Jack pine	---	---	
						Red pine	---	---	
						Eastern white pine	---	---	
						Northern red oak	---	---	
116F:									
Mancelona	3R	Moderate	Moderate	Moderate	Slight	Sugar maple	58	43	Eastern white pine, jack pine, red pine.
						Yellow birch	---	---	
						Jack pine	---	---	
						Red pine	---	---	
						Eastern white pine	---	---	
						Northern red oak	---	---	
123D:									
Klacking	6S	Slight	Moderate	Moderate	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	

See footnote at end of table.

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
125B:									
Melita	3S	Slight	Moderate	Moderate	Slight	Sugar maple	61	43	Eastern white pine, red pine.
						Red maple	---	---	
						Yellow birch	---	---	
						American beech	---	---	
						Red pine	---	---	
						Eastern white pine	---	---	
						Quaking aspen	---	---	
						Black cherry	---	---	
						American basswood	---	---	
147B:									
Lindquist	6S	Slight	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	54	86	
147E:									
Lindquist	6R	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	54	86	
307B:									
Klacking	6S	Slight	Moderate	Moderate	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	
307E:									
Klacking	6R	Moderate	Moderate	Moderate	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	

See footnote at end of table.

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
307F:									
Klacking-------	6R	Moderate	Moderate	Moderate	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	
350B:									
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--------	---	---	
350D:									
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--------	---	---	
350E:									
Blue Lake------	3R	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--------	---	---	
351A:									
Allendale------	4W	Slight	Severe	Slight	Moderate	Quaking aspen-------	60	57	Eastern white pine, white spruce.
						Balsam fir----------	---	---	
						Red maple-----------	---	---	
						Paper birch---------	---	---	
						White ash-----------	---	---	
						White spruce--------	---	---	
						Eastern white pine--	---	---	
Wakeley--------	3W	Slight	Severe	Severe	Severe	Balsam fir----------	---	---	Northern whitecedar.
						Black spruce--------	---	---	
						Northern whitecedar	---	---	
						Quaking aspen-------	50	43	

See footnote at end of table.

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
351A:									
Dorval	2W	Slight	Severe	Severe	Severe	Red maple	50	29	Northern whitecedar, white spruce.
						White ash	---	---	
						Northern whitecedar	---	---	
						American elm	---	---	
352B:									
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	
Au Gres	6W	Slight	Severe	Moderate	Severe	Quaking aspen	70	86	Norway spruce, eastern white pine, red pine, white spruce.
						Bigtooth aspen	---	---	
						Balsam fir	---	---	
						Red maple	65	43	
						Yellow birch	---	---	
						Paper birch	---	---	
						Jack pine	51	72	
						Eastern white pine	---	---	
						Northern whitecedar	---	---	
						Eastern hemlock	---	---	
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	
353B:									
Mancelona	3S	Slight	Moderate	Moderate	Slight	Sugar maple	58	43	Eastern white pine, jack pine, red pine.
						Yellow birch	---	---	
						Jack pine	---	---	
						Red pine	---	---	
						Eastern white pine	---	---	
						Northern red oak	---	---	
Ossineke	3L	Slight	Moderate	Slight	Moderate	Northern red oak	65	57	Norway spruce, eastern white pine, red pine, white spruce.
						Sugar maple	63	43	
						Paper birch	---	---	
						White ash	---	---	
						Bigtooth aspen	---	---	
						American basswood	---	---	
						Eastern hemlock	---	---	
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	---	---	

See footnote at end of table.

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
354F:									
Mancelona	3R	Moderate	Moderate	Moderate	Slight	Sugar maple	58	43	Eastern white pine, jack pine, red pine.
						Yellow birch	---	---	
						Jack pine	---	---	
						Red pine	---	---	
						Eastern white pine	---	---	
						Northern red oak	---	---	
Blue Lake	3R	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	---	---	
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	3L	Slight	Moderate	Slight	Moderate	Sugar maple	62	43	Eastern white pine, white spruce.
						Balsam fir	---	---	
						American beech	---	---	
						White ash	---	---	
						Bigtooth aspen	---	---	
						Northern red oak	---	---	
						Eastern hemlock	---	---	
Dorval	2W	Slight	Severe	Severe	Severe	Red maple	50	29	Northern whitecedar, white spruce.
						White ash	---	---	
						Northern whitecedar	---	---	
						American elm	---	---	
360:									
Wakeley	3W	Slight	Severe	Severe	Severe	Balsam fir	---	---	Northern whitecedar.
						Black spruce	---	---	
						Northern whitecedar	---	---	
						Quaking aspen	50	43	
361B:									
Allendale	4W	Slight	Severe	Slight	Moderate	Quaking aspen	60	57	Eastern white pine, white spruce.
						Balsam fir	---	---	
						Red maple	---	---	
						Paper birch	---	---	
						White ash	---	---	
						White spruce	---	---	
						Eastern white pine	---	---	
Dorval	2W	Slight	Severe	Severe	Severe	Red maple	50	29	Northern whitecedar, white spruce.
						White ash	---	---	
						Northern whitecedar	---	---	
						American elm	---	---	

See footnote at end of table.

Table 8.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordi- nation symbol	Management concerns: Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
361B:									
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--------	---	---	
362B:									
Millersburg----	3A	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	
362D:									
Millersburg----	3A	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	
362E:									
Millersburg----	3R	Moderate	Moderate	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	
363D:									
Mancelona------	3S	Slight	Moderate	Moderate	Slight	Sugar maple---------	58	43	Eastern white pine, jack pine, red pine.
						Yellow birch--------	---	---	
						Jack pine-----------	---	---	
						Red pine------------	---	---	
						Eastern white pine--	---	---	
						Northern red oak----	---	---	
Millersburg----	3A	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	

See footnote at end of table.

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
363D:									
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--------	---	---	
364E:									
Mancelona------	3R	Moderate	Moderate	Moderate	Slight	Sugar maple---------	58	43	Eastern white pine, jack pine, red pine.
						Yellow birch--------	---	---	
						Jack pine-----------	---	---	
						Red pine------------	---	---	
						Eastern white pine--	---	---	
						Northern red oak----	---	---	
Millersburg----	3R	Moderate	Moderate	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	
Blue Lake------	3R	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--------	---	---	
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-------	---	---	

See footnote at end of table.

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
384B:									
Iosco	5W	Slight	Severe	Moderate	Severe	Balsam fir	55	114	Eastern white pine, white spruce.
						Eastern white pine	---	---	
						Northern pin oak	---	---	
						Paper birch	58	57	
						Quaking aspen	65	72	
						Red maple	---	---	
						White ash	---	---	
						White spruce	---	---	
						Yellow birch	---	---	
385D:									
Lindquist	6S	Slight	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	54	86	
386B:									
Mancelona	3S	Slight	Moderate	Moderate	Slight	Sugar maple	58	43	Eastern white pine, jack pine, red pine.
						Yellow birch	---	---	
						Jack pine	---	---	
						Red pine	---	---	
						Eastern white pine	---	---	
						Northern red oak	---	---	
Rubicon	4S	Slight	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	---	---	
386D:									
Mancelona	3S	Slight	Moderate	Moderate	Slight	Sugar maple	58	43	Eastern white pine, jack pine, red pine.
						Yellow birch	---	---	
						Jack pine	---	---	
						Red pine	---	---	
						Eastern white pine	---	---	
						Northern red oak	---	---	
Rubicon	4S	Slight	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	---	---	

See footnote at end of table.

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
387E:									
Mancelona------	3R	Moderate	Moderate	Moderate	Slight	Sugar maple---------	58	43	Eastern white pine, jack pine, red pine.
						Yellow birch--------	---	---	
						Jack pine-----------	---	---	
						Red pine------------	---	---	
						Eastern white pine--	---	---	
						Northern red oak----	---	---	
Rubicon--------	4R	Slight	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-----------	---	---	
387F:									
Mancelona------	3R	Moderate	Moderate	Moderate	Slight	Sugar maple---------	58	43	Eastern white pine, jack pine, red pine.
						Yellow birch--------	---	---	
						Jack pine-----------	---	---	
						Red pine------------	---	---	
						Eastern white pine--	---	---	
						Northern red oak----	---	---	
Rubicon--------	4R	Slight	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-----------	---	---	
388B:									
Millersburg----	3A	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	
Klacking-------	6S	Slight	Moderate	Moderate	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	

See footnote at end of table.

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
388B:									
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	
388D:									
Millersburg----	3A	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	
Klacking-------	6S	Slight	Moderate	Moderate	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	
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	
388E:									
Millersburg----	3R	Moderate	Moderate	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	
Klacking-------	6R	Moderate	Moderate	Moderate	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	

See footnote at end of table.

Table 8.--Forestland Management and Productivity--Continued

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
388E:									
Graycalm-------	6R	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	
389B:									
Horsehead------	3S	Slight	Moderate	Moderate	Slight	Bigtooth aspen------	48	43	Eastern white pine, jack pine, red pine.
						Northern red oak----	54	43	
						Quaking aspen-------	48	43	
						Red maple-----------	53	43	
						Red pine------------	55	86	
						White ash-----------	---	---	
						White oak-----------	---	---	
389D:									
Horsehead------	3S	Slight	Moderate	Moderate	Slight	Bigtooth aspen------	48	43	Eastern white pine, jack pine, red pine.
						Northern red oak----	54	43	
						Quaking aspen-------	48	43	
						Red maple-----------	53	43	
						Red pine------------	55	86	
						White ash-----------	---	---	
						White oak-----------	---	---	
389E:									
Horsehead------	3R	Slight	Moderate	Moderate	Slight	Bigtooth aspen------	48	43	Eastern white pine, jack pine, red pine.
						Northern red oak----	54	43	
						Quaking aspen-------	48	43	
						Red maple-----------	53	43	
						Red pine------------	55	86	
						White ash-----------	---	---	
						White oak-----------	---	---	
390B:									
Horsehead------	3R	Slight	Moderate	Moderate	Slight	Bigtooth aspen------	48	43	Eastern white pine, jack pine, red pine.
						Northern red oak----	53	43	
						Quaking aspen-------	48	43	
						Red pine------------	55	86	
						White ash-----------	---	---	
						White oak-----------	---	---	
Graycalm-------	6R	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	
390D:									
Horsehead------	3S	Slight	Moderate	Moderate	Slight	Bigtooth aspen------	48	43	Eastern white pine, jack pine, red pine.
						Northern red oak----	53	43	
						Quaking aspen-------	48	43	
						Red pine------------	55	86	
						White ash-----------	---	---	
						White oak-----------	---	---	

See footnote at end of table.

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
390D:									
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	
390E:									
Horsehead------	3S	Slight	Moderate	Moderate	Slight	Bigtooth aspen------	48	43	Eastern white pine, jack pine, red pine.
						Northern red oak----	53	43	
						Quaking aspen-------	48	43	
						Red pine------------	55	86	
						White ash-----------	---	---	
						White oak-----------	---	---	
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	
390F:									
Horsehead------	3R	Slight	Moderate	Moderate	Slight	Bigtooth aspen------	48	43	Eastern white pine, jack pine, red pine.
						Northern red oak----	53	43	
						Quaking aspen-------	48	43	
						Red pine------------	55	86	
						White ash-----------	---	---	
						White oak-----------	---	---	
Graycalm-------	6R	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	
391B:									
Horsehead------	3S	Slight	Moderate	Moderate	Slight	Bigtooth aspen------	48	43	Eastern white pine, jack pine, red pine.
						Northern red oak----	53	43	
						Quaking aspen-------	48	43	
						Red pine------------	55	86	
						White ash-----------	---	---	
						White oak-----------	---	---	
391D:									
Horsehead------	3S	Slight	Moderate	Moderate	Slight	Bigtooth aspen------	48	43	Eastern white pine, jack pine, red pine.
						Northern red oak----	53	43	
						Quaking aspen-------	48	43	
						Red pine------------	55	86	
						White ash-----------	---	---	
						White oak-----------	---	---	

See footnote at end of table.

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
392:									
Caffey---------	2W	Slight	Severe	Severe	Severe	Balsam fir----------	---	---	---
						Bigtooth aspen------	---	---	
						Black ash-----------	---	---	
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	40	29	
						Red maple-----------	---	---	
393B:									
Morganlake-----	6A	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--------	---	---	
393C:									
Morganlake-----	6A	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--------	---	---	
394B:									
Ocqueoc--------	3S	Slight	Moderate	Moderate	Slight	American beech------	---	---	Eastern white pine, red pine, white spruce.
						Eastern white pine--	---	---	
						Jack pine-----------	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
						Red pine------------	---	---	
						Sugar maple---------	63	43	
						Yellow birch--------	---	---	
399D:									
Menominee------	6A	Slight	Slight	Slight	Slight	Quaking aspen-------	74	86	Eastern white pine, white spruce.
						Bigtooth aspen------	76	86	
						Sugar maple---------	---	---	
						Paper birch---------	---	---	
						White ash-----------	77	72	
						Red pine------------	62	114	
						Black cherry--------	---	---	
						White oak-----------	77	72	
						Northern red oak----	63	57	
						American basswood---	---	---	

See footnote at end of table.

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
399D:									
Bamfield-------	3L	Slight	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-----------	---	---	
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--------	---	---	
400F:									
Menominee------	6R	Slight	Slight	Slight	Slight	Quaking aspen-------	74	86	Eastern white pine, white spruce.
						Bigtooth aspen------	76	86	
						Sugar maple---------	---	---	
						Paper birch---------	---	---	
						White ash-----------	77	72	
						Red pine------------	62	114	
						Black cherry--------	---	---	
						White oak-----------	77	72	
						Northern red oak----	63	57	
						American basswood---	---	---	
Bamfield-------	3R	Slight	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-----------	---	---	
Blue Lake------	3R	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--------	---	---	
421A:									
Richter--------	3W	Slight	Severe	Moderate	Severe	Red maple-----------	65	43	Eastern white pine, northern whitecedar, white spruce.
						Sugar maple---------	61	43	
						Balsam fir----------	---	---	
						Paper birch---------	65	72	
						Black ash-----------	---	---	
						Quaking aspen-------	---	---	
						Eastern hemlock-----	---	---	

See footnote at end of table.

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
421A:									
Caffey----------	2W	Slight	Severe	Severe	Severe	Balsam fir----------	---	---	---
						Bigtooth aspen------	---	---	
						Black ash-----------	---	---	
						Northern whitecedar	---	---	
						Paper birch---------	---	---	
						Quaking aspen-------	40	29	
						Red maple-----------	---	---	
422B:									
Morganlake-----	6A	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--------	---	---	
Iosco----------	5W	Slight	Severe	Moderate	Severe	Balsam fir----------	55	114	Eastern white pine, white spruce.
						Eastern white pine--	---	---	
						Northern pin oak----	---	---	
						Paper birch---------	58	57	
						Quaking aspen-------	65	72	
						Red maple-----------	---	---	
						White ash-----------	---	---	
						White spruce--------	---	---	
						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	
423B:									
Richter--------	3W	Slight	Severe	Moderate	Severe	Red maple-----------	65	43	Eastern white pine, northern whitecedar, white spruce.
						Sugar maple---------	61	43	
						Balsam fir----------	---	---	
						Paper birch---------	65	72	
						Black ash-----------	---	---	
						Quaking aspen-------	---	---	
						Eastern hemlock-----	---	---	
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-----------	---	---	

See footnote at end of table.

Table 8.--Forestland Management and Productivity--Continued

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
424B:									
Morganlake-----	6A	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-------	4L	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-----------	---	---	
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--------	---	---	
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-------	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-----------	---	---	
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--------	---	---	

See footnote at end of table.

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
450B:									
Millersburg----	3A	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	
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--------	---	---	
450D:									
Millersburg----	3A	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	
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--------	---	---	
450E:									
Millersburg----	3R	Moderate	Moderate	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	
Blue Lake------	3R	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--------	---	---	

See footnote at end of table.

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
451B:									
Annalake	3L	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	---	---	
451C:									
Annalake	3L	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	---	---	
452D:									
Bamfield	3L	Slight	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	---	---	
452E:									
Bamfield	3R	Slight	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	---	---	
453B:									
Ossineke	4L	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	---	---	

* Volume of wood fiber is the yield in cubic feet per acre per year calculated at the age of culmination of the mean annual increment for fully stocked natural stands.

Table 9.--Equipment Limitations on Woodland

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for further explanation of ratings in this table)

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
13:							
Tawas	Poorly suited: Wetness Strength	Poorly suited: Ponding Strength	Poorly suited: Strength Wetness	Winter	Poorly suited: Strength limitation (severe)	Moderately well suited: Strength limitation (moderate)	Moderately well suited: Strength limitation (moderate)
Lupton	Poorly suited: Wetness Strength	Poorly suited: Ponding Strength	Poorly suited: Strength Wetness	Winter	Poorly suited: Strength limitation (severe)	Moderately well suited: Strength limitation (moderate)	Moderately well suited: Strength limitation (moderate)
14:							
Dawson	Poorly suited: Wetness Strength	Poorly suited: Ponding Strength	Poorly suited: Strength Wetness	Winter	Poorly suited: Strength limitation (severe)	Moderately well suited: Strength limitation (moderate)	Moderately well suited: Strength limitation (moderate)
Loxley	Poorly suited: Wetness Strength	Poorly suited: Ponding Strength	Poorly suited: Strength Wetness	Winter	Poorly suited: Strength limitation (severe)	Moderately well suited: Strength limitation (moderate)	Moderately well suited: Strength limitation (moderate)
16B:							
Graycalm	Moderately suited: Sandiness	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
17B:							
Croswell	Moderately suited: Sandiness	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
18A:							
Au Gres	Moderately suited: Sandiness	Moderately well suited: Wetness Sandiness	Moderately suited: Sandiness	Summer, winter.	Well suited	Well suited	Well suited
24A:							
Kinross	Poorly suited: Wetness	Poorly suited: Ponding Wetness	Moderately suited: Wetness	Summer, winter.	Well suited	Well suited	Well suited
Au Gres	Moderately suited: Sandiness	Moderately well suited: Wetness Sandiness	Moderately suited: Sandiness	Summer, winter.	Well suited	Well suited	Well suited

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
32B:							
Kellogg	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
32C:							
Kellogg	Well suited	Moderately well suited: Sandiness Slope limitation (moderate)	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Moderately well suited: Slope limitation (moderate)	Well suited
37B:							
Richter	Well suited	Moderately well suited: Wetness	Well suited	Summer, winter.	Well suited	Well suited	Well suited
41B:							
McGinn	Well suited	Well suited	Well suited	Year round	Well suited	Well suited	Well suited
41C:							
McGinn	Well suited	Moderately well suited: Slope limitation (moderate)	Well suited	Year round	Well suited	Moderately well suited: Slope limitation (moderate)	Well suited
44B:							
Ossineke	Poorly suited: Wetness	Moderately well suited: Wetness	Moderately suited: Wetness	Summer, fall, winter.	Well suited	Well suited	Well suited
44C:							
Ossineke	Poorly suited: Wetness	Moderately well suited: Wetness Slope limitation (moderate)	Moderately suited: Wetness	Summer, fall, winter.	Well suited	Moderately well suited: Slope limitation (moderate)	Well suited
47D:							
Graycalm	Moderately suited: Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited
47F:							
Graycalm	Moderately suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Slope Sandiness	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
53B:							
Negwegon	Poorly suited: Wetness	Moderately well suited: Wetness Strength	Moderately suited: Strength Wetness	Summer, fall, winter.	Well suited	Well suited	Well suited
53C:							
Negwegon	Poorly suited: Wetness	Moderately well suited: Wetness Strength Slope limitation (moderate)	Moderately suited: Strength Wetness	Summer, fall, winter.	Well suited	Moderately well suited: Slope limitation (moderate)	Well suited
54A:							
Algonquin	Poorly suited: Wetness	Poorly suited: Wetness Strength	Moderately suited: Strength Wetness	Summer, winter.	Well suited	Well suited	Well suited
59B:							
Algonquin	Poorly suited: Wetness	Poorly suited: Wetness Strength	Moderately suited: Strength Wetness	Summer, winter.	Well suited	Well suited	Well suited
Springport	Poorly suited: Wetness Strength Stickiness/ slope limitation	Poorly suited: Ponding Wetness Strength	Moderately suited: Strength Wetness Stickiness	Summer, winter.	Moderately suited: Stickiness/ slope limitation	Moderately well suited: Stickiness	Moderately well suited: Stickiness
62A:							
Allendale	Poorly suited: Wetness	Poorly suited: Wetness	Moderately suited: Wetness	Summer, winter.	Well suited	Well suited	Well suited
72:							
Dorval	Poorly suited: Wetness Strength Stickiness/ slope limitation	Poorly suited: Ponding Strength Stickiness	Poorly suited: Wetness Strength Stickiness	Winter	Moderately suited: Stickiness/ slope limitation	Moderately well suited: Stickiness	Moderately well suited: Stickiness
75B:							
Rubicon	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
75D: Rubicon	Well suited	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited
75E: Rubicon	Moderately suited: Slope Sandiness	Poorly suited: Slope limitation (severe)	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
75F: Rubicon	Poorly suited: Slope	Poorly suited: Slope limitation (severe)	Poorly suited: Slope Sandiness	Spring, fall, winter.	Poorly suited: Slope	Poorly suited: Slope limitation (severe)	Poorly suited: Slope
78: Pits, borrow.							
81B: Grayling	Moderately suited: Sandiness	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
81D: Grayling	Moderately suited: Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited
81E: Grayling	Moderately suited: Slope Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
86: Histosols	Poorly suited: Wetness	Poorly suited: Ponding	Poorly suited: Wetness	Winter	Well suited	Well suited	Well suited
Aquents	Poorly suited: Wetness	Poorly suited: Ponding Wetness	Poorly suited: Wetness	Winter	Well suited	Well suited	Well suited

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s): Haul roads	Log landings	Logging areas and skid roads	Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s): Haul roads	Log landings	Logging areas and skid roads
87:							
Ausable	Poorly suited: Wetness Flooding Sandiness	Poorly suited: Ponding Flooding Sandiness	Moderately suited: Wetness Sandiness	Summer, winter.	Well suited	Well suited	Well suited
90B:							
Chinwhisker	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
94F:							
Klacking	Moderately suited: Slope Sandiness	Poorly suited: Slope limitation (severe)	Moderately suited: Slope	Year round	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
McGinn	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately suited: Slope	Year round	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
95D:							
Menominee	Moderately suited: Slope Strength Sandiness	Poorly suited: Slope limitation (severe)	Well suited	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Well suited
97:							
Colonville	Poorly suited: Flooding Strength	Poorly suited: Flooding Wetness Strength	Moderately suited: Strength	Summer, winter.	Well suited	Well suited	Well suited
116B:							
Mancelona	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
116C:							
Mancelona	Well suited	Moderately well suited: Sandiness Slope limitation (moderate)	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Moderately well suited: Slope limitation (moderate)	Well suited
116D:							
Mancelona	Moderately suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Well suited

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
116E:							
Mancelona	Moderately suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
116F:							
Mancelona	Poorly suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Poorly suited: Slope Sandiness	Spring, fall, winter.	Poorly suited: Slope	Poorly suited: Slope limitation (severe)	Poorly suited: Slope
123D:							
Klacking	Moderately suited: Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Year round	Well suited	Poorly suited: Slope limitation (severe)	Well suited
125B:							
Melita	Well suited	Well suited	Well suited	Spring, fall, winter.	Well suited	Well suited	Well suited
147B:							
Lindquist	Moderately suited: Sandiness	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
147E:							
Lindquist	Moderately suited: Slope Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
307B:							
Klacking	Moderately suited: Sandiness	Moderately well suited: Sandiness	Moderately suited: Sandiness	Year round	Well suited	Well suited	Well suited
307E:							
Klacking	Moderately suited: Slope Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Year round	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s): Haul roads	Log landings	Logging areas and skid roads	Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s): Haul roads	Log landings	Logging areas and skid roads
307F:							
Klacking	Poorly suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Poorly suited: Slope Sandiness	Year round	Poorly suited: Slope	Poorly suited: Slope limitation (severe)	Poorly suited: Slope
350B:							
Blue Lake	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
350D:							
Blue Lake	Well suited	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited
350E:							
Blue Lake	Moderately suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
351A:							
Allendale	Poorly suited: Wetness	Poorly suited: Wetness	Moderately suited: Wetness	Summer, winter.	Well suited	Well suited	Well suited
Wakeley	Poorly suited: Wetness	Well suited	Moderately suited: Wetness	Summer, winter.	Well suited	Well suited	Well suited
Dorval	Poorly suited: Wetness Strength Stickiness/ slope limitation	Poorly suited: Ponding Strength Stickiness	Poorly suited: Wetness Strength Stickiness	Winter	Moderately suited: Stickiness/ slope limitation	Moderately well suited: Stickiness	Moderately well suited: Stickiness
352B:							
Deford	Poorly suited: Wetness	Poorly suited: Ponding	Moderately suited: Wetness	Summer, winter.	Well suited	Well suited	Well suited
Au Gres	Moderately suited: Sandiness	Moderately well suited: Wetness Sandiness	Moderately suited: Sandiness	Summer, winter.	Well suited	Well suited	Well suited
Croswell	Moderately suited: Sandiness	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
353B:							
Mancelona	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
Ossineke	Poorly suited: Wetness	Moderately well suited: Wetness	Moderately suited: Wetness	Summer, fall, winter.	Well suited	Well suited	Well suited
Blue Lake	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
354F:							
Mancelona	Poorly suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Poorly suited: Slope Sandiness	Spring, fall, winter.	Poorly suited: Slope	Poorly suited: Slope limitation (severe)	Poorly suited: Slope
Blue Lake	Poorly suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Poorly suited: Slope Sandiness	Spring, fall, winter.	Poorly suited: Slope	Poorly suited: Slope limitation (severe)	Poorly suited: Slope
359C:							
Algonquin	Poorly suited: Wetness	Poorly suited: Wetness Strength	Moderately suited: Strength Wetness	Summer, winter.	Well suited	Well suited	Well suited
Negwegon	Poorly suited: Wetness	Moderately well suited: Wetness Strength Slope limitation (moderate)	Moderately suited: Strength Wetness	Summer, fall, winter.	Well suited	Well suited Slope limitation (moderate)	Well suited
Dorval	Poorly suited: Wetness Strength Stickiness/ slope limitation	Poorly suited: Ponding Strength Stickiness	Poorly suited: Wetness Strength Stickiness	Winter	Moderately suited: Stickiness/ slope limitation	Moderately well suited: Stickiness	Moderately well suited: Stickiness
360:							
Wakeley	Poorly suited: Wetness	Well suited	Moderately suited: Wetness	Summer, winter.	Well suited	Well suited	Well suited

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
361B:							
Allendale	Poorly suited: Wetness	Poorly suited: Wetness	Moderately suited: Wetness	Summer, winter.	Well suited	Well suited	Well suited
Dorval	Poorly suited: Wetness Strength Stickiness/ slope limitation	Poorly suited: Ponding Strength Stickiness	Poorly suited: Wetness Strength Stickiness	Winter	Moderately suited: Stickiness/ slope limitation	Moderately well suited: Stickiness	Moderately well suited: Stickiness
Blue Lake	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
362B:							
Millersburg	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Year round	Well suited	Well suited	Well suited
362D:							
Millersburg	Well suited	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Year round	Well suited	Poorly suited: Slope limitation (severe)	Well suited
362E:							
Millersburg	Moderately suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Year round	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
363D:							
Mancelona	Well suited	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited
Millersburg	Well suited	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Year round	Well suited	Poorly suited: Slope limitation (severe)	Well suited
Blue Lake	Well suited	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
364E:							
Mancelona	Moderately suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
Millersburg	Moderately suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Year round	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
Blue Lake	Moderately suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
369:							
Deford	Poorly suited: Wetness	Poorly suited: Ponding	Moderately suited: Wetness	Summer, winter.	Well suited	Well suited	Well suited
371:							
Springport	Poorly suited: Wetness Strength Stickiness/ slope limitation	Poorly suited: Ponding Wetness Strength	Moderately suited: Strength Wetness Stickiness	Summer, winter.	Moderately suited: Stickiness/ slope limitation	Moderately well suited: Stickiness	Moderately well suited: Stickiness
384B:							
Iosco	Poorly suited: Wetness	Poorly suited: Wetness	Moderately suited: Wetness	Summer, winter.	Well suited	Well suited	Well suited
385D:							
Lindquist	Moderately suited: Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited
386B:							
Mancelona	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
Rubicon	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
386D:							
Mancelona	Well suited	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited
Rubicon	Well suited	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited
387E:							
Mancelona	Moderately suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
Rubicon	Moderately suited: Slope Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
387F:							
Mancelona	Poorly suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Poorly suited: Slope Sandiness	Spring, fall, winter.	Poorly suited: Slope	Poorly suited: Slope limitation (severe)	Poorly suited: Slope
Rubicon	Poorly suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Poorly suited: Slope Sandiness	Spring, fall, winter.	Poorly suited: Slope	Poorly suited: Slope limitation (severe)	Poorly suited: Slope
388B:							
Millersburg	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Year round	Well suited	Well suited	Well suited
Klacking	Moderately suited: Sandiness	Moderately well suited: Sandiness	Moderately suited: Sandiness	Year round	Well suited	Well suited	Well suited
Graycalm	Moderately suited: Sandiness	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
388D:							
Millersburg	Well suited	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Year round	Well suited	Poorly suited: Slope limitation (severe)	Well suited
Klacking	Moderately suited: Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Year round	Well suited	Poorly suited: Slope limitation (severe)	Well suited
Graycalm	Moderately suited: Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited
388E:							
Millersburg	Moderately suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Year round	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
Klacking	Moderately suited: Slope Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Year round	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
Graycalm	Moderately suited: Slope Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
389B:							
Horsehead	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
389D:							
Horsehead	Well suited	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
389E:							
Horsehead	Moderately suited: Slope Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
390B:							
Horsehead	Moderately suited: Sandiness	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
Graycalm	Moderately suited: Sandiness	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
390D:							
Horsehead	Moderately suited: Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited
Graycalm	Moderately suited: Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited
390E:							
Horsehead	Moderately suited: Slope Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
Graycalm	Moderately suited: Slope Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
390F:							
Horsehead	Poorly suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Poorly suited: Slope Sandiness	Spring, fall, winter.	Poorly suited: Slope	Poorly suited: Slope limitation (severe)	Poorly suited: Slope

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
390F:							
Graycalm	Poorly suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Poorly suited: Slope Sandiness	Spring, fall, winter.	Poorly suited: Slope	Poorly suited: Slope limitation (severe)	Poorly suited: Slope
391B:							
Horsehead	Moderately suited: Sandiness	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
391D:							
Horsehead	Moderately suited: Sandiness	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited
392:							
Caffey	Poorly suited: Wetness Sandiness	Poorly suited: Ponding Wetness Sandiness	Moderately suited: Wetness Sandiness	Summer, winter.	Well suited	Well suited	Well suited
393B:							
Morganlake	Moderately suited: Sandiness	Moderately well suited: Wetness Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
393C:							
Morganlake	Moderately suited: Sandiness	Moderately well suited: Wetness Sandiness Slope limitation (moderate)	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Moderately well suited: Slope limitation (moderate)	Well suited
394B:							
Ocqueoc	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
399D:							
Menominee	Moderately suited: Slope Strength Sandiness	Poorly suited: Slope limitation (severe)	Well suited	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Well suited

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
399D:							
Bamfield	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Well suited	Summer, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Well suited
Blue Lake	Moderately suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Well suited
400F:							
Menominee	Poorly suited: Slope Strength	Poorly suited: Slope limitation (severe)	Poorly suited: Slope	Spring, fall, winter.	Poorly suited: Slope	Poorly suited: Slope limitation (severe)	Poorly suited: Slope
Bamfield	Poorly suited: Slope Strength	Poorly suited: Slope limitation (severe)	Poorly suited: Slope	Summer, fall, winter.	Poorly suited: Slope	Poorly suited: Slope limitation (severe)	Poorly suited: Slope
Blue Lake	Poorly suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Poorly suited: Slope Sandiness	Spring, fall, winter.	Poorly suited: Slope	Poorly suited: Slope limitation (severe)	Poorly suited: Slope
420A:							
Otisco	Well suited	Moderately well suited: Wetness	Well suited	Summer, winter.	Well suited	Well suited	Well suited
421A:							
Richter	Well suited	Moderately well suited: Wetness	Well suited	Summer, winter.	Well suited	Well suited	Well suited
Caffey	Poorly suited: Wetness Sandiness	Poorly suited: Ponding Wetness Sandiness	Moderately suited: Wetness Sandiness	Summer, winter.	Well suited	Well suited	Well suited
422B:							
Morganlake	Moderately suited: Sandiness	Moderately well suited: Wetness Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
Iosco	Poorly suited: Wetness	Poorly suited: Wetness	Moderately suited: Wetness	Summer, winter.	Well suited	Well suited	Well suited

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
422B:							
Deford----------	Poorly suited: Wetness	Poorly suited: Ponding	Moderately suited: Wetness	Summer, winter.	Well suited	Well suited	Well suited
423B:							
Richter---------	Well suited	Moderately well suited: Wetness	Well suited	Summer, winter.	Well suited	Well suited	Well suited
Algonquin--------	Poorly suited: Wetness	Poorly suited: Wetness Strength	Moderately suited: Strength Wetness	Summer, winter.	Well suited	Well suited	Well suited
424B:							
Morganlake-------	Moderately suited: Sandiness	Moderately well suited: Wetness Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
Ossineke---------	Poorly suited: Wetness	Moderately well suited: Wetness	Moderately suited: Wetness	Summer, fall, winter.	Well suited	Well suited	Well suited
Blue Lake--------	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited
424C:							
Morganlake-------	Moderately suited: Sandiness	Moderately well suited: Wetness Sandiness Slope limitation (moderate)	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Moderately well suited: Slope limitation (moderate)	Well suited
Ossineke---------	Poorly suited: Wetness	Moderately well suited: Wetness Slope limitation (moderate)	Moderately suited: Wetness	Summer, fall, winter.	Well suited	Moderately well suited: Slope limitation (moderate)	Well suited
Blue Lake--------	Well suited	Moderately well suited: Sandiness Slope limitation (moderate)	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Moderately well suited: Slope limitation (moderate)	Well suited
450B:							
Millersburg------	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Year round	Well suited	Well suited	Well suited
Blue Lake--------	Well suited	Moderately well suited: Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Well suited	Well suited

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
450D:							
Millersburg------	Well suited	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Year round	Well suited	Poorly suited: Slope limitation (severe)	Well suited
Blue Lake--------	Well suited	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness	Spring, fall, winter.	Well suited	Poorly suited: Slope limitation (severe)	Well suited
450E:							
Millersburg------	Moderately suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Year round	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
Blue Lake--------	Moderately suited: Slope	Poorly suited: Slope limitation (severe) Sandiness	Moderately suited: Sandiness Slope	Spring, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope
451B:							
Annalake---------	Moderately suited: Strength	Moderately well suited: Strength	Moderately suited: Strength	Summer, fall, winter.	Well suited	Well suited	Well suited
451C:							
Annalake---------	Moderately suited: Strength	Moderately well suited: Strength Slope limitation (moderate)	Moderately suited: Strength	Summer, fall, winter.	Well suited	Moderately well suited: Slope limitation (moderate)	Well suited
452D:							
Bamfield---------	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Well suited	Summer, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Well suited
452E:							
Bamfield---------	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately suited: Slope	Summer, fall, winter.	Moderately suited: Slope	Poorly suited: Slope limitation (severe)	Moderately well suited: Slope

Table 9.--Equipment Limitations on Woodland--Continued

Map symbol and soil name	Rating class and limiting features for most limiting season(s)			Preferred operating season(s)	Rating class and limiting features for preferred operating seasons(s)		
	Haul roads	Log landings	Logging areas and skid roads		Haul roads	Log landings	Logging areas and skid roads
453B:							
Ossineke	Poorly suited: Wetness	Moderately well suited: Wetness	Moderately suited: Wetness	Summer, fall, winter.	Well suited	Well suited	Well suited

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*
13-------------------- Tawas-Lupton	N.whitecedar ------ 5	Balsam fir ------- 3	Alternateleaf dogwood --------- 1	Oak fern --------- 3	Dwarf enchanters nightshade ------- 4
	Balsam fir -------- 3	Northern red oak - 2	Redosier dogwood - 1	Cinnamon fern ---- 2	Dewberry spp. ----- 3
	Black spruce ------ 3	Balsam poplar ---- 1	Silky dogwood ---- 1	Sensitive fern --- 2	Goldthread -------- 3
	Paper birch ------- 2	Black cherry ----- 1	Speckled alder --- 1	Shield fern ------ 2	Miterwort spp. ---- 3
	Quaking aspen ----- 1	Red maple -------- 1	American fly honeysuckle ----- 1	Rattlesnake fern - 1	Sphagnum moss ----- 3
	Balsam poplar ----- 1	Black ash -------- 1		Shining clubmoss - 1	Starflower -------- 3
	Red maple --------- 1	American elm ----- 1			Canada mayflower -- 3
		N.whitecedar ----- 1			Wild sarsaparilla - 3
		Black spruce ----- 1			Yellow beadlily --- 3
					Bedstraw spp. ----- 2
					Canada blueberry -- 2
					Bunchberry -------- 2
					Gaywings ---------- 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
					Cow-wheat --------- 1
					Currant spp. ------ 1
					Wild strawberry --- 1
					Grass spp. -------- 1
					Horsetail spp. ---- 1
					Largeleaf aster --- 1
					Partridgeberry ---- 1
					Rosy twistedstalk - 1
					Wintergreen ------- 1
					Trailing arbutus -- 1
					Twinflower -------- 1

See footnote at end of table.

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*
14------------------- Dawson-Loxley	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 spp. ---- 4 Sedge spp. -------- 4 Moss spp. --------- 3 Lowbush blueberry - 3 Labrador tea ------ 3 Pitcher plant ----- 2 Yellow beadlily --- 1 Sundew spp. ------- 1
16B------------------ Graycalm	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 Mapleleaved viburnum -------- 3 Serviceberry spp. 2 Witch hazel ------ 2 Northern bush honeysuckle ----- 1 Hawthorn spp. ---- 1	Brackenfern ------ 4 Ground cedar ----- 1	Lowbush blueberry - 3 Grass spp. -------- 3 Blue cladonia ----- 3 False Solomon's 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 Cow-wheat --------- 1 Hairy Solomon's seal ------------ 1 Indian pipe ------- 1 Moss spp. --------- 1 Rosy twistedstalk - 1 Sedge spp. -------- 1

See footnote at end of table.

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*
17B-------------------	Quaking aspen ----- 4	Eastern hemlock -- 4	Serviceberry spp. 2	Brackenfern ------ 6	Lowbush blueberry - 4
Croswell	Red maple --------- 4	Pin cherry ------- 3	Hawthorn spp. ---- 1		Grass spp. -------- 4
	Jack pine --------- 3	Jack pine -------- 3			Wintergreen ------- 3
	Eastern hemlock --- 2	Quaking aspen ---- 2			Canada blueberry -- 3
	Pin cherry -------- 2	Black cherry ----- 2			Sweetfern --------- 3
	Balsam fir -------- 2	Red maple -------- 2			Scotch bellflower - 2
	E.white pine ------ 2	Northern red oak - 2			Bunchberry -------- 2
	Red pine ---------- 2	Balsam fir ------- 2			Canada mayflower -- 2
	White spruce ------ 2	Red pine --------- 2			
		E.white pine ----- 1			
18A-------------------	Red maple --------- 4	Northern red oak - 3	Serviceberry spp. 2	Brackenfern ------ 5	Wintergreen ------- 4
Au Gres	E.white pine ------ 4	Red maple -------- 2	Hawthorn spp. ---- 1		Canada blueberry -- 3
	Paper birch ------- 3	E.white pine ----- 2	Beaked hazelnut -- 1		Lowbush blueberry - 3
	Quaking aspen ----- 2	Balsam fir ------- 2			Starflower -------- 2
	Northern red oak -- 2	Quaking aspen ---- 1			Canada mayflower -- 2
	White oak --------- 1	White oak -------- 1			Bunchberry -------- 1
	Jack pine --------- 1	Jack pine -------- 1			Grass spp. -------- 1
	White spruce ------ 1	White spruce ----- 1			Trailing arbutus -- 1
	Red pine ---------- 1	Tamarack --------- 1			Wild sarsaparilla - 1
					Wood anemone ------ 1
					Yellow beadlily --- 1
32B, 32C--------------	Quaking aspen ----- 5	Northern red oak - 3	American fly	Brackenfern ------ 5	Largeleaf aster --- 4
Kellogg	Red maple --------- 3	Balsam fir ------- 3	honeysuckle ----- 3		Wood betony ------- 3
	Northern red oak -- 2	Red maple -------- 2			Gaywings ---------- 2
	Balsam fir -------- 1	White spruce ----- 2			Canada mayflower -- 2
	E.white pine ------ 1	Quaking aspen ---- 1			Wintergreen ------- 2
	White spruce ------ 1				Yellow beadlily --- 2
					White lettuce ----- 2
					Wild strawberry --- 2
					Bramble spp. ------ 1

See footnote at end of table.

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*
44B, 44C--------------	Sugar maple ------- 6	Sugar maple ------ 4	Witch hazel ------ 3	Brackenfern ------ 5	Trout lily -------- 4
Ossineke	Paper birch ------- 3	Red maple -------- 3	Red elderberry --- 2	Shield fern ------ 1	Downy yellow violet 4
	Red maple --------- 3	Quaking aspen ---- 2	Serviceberry spp. 2		Sweet cicely ------ 4
	E.white pine ------ 3	American beech --- 1	Hawthorn spp. ---- 1		Grass spp. -------- 4
	Red pine ---------- 3	Black cherry ----- 1			Spring beauty ----- 3
	American basswood - 2	Hophornbeam ------ 1			Trillium spp. ----- 3
	American beech ---- 2	Northern red oak - 1			Wild leek --------- 3
	Quaking aspen ----- 2	E.white pine ----- 1			Canada mayflower -- 3
	White oak --------- 1				Wood anemone ------ 3
					Squirrel corn ----- 3
					Bedstraw spp. ----- 2
					Black snakeroot --- 2
					False Solomon's seal ------------ 2
					Sedge spp. -------- 2
					Canada white violet 2
					Baneberry spp. ---- 1
					Lowbush blueberry - 1
					Bramble spp. ------ 1
					Gaywings ---------- 1
					Jack-in-the-pulpit 1
					Largeleaf aster --- 1
					Miterwort spp. ---- 1
					Violet spp. ------- 1
					Wood betony ------- 1
					Currant spp. ------ 1
					Toothwort spp. ---- 1
					White lettuce ----- 1

See footnote at end of table.

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*
47D, 47F	Jack pine --------- 6	Jack pine -------- 4	Silky dogwood ---- 3	Brackenfern ------ 4	Lowbush blueberry - 3
Graycalm	Bigtooth aspen ---- 4	Quaking aspen ---- 3	Mapleleaved	Ground cedar ----- 1	Grass spp. -------- 3
	Black oak --------- 4	Red maple -------- 3	viburnum -------- 3		Blue cladonia ----- 3
	Quaking aspen ----- 3	Paper birch ------ 2	Serviceberry spp. 2		False Solomon's
	Paper birch ------- 3	Black cherry ----- 2	Witch hazel ------ 2		seal ------------- 3
	Black cherry ------ 3	Sugar maple ------ 2	Northern bush		Reindeer lichen --- 3
	Red maple --------- 3	Northern red oak - 2	honeysuckle ----- 1		Huckleberry spp. -- 2
	Red pine ---------- 3	Hophornbeam ------ 2	Hawthorn spp. ---- 1		Canada blueberry -- 2
	Northern red oak -- 2	E.white pine ----- 2			Gaywings ---------- 2
	White oak --------- 1	Red pine --------- 2			Largeleaf aster --- 2
	E.white pine ------ 1	Bigtooth aspen --- 1			Starflower -------- 2
		White oak -------- 1			Sweetfern --------- 2
					Wintergreen ------- 2
					Wood anemone ------ 2
					Canada mayflower -- 1
					Bramble spp. ------ 1
					Cow-wheat --------- 1
					Hairy Solomon's
					seal ------------- 1
					Indian pipe ------- 1
					Moss spp. --------- 1
					Rosy twistedstalk - 1
					Sedge spp. -------- 1
53B, 53C	Northern red oak -- 4	Red maple -------- 3	Beaked hazelnut -- 1	Brackenfern ------ 4	Grass spp. -------- 3
Negwegon	Paper birch ------- 3	White ash -------- 2	Serviceberry spp. 1		Wood anemone ------ 3
	Red maple --------- 3	Northern red oak - 2			Gaywings ---------- 2
	White ash --------- 2	E.white pine ----- 2			Hepatica spp. ----- 2
	Bigtooth aspen ---- 2	Bigtooth aspen --- 1			Bedstraw spp. ----- 1
	Sugar maple ------- 2	Black cherry ----- 1			Black snakeroot --- 1
	Hophornbeam ------- 1	Red pine --------- 1			Moss spp. --------- 1
	White oak --------- 1	White spruce ----- 1			Rosy twistedstalk - 1
	Red pine ---------- 1				Toothwort spp. ---- 1
					Trillium spp. ----- 1
					Violet spp. ------- 1
					Wintergreen ------- 1
					Wood betony ------- 1
					Tick clover spp. -- 1

See footnote at end of table.

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*
54A------------------	Quaking aspen ----- 5	White ash -------- 4	Hawthorn spp. ---- 1	Brackenfern ------ 3	Grass spp. -------- 6
Algonquin	White spruce ------ 3	American basswood 1	Serviceberry spp. 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
	Balsam poplar ----- 1	American elm ----- 1			Heal-all ---------- 3
	American elm ------ 1	White spruce ----- 1			Miterwort spp. ---- 3
	N.whitecedar ------ 1				Wood anemone ------ 3
					Wild bergamot ----- 3
					Bedstraw spp. ----- 2
					Black snakeroot --- 2
					Gaywings ---------- 2
					Hepatica spp. ----- 2
					Largeleaf aster --- 2
					Violet spp. ------- 2
					Wild sarsaparilla - 2
					Poison ivy -------- 2
					Cow-wheat --------- 1
					Columbine --------- 1
					Horsetail spp. ---- 1
					Wood betony ------- 1
59B:					
Algonquin-----------	Quaking aspen ----- 5	White ash -------- 4	Hawthorn spp. ---- 1	Brackenfern ------ 3	Grass spp. -------- 6
	White spruce ------ 3	American basswood 1	Serviceberry spp. 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
	Balsam poplar ----- 1	American elm ----- 1			Heal-all ---------- 3
	American elm ------ 1	White spruce ----- 1			Miterwort spp. ---- 3
	N.whitecedar ------ 1				Wood anemone ------ 3
					Wild bergamot ----- 3
					Bedstraw spp. ----- 2
					Black snakeroot --- 2
					Gaywings ---------- 2
					Hepatica spp. ----- 2
					Largeleaf aster --- 2
					Violet spp. ------- 2
					Wild sarsaparilla - 2
					Poison ivy -------- 2
					Cow-wheat --------- 1
					Columbine --------- 1
					Horsetail spp. ---- 1
					Wood betony ------- 1

See footnote at end of table.

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*
59B:					
Springport-----------	Red maple --------- 4	Black ash -------- 3	American fly honeysuckle ----- 2	Shield fern ------ 2	Dewberry spp. ----- 4
	N.whitecedar ------ 4	White ash -------- 2	Alternateleaf dogwood --------- 2	Ladyfern --------- 1	Poison ivy -------- 4
	Black ash --------- 3	Quaking aspen ---- 2			Virginia creeper -- 4
	Quaking aspen ----- 3	American elm ----- 1			Currant spp. ------ 3
	Balsam poplar ----- 3	Balsam fir ------- 1			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 Solomon's seal ------------- 1
					Avens spp. -------- 1
75B, 75D, 75E, 75F---- Rubicon	Bigtooth aspen ---- 5	Northern red oak - 4	Beaked hazelnut -- 3	Brackenfern ------ 4	Lowbush blueberry - 4
	Quaking aspen ----- 4	Bigtooth aspen --- 3	Serviceberry spp. 2		Bramble spp. ------ 4
	White oak --------- 4	Black cherry ----- 3			Wintergreen ------- 3
	Northern red oak -- 4	Red maple -------- 3			Grass spp. -------- 3
	Red maple --------- 3	Quaking aspen ---- 2			Reindeer lichen --- 2
	Jack pine --------- 3	White oak -------- 2			Wild sarsaparilla - 2
	E.white pine ------ 2	E.white pine ----- 2			Rosy twistedstalk - 2
	Red pine ---------- 2	Balsam poplar ---- 2			Sedge spp. -------- 2
	American basswood - 1	American beech --- 1			Moss spp. --------- 2
		Pin cherry ------- 1			Canada mayflower -- 1
		Sugar maple ------ 1			Wild strawberry --- 1
					White lettuce ----- 1
					Partridgeberry ---- 1
					Pink ladyslipper -- 1
					Pyrola spp. ------- 1
					Starflower -------- 1
					Trailing arbutus -- 1
					Blue cladonia ----- 1
					Largeleaf aster --- 1

See footnote at end of table.

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*
81B, 81D, 81E	Jack pine --------- 4	Jack pine -------- 3	Sandcherry ------- 3	Brackenfern ------ 2	Grass spp. -------- 5
Grayling	Black oak --------- 4	Black cherry ----- 2	Serviceberry spp. 2		Lowbush blueberry - 4
	Quaking aspen ----- 2	Chokecherry ------ 2			Sedge spp. -------- 4
	Northern red oak -- 2	Black oak -------- 2			Wintergreen ------- 3
	Red pine ---------- 2	Quaking aspen ---- 1			Blue cladonia ----- 3
	Chokecherry ------- 1	Red maple -------- 1			Reindeer lichen --- 3
	Red maple --------- 1	Northern red oak - 1			Sweetfern --------- 3
	Black cherry ------ 1				Bearberry --------- 3
	E.white pine ------ 1				Wood anemone ------ 2
					Moss spp. --------- 2
90B	Bigtooth aspen ---- 4	Quaking aspen ---- 4	American fly	Brackenfern ------ 4	Wintergreen ------- 4
Chinwhisker	Quaking aspen ----- 4	Red maple -------- 3	honeysuckle ----- 1	Running pine	Lowbush blueberry - 3
	White spruce ------ 3	Black cherry ----- 3	Serviceberry spp. 1	clubmoss -------- 2	Sweetfern --------- 3
	Red maple --------- 3	Balsam fir ------- 3	Alternateleaf		Starflower -------- 2
	Eastern hemlock --- 2	Eastern hemlock -- 2	dogwood --------- 1		Pink ladyslipper -- 2
	Balsam poplar ----- 2	Black spruce ----- 2	Northern bush		Bramble spp. ------ 2
	Northern red oak -- 2	Northern red oak - 2	honeysuckle ----- 1		Gaywings ---------- 2
	Jack pine --------- 2	White spruce ----- 2	Sandcherry ------- 1		Grass spp. -------- 2
	Red pine ---------- 2	Sugar maple ------ 1			Largeleaf aster --- 2
	Paper birch ------- 1	White oak -------- 1			Canada mayflower -- 2
	Black cherry ------ 1				Wild strawberry --- 2
	Balsam fir -------- 1				Bedstraw spp. ----- 1
	E.white pine ------ 1				Bunchberry -------- 1
					Partridgeberry ---- 1
					Pyrola spp. ------- 1
					Trailing arbutus -- 1
					White lettuce ----- 1
					Princes pine ------ 1
95D	Sugar maple ------- 5	Hophornbeam ------ 4	Alternateleaf	Rattlesnake fern - 1	Sweet cicely ------ 3
Menominee	American basswood - 4	American beech --- 2	dogwood --------- 1	Shield fern ------ 1	Sedge spp. -------- 3
	American beech ---- 1	White ash -------- 1			Violet spp. ------- 2
	White ash --------- 1	Black cherry ----- 1			Downy yellow violet 2
	Paper birch ------- 1	Northern red oak - 1			Canada mayflower -- 2
					Baneberry spp. ---- 2
					Bedstraw spp. ----- 1
					Grass spp. -------- 1
					Hepatica spp. ----- 1
					Pyrola spp. ------- 1
					Solomon's seal ---- 1
					White lettuce ----- 1
					Trillium spp. ----- 1

See footnote at end of table.

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*
116B, 116C, 116D, 116E, 116F----------- Mancelona	Bigtooth aspen ---- 5	Quaking aspen ---- 4	Silky dogwood ---- 3	Brackenfern ------ 4	Trout lily -------- 4
	Sugar maple ------- 4	Sugar maple ------ 4	Mapleleaved viburnum -------- 3	Shield fern ------ 2	Bramble spp. ------ 3
	American basswood - 3	Hophornbeam ------ 4	Hawthorn spp. ---- 2		Grass spp. -------- 3
	White ash --------- 3	White ash -------- 3	Serviceberry spp. 2		Largeleaf aster --- 3
	Quaking aspen ----- 3	Black cherry ----- 3	Striped maple ---- 2		Trillium spp. ----- 3
	Paper birch ------- 3	White oak -------- 3	Witch hazel ------ 2		Wintergreen ------- 3
	Hophornbeam ------- 3	Chokecherry ------ 2	Beaked hazelnut -- 1		False Solomon's seal ------------ 2
	Northern red oak -- 3	Red maple -------- 2			Hairy Solomon's seal ------------ 2
	Red pine ---------- 3	Northern red oak - 2			Hepatica spp. ----- 2
	Red maple --------- 2	Red pine --------- 2			Moss spp. --------- 2
	White oak --------- 2	American basswood 1			Wild sarsaparilla - 2
	American beech ---- 1	American beech --- 1			Partridgeberry ---- 2
	Black oak --------- 1	Bigtooth aspen --- 1			Sedge spp. -------- 2
	Eastern hemlock --- 1	Black oak -------- 1			Sweetfern --------- 2
					Canada mayflower -- 2
					Bedstraw spp. ----- 1
					Currant spp. ------ 1
					Sweet cicely ------ 1
					Pyrola spp. ------- 1
					Rosy twistedstalk - 1
					White lettuce ----- 1

See footnote at end of table.

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*
123D-----------------	Northern red oak -- 4	Red maple -------- 3	Beaked hazelnut -- 3	Brackenfern ------ 4	Sedge spp. -------- 4
Klacking	White oak --------- 4	E.white pine ----- 3	Mapleleaved	Running pine ----- 1	Lowbush blueberry - 3
	Bigtooth aspen ---- 3	White spruce ----- 3	viburnum -------- 3		Wintergreen ------- 3
	Red maple --------- 3	White ash -------- 2	Serviceberry spp. 3		Grass spp. -------- 3
	Hophornbeam ------- 2	Bigtooth aspen --- 2	Witch hazel ------ 2		Wild sarsaparilla - 3
	Sugar maple ------- 2	Sugar maple ------ 2	Honeysuckle spp. - 2		White lettuce ----- 2
	E.white pine ------ 2	Northern red oak - 2	Hawthorn spp. ---- 1		Canada blueberry -- 2
	Red pine ---------- 2	White oak -------- 2			Bramble spp. ------ 2
	American beech ---- 1	American beech --- 1			Hairy Solomon's
	White ash --------- 1	Quaking aspen ---- 1			seal ------------- 2
	Quaking aspen ----- 1	Black cherry ----- 1			Largeleaf aster --- 2
	Paper birch ------- 1	Balsam fir ------- 1			Moss spp. --------- 2
					Sweetfern --------- 2
					Starflower -------- 2
					Canada mayflower -- 2
					Wood anemone ------ 2
					Cow-wheat -------- 2
					Princes pine ------ 1
					False Solomon's
					seal ------------- 1
					Gaywings ---------- 1
					Indian pipe ------- 1
					Pyrola spp. ------- 1
					Sweet cicely ------ 1
					Trailing arbutus -- 1
					Violet spp. ------- 1
					Wild strawberry --- 1
					Yellow beadlily --- 1
147B, 147E------------	Bigtooth aspen ---- 4	Red maple -------- 3	Serviceberry spp. 3	Brackenfern ------ 5	Lowbush blueberry - 4
Lindquist	Red maple --------- 3	Hophornbeam ------ 2	Beaked hazelnut -- 1	Ground cedar ----- 2	Bramble spp. ------ 3
	Northern red oak -- 2	Sugar maple ------ 2	Mapleleaved		Starflower -------- 3
	Paper birch ------- 2	Northern red oak - 2	viburnum -------- 1		Wild strawberry --- 3
	White oak --------- 2	E.white pine ----- 2	Striped maple ---- 1		Wintergreen ------- 3
	Red pine ---------- 2	American beech --- 1			Grass spp. -------- 3
	Hophornbeam ------- 1	White ash -------- 1			Largeleaf aster --- 2
	Sugar maple ------- 1	Bigtooth aspen --- 1			Pyrola spp. ------- 2
	E.white pine ------ 1	Quaking aspen ---- 1			Canada mayflower -- 2
		Paper birch ------ 1			Bedstraw spp. ----- 1
		Black cherry ----- 1			Canada blueberry -- 1
		Red pine --------- 1			Buttercup spp. ---- 1
					Rosy twistedstalk - 1
					Trailing arbutus -- 1
					White lettuce ----- 1

See footnote at end of table.

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*
307B, 307E, 307F------	Northern red oak -- 4	Red maple -------- 3	Beaked hazelnut -- 3	Brackenfern ------ 4	Sedge spp. -------- 4
Klacking	White oak --------- 4	E.white pine ----- 3	Mapleleaved	Running pine ----- 1	Lowbush blueberry - 3
	Bigtooth aspen ---- 3	White spruce ----- 3	viburnum -------- 3		Wintergreen ------- 3
	Red maple --------- 3	White ash -------- 2	Serviceberry spp. 3		Grass spp. -------- 3
	Hophornbeam ------- 2	Bigtooth aspen --- 2	Witch hazel ------ 2		Wild sarsaparilla - 3
	Sugar maple ------- 2	Sugar maple ------ 2	Honeysuckle spp. - 2		White lettuce ----- 2
	E.white pine ------ 2	Northern red oak - 2	Hawthorn spp. ---- 1		Canada blueberry -- 2
	Red pine ---------- 2	White oak -------- 2			Bramble spp. ------ 2
	American beech ---- 1	American beech --- 1			Hairy Solomon's
	White ash --------- 1	Quaking aspen ---- 1			seal ------------ 2
	Quaking aspen ----- 1	Black cherry ----- 1			Largeleaf aster --- 2
	Paper birch ------- 1	Balsam fir ------- 1			Moss spp. --------- 2
					Sweetfern --------- 2
					Starflower -------- 2
					Canada mayflower -- 2
					Wood anemone ------ 2
					Cow-wheat -------- 2
					Princes pine ------ 1
					False Solomon's
					seal ------------ 1
					Gaywings ---------- 1
					Indian pipe ------- 1
					Pyrola spp. ------- 1
					Sweet cicely ------ 1
					Trailing arbutus -- 1
					Violet spp. ------- 1
					Wild strawberry --- 1
					Yellow beadlily --- 1
350B, 350D, 350E------	Quaking aspen ----- 5	Sugar maple ------ 3	Striped maple ---- 4	Brackenfern ------ 4	Largeleaf aster --- 4
Blue Lake	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
					Princes pine ------ 1
					False Solomon's
					seal ------------ 1
					Violet spp. ------- 1

See footnote at end of table.

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*
352B:					
Deford---------------	Quaking aspen ----- 3	Black ash -------- 3	Speckled alder --- 4	Sensitive fern --- 4	Dewberry spp. ----- 4
	White spruce ------ 3	American elm ----- 3	Redosier dogwood - 3	Cinnamon fern ---- 3	Sedge spp. -------- 4
	Black ash --------- 3	Balsam fir ------- 3	Meadow-sweet spp. 3	Shield fern ------ 3	Bedstraw spp. ----- 3
	Green ash --------- 3	N.whitecedar ----- 1	Leatherleaf ------ 3	Marsh fern ------- 2	Bunchberry -------- 3
	Balsam fir -------- 3	Black spruce ----- 1	Rose spp. -------- 3	Brackenfern ------ 1	Goldenrod spp. ---- 3
	Balsam poplar ----- 2	Red maple -------- 1	Honeysuckle spp. - 2		Horsetail spp. ---- 3
	N.whitecedar ------ 2		Alternateleaf dogwood --------- 1		Largeleaf aster --- 3
	Black spruce ------ 2				Miterwort spp. ---- 3
	Bigtooth aspen ---- 1				Wild strawberry --- 3
	Jack pine --------- 1				Poison ivy -------- 3
					Grass spp. -------- 3
					Blueflag ---------- 3
					Wild sarsaparilla - 3
					Virginia creeper -- 3
					Cow-wheat --------- 2
					Heal-all ---------- 2
					Jewelweed --------- 2
					Marsh marigold ---- 2
					Canada mayflower -- 2
					Dwarf enchanters nightshade ------- 2
					Cattail spp. ------ 1
					Columbine --------- 1
					Pyrola spp. ------- 1
					Avens spp. -------- 1
					Spiderwort spp. --- 1
					Canada blueberry -- 1
					Pale laurel ------- 1
					Currant spp. ------ 1
					Bulrush spp. ------ 1
Au Gres--------------	Red maple --------- 4	Northern red oak - 3	Serviceberry spp. 2	Brackenfern ------ 5	Wintergreen ------- 4
	E.white pine ------ 4	Red maple -------- 2	Hawthorn spp. ---- 1		Canada blueberry -- 3
	Paper birch ------- 3	E.white pine ----- 2	Beaked hazelnut -- 1		Lowbush blueberry - 3
	Quaking aspen ----- 2	Balsam fir ------- 2			Starflower -------- 2
	Northern red oak -- 2	Quaking aspen ---- 1			Canada mayflower -- 2
	White oak --------- 1	White oak -------- 1			Bunchberry -------- 1
	Jack pine --------- 1	Jack pine -------- 1			Grass spp. -------- 1
	White spruce ------ 1	White spruce ----- 1			Trailing arbutus -- 1
		Tamarack --------- 1			Wild sarsaparilla - 1
					Wood anemone ------ 1
					Yellow beadlily --- 1

See footnote at end of table.

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*
352B:					
Croswell-------------	Quaking aspen ----- 4	Eastern hemlock -- 4	Serviceberry spp. 2	Brackenfern ------ 6	Lowbush blueberry - 4
	Red maple --------- 4	Pin cherry ------- 3	Hawthorn spp. ---- 1		Grass spp. -------- 4
	Eastern hemlock --- 3	Jack pine -------- 3			Wintergreen ------- 3
	Jack pine --------- 3	Quaking aspen ---- 2			Canada blueberry -- 3
	Pin cherry -------- 2	Black cherry ----- 2			Sweetfern --------- 3
	Balsam fir -------- 2	Red maple -------- 2			Scotch bellflower - 2
	E.white pine ------ 2	Northern red oak - 2			Bunchberry -------- 2
	Red pine ---------- 2	Balsam fir ------- 2			Canada mayflower -- 2
	White spruce ------ 2	Red pine --------- 2			
		E.white pine ----- 1			
360------------------ Wakeley	Black ash --------- 3	Black ash -------- 3	Redosier dogwood - 1	Brackenfern ------ 1	Dewberry spp. ----- 4
	Balsam poplar ----- 3	Balsam fir ------- 3	Northern bush honeysuckle ----- 1		Bunchberry -------- 3
	Balsam fir -------- 3	White spruce ----- 2			Horsetail spp. ---- 3
	White spruce ------ 2	Quaking aspen ---- 1	Speckled alder --- 1		Largeleaf aster --- 3
	Quaking aspen ----- 2	Balsam poplar ---- 1			Miterwort spp. ---- 3
	American elm ------ 1	Northern red oak - 1			Moss spp. --------- 3
		American elm ----- 1			Wild sarsaparilla - 3
					Poison ivy -------- 3
					Sweet coltsfoot --- 3
					Bedstraw spp. ----- 2
					Black snakeroot --- 2
					Buttercup spp. ---- 2
					Currant spp. ------ 2
					Wild strawberry --- 2
					Avens spp. -------- 2
					Baneberry spp. ---- 1
					Grass spp. -------- 1
					Orchid spp. ------- 1
					Rosy twistedstalk - 1
					Sedge spp. -------- 1
					Sweet cicely ------ 1
					Trillium spp. ----- 1
					Twinflower -------- 1
					Violet spp. ------- 1
					Canada mayflower -- 1
					Columbine --------- 1
					White lettuce ----- 1

See footnote at end of table.

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*
362B, 362D, 362E------ Millersburg	Sugar maple ------- 4	Sugar maple ------ 4	Beaked hazelnut -- 3	Brackenfern ------ 4	Trout lily -------- 4
	American basswood - 3	American beech --- 3	Mapleleaved viburnum -------- 2	Ladyfern --------- 1	Squirrel corn ----- 3
	American beech ---- 3	White ash -------- 3	Serviceberry spp. 2	Long beech fern -- 1	Lowbush blueberry - 3
	Bigtooth aspen ---- 3	Red maple -------- 3	Striped maple ---- 2	Rattlesnake fern - 1	Grass spp. -------- 3
	Northern red oak -- 3	American basswood 2	Witch hazel ------ 2	Shield fern ------ 1	Dutchman's breeches --------- 3
	Jack pine --------- 3	Bigtooth aspen --- 2	Sandcherry spp. -- 2	Running pine ----- 1	Sweet cicely ------ 3
	Quaking aspen ----- 2	Hophornbeam ------ 2	Red elderberry --- 1	Shining clubmoss - 1	Wood anemone ------ 3
	Paper birch ------- 2	Northern red oak - 2	Hawthorn spp. ---- 1	Staghorn clubmoss 1	Canada mayflower -- 3
	Red maple --------- 2	E.white pine ----- 2	American fly honeysuckle ----- 1		Wood betony ------- 2
	White oak --------- 2	Quaking aspen ---- 1	Silky dogwood ---- 1		White lettuce ----- 2
	White ash --------- 2	Paper birch ------ 1			Bedstraw spp. ----- 2
	Hophornbeam ------- 1	Black cherry ----- 1			Canada blueberry -- 2
	E.white pine ------ 1	Chokecherry ------ 1			Bramble spp. ------ 2
	Red pine ---------- 1	American elm ----- 1			Currant spp. ------ 2
		Red pine --------- 1			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
					Princes pine ------ 1
					Baneberry --------- 1
					Black snakeroot --- 1
					False Solomon's seal ------------ 1
					Hairy Solomon's seal ------------ 1
					Hawkweed spp. ----- 1
					Hepatica spp. ----- 1
					Indian cucumber root ------------ 1
					Rosy twistedstalk - 1
					Wild strawberry --- 1

See footnote at end of table.

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------------------- Deford	Quaking aspen ----- 3	Black ash -------- 3	Speckled alder --- 4	Sensitive fern --- 4	Dewberry spp. ----- 4
	White spruce ------ 3	American elm ----- 3	Redosier dogwood - 3	Cinnamon fern ---- 3	Sedge spp. -------- 4
	Black ash --------- 3	Balsam fir ------- 3	Meadow-sweet spp. 3	Shield fern ------ 3	Bedstraw spp. ----- 3
	Green ash --------- 3	N.whitecedar ----- 1	Leatherleaf ------ 3	Marsh fern ------- 2	Bunchberry -------- 3
	Balsam fir -------- 3	Black spruce ----- 1	Rose spp. -------- 3	Brackenfern ------ 1	Goldenrod spp. ---- 3
	Balsam poplar ----- 2	Red maple -------- 1	Honeysuckle spp. - 2		Horsetail spp. ---- 3
	N.whitecedar ------ 2		Alternateleaf dogwood --------- 1		Largeleaf aster --- 3
	Black spruce ------ 2				Miterwort spp. ---- 3
	Bigtooth aspen ---- 1				Wild strawberry --- 3
	Jack pine --------- 1				Poison ivy -------- 3
	Red maple --------- 1				Grass spp. -------- 3
					Blueflag ---------- 3
					Wild sarsaparilla - 3
					Virginia creeper -- 3
					Cow-wheat --------- 2
					Heal-all ---------- 2
					Jewelweed --------- 2
					Marsh marigold ---- 2
					Canada mayflower -- 2
					Dwarf enchanters nightshade ------- 2
					Cattail spp. ------ 1
					Columbine --------- 1
					Pyrola spp. ------- 1
					Avens spp. -------- 1
					Spiderwort spp. --- 1
					Canada blueberry -- 1
					Pale laurel ------- 1
					Currant spp. ------ 1
					Bulrush spp. ------ 1

See footnote at end of table.

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*
371-------------------	Red maple --------- 4	Black ash -------- 3	Virginia creeper - 4	Shield fern ------ 2	Dewberry spp. ----- 4
Springport	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 Solomon's
					seal ------------ 1
					Avens spp. -------- 1
384B------------------	Quaking aspen ----- 6	Red maple -------- 3	Striped maple ---- 3	Brackenfern ------ 3	Bramble spp. ------ 3
Iosco	Balsam fir -------- 3	Balsam fir ------- 3	Alternateleaf	Rattlesnake fern - 1	Sedge spp. -------- 3
	Red maple --------- 2	Northern red oak - 2	dogwood --------- 2	Shield fern ------ 1	Starflower -------- 3
	E.white pine ------ 1	Black cherry ----- 1	American fly		Trillium spp. ----- 3
			honeysuckle ----- 1		Canada mayflower -- 3
			Speckled alder --- 1		Grass spp. -------- 3
					Bedstraw spp. ----- 2
					Currant spp. ------ 2
					Gaywings ---------- 2
					Wild sarsaparilla - 2
					Wild strawberry --- 2
					Wood betony ------- 2
					Yellow beadlily --- 1
					Canada blueberry -- 1
					Bunchberry -------- 1
					Buttercup spp. ---- 1
					Downy yellow violet 1
					Violet spp. ------- 1
					Wintergreen ------- 1
					White lettuce ----- 1

See footnote at end of table.

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*
385D-----------------	Bigtooth aspen ---- 4	Red maple -------- 3	Serviceberry spp. 3	Brackenfern ------ 5	Lowbush blueberry - 4
Lindquist	Red maple --------- 3	Hophornbeam ------ 2	Beaked hazelnut -- 1	Ground cedar ----- 2	Bramble spp. ------ 3
	Northern red oak -- 2	Sugar maple ------ 2	Mapleleaved		Starflower -------- 3
	Paper birch ------- 2	Northern red oak - 2	viburnum -------- 1		Wild strawberry --- 3
	White oak --------- 2	E.white pine ----- 2	Striped maple ---- 1		Wintergreen ------- 3
	Red pine ---------- 2	American beech --- 1			Grass spp. -------- 3
	Hophornbeam ------- 1	White ash -------- 1			Largeleaf aster --- 2
	Sugar maple ------- 1	Bigtooth aspen --- 1			Pyrola spp. ------- 2
	E.white pine ------ 1	Quaking aspen ---- 1			Canada mayflower -- 2
		Paper birch ------ 1			Bedstraw spp. ----- 1
		Black cherry ----- 1			Canada blueberry -- 1
		Red pine --------- 1			Buttercup spp. ---- 1
					Rosy twistedstalk - 1
					Trailing arbutus -- 1
					White lettuce ----- 1
386B, 386D-----------	American basswood - 4	Sugar maple ------ 4	Mapleleaved	Staghorn clubmoss 1	Bedstraw spp. ----- 3
Mancelona-Rubicon	White ash --------- 4	Hophornbeam ------ 4	viburnum -------- 2		Grass spp. -------- 3
	Northern red oak -- 4	White ash -------- 3	Serviceberry spp. 2		Sedge spp. -------- 3
	Paper birch ------- 3	Red maple -------- 2	Striped maple ---- 2		Canada mayflower -- 3
	Sugar maple ------- 3	American basswood 1	Alternateleaf		Bellwort spp. ----- 2
	American beech ---- 2	American beech --- 1	dogwood --------- 1		Bramble spp. ------ 2
	Hophornbeam ------- 2	Bigtooth aspen --- 1	American fly		Currant spp. ------ 2
	Red maple --------- 2	Northern red oak - 1	honeysuckle ----- 1		Wild sarsaparilla - 2
	Quaking aspen ----- 1	American elm ----- 1	Northern bush		Wood betony ------- 1
	American elm ------ 1		honeysuckle ----- 1		Baneberry --------- 1
					Columbine --------- 1
					False Solomon's
					seal ------------ 1
					Hairy Solomon's
					seal ------------ 1
					Largeleaf aster --- 1
					Moss spp. --------- 1
					Partridgeberry ---- 1
					Pyrola spp. ------- 1
					Sweet cicely ------ 1
					Trillium spp. ----- 1
					Downy yellow violet 1
					Wild strawberry --- 1

See footnote at end of table.

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*
387E, 387F------------	American basswood - 4	Sugar maple ------ 4	Mapleleaved	Staghorn clubmoss 1	Bedstraw spp. ----- 3
Mancelona-Rubicon	White ash --------- 4	Hophornbeam ------ 4	viburnum -------- 2		Grass spp. -------- 3
	Northern red oak -- 4	White ash -------- 3	Serviceberry spp. 2		Sedge spp. -------- 3
	Paper birch ------- 3	Red maple -------- 2	Striped maple ---- 2		Canada mayflower -- 3
	Sugar maple ------- 3	American basswood 1	Alternateleaf		Bellwort spp. ----- 2
	American beech ---- 2	American beech --- 1	dogwood --------- 1		Bramble spp. ------ 2
	Hophornbeam ------- 2	Bigtooth aspen --- 1	American fly		Currant spp. ------ 2
	Red maple --------- 2	Northern red oak - 1	honeysuckle ----- 1		Wild sarsaparilla - 2
	Quaking aspen ----- 1	American elm ----- 1	Northern bush		Wood betony ------- 1
	American elm ------ 1		honeysuckle ----- 1		Baneberry --------- 1
					Columbine --------- 1
					False Solomon's
					seal ------------ 1
					Hairy Solomon's
					seal ------------ 1
					Largeleaf aster --- 1
					Moss spp. --------- 1
					Partridgeberry ---- 1
					Pyrola spp. ------- 1
					Sweet cicely ------ 1
					Trillium spp. ----- 1
					Downy yellow violet 1
					Wild strawberry --- 1

See footnote at end of table.

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*
388B, 388D, 388E------ Millersburg-Klacking-Graycalm	Red maple --------- 4	E.white pine ----- 4	Beaked hazelnut -- 3	Brackenfern ------ 3	Wintergreen ------- 4
	Sugar maple ------- 3	Red maple -------- 3	Moosewood -------- 3	Running pine ----- 1	Lowbush blueberry - 3
	American basswood - 3	American basswood 2	Mapleleaved viburnum -------- 3		Wild sarsaparilla - 3
	American beech ---- 3	American beech --- 2	Redosier dogwood - 2		Grass spp. -------- 3
	Bigtooth aspen ---- 3	White ash -------- 2	Northern bush honeysuckle ----- 2		Indian cucumber root ------------ 3
	Paper birch ------- 3	Quaking aspen ---- 2	Serviceberry spp. 2		White lettuce ----- 2
	Northern red oak -- 3	Paper birch ------ 2	Witch hazel ------ 2		Canada blueberry -- 2
	Quaking aspen ----- 2	Black cherry ----- 2	Silky dogwood ---- 1		Largeleaf aster --- 2
	White ash --------- 1	Chokecherry ------ 2	Striped maple ---- 1		Moss spp. --------- 2
	Hophornbeam ------- 1	Hophornbeam ------ 2			Pyrola spp. ------- 2
	E.white pine ------ 1	Sugar maple ------ 2			Starflower -------- 2
	Red pine ---------- 1	Black oak -------- 2			Canada mayflower -- 2
		Northern red oak - 2			Princes pine ------ 1
					Baneberry --------- 1
					Bedstraw spp. ----- 1
					Bramble spp. ------ 1
					Bunchberry -------- 1
					False Solomon's seal ------------ 1
					Indian pipe ------- 1
					Partridgeberry ---- 1
					Rosy twistedstalk - 1
					Wood betony ------- 1
					Trailing arbutus -- 1
					Trillium spp. ----- 1
					Violet spp. ------- 1
389B, 389D, 389E------ Horsehead	Red maple --------- 4	Bigtooth aspen --- 3	Serviceberry spp. 3	Brackenfern ------ 5	Cinquefoil spp. --- 4
	Northern red oak -- 4	Quaking aspen ---- 3	Witch hazel ------ 3		Sedge spp. -------- 4
	Quaking aspen ----- 4	Black cherry ----- 3	Beaked hazelnut -- 2		Wintergreen ------- 4
	Bigtooth aspen ---- 3	Red maple -------- 3	Hawthorn spp. ---- 2		Lowbush blueberry -------- 3
	White oak --------- 2	White oak -------- 3	Mapleleaved viburnum -------- 2		Bramble spp. ------ 3
	Red pine ---------- 1	Chokecherry ------ 2			Wild strawberry --- 3
		Northern red oak - 2			Grass spp. -------- 3
		E.white pine ----- 2			Canada blueberry -- 2
		Red pine --------- 1			Gaywings ---------- 2
		White ash -------- 1			Largeleaf aster --- 2
					Pyrola spp. ------- 2
					Sweetfern --------- 2
					Wood anemone ------ 2
					Bedstraw spp. ----- 1
					Violet spp. ------- 1
					Canada mayflower -- 1

See footnote at end of table.

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*
390B, 390D, 390E, 390F Horsehead-Graycalm	Northern red oak 5	Black cherry 3	Serviceberry spp. 3	Brackenfern 3	Lowbush blueberry 3
	Bigtooth aspen 3	Red maple 3	American fly honeysuckle 3		Poison ivy 3
	Red pine 2	White ash 2	Northern bush honeysuckle 2		False Solomon's seal 3
	Red maple 2	Northern red oak 2	Mapleleaved viburnum 2		Grass spp. 3
	Quaking aspen 2	E.white pine 2	Honeysuckle spp. 2		Sedge spp. 3
	Paper birch 2	Bigtooth aspen 1	Beaked hazelnut 2		Canada mayflower 3
	E.white pine 1	Chokecherry 1	Hawthorn spp. 2		Wild sarsaparilla 2
	White ash 1	White oak 1			Bearberry 2
		Balsam fir 1			Cow-wheat 2
					Black snakeroot 2
					Gaywings 2
					Hairy Solomon's seal 2
					Hepatica spp. 2
					Largeleaf aster 2
					Starflower 2
					Wild strawberry 2
					Wild bergamot 1
					White lettuce 1
					Canada blueberry 1
					Bramble spp. 1
					Goldenrod spp. 1
					Moss spp. 1
					Partridgeberry 1
					Rosy twistedstalk 1
					Downy yellow violet 1
					Trailing arbutus 1
					Violet spp. 1

See footnote at end of table.

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*
391B, 391D------------ Horsehead	Northern red oak -- 4	Red maple -------- 3	Beaked hazelnut -- 4	Brackenfern ------ 4	Lowbush blueberry - 3
	White ash --------- 3	Black cherry ----- 3	Mapleleaved viburnum -------- 3		Wild sarsaparilla - 3
	Bigtooth aspen ---- 3	White ash -------- 2	Serviceberry spp. 3		Grass spp. -------- 3
	Quaking aspen ----- 3	Chokecherry ------ 2	Witch hazel ------ 3		Largeleaf aster --- 3
	Red maple --------- 3	Northern red oak - 2	Silky dogwood ---- 2		Wood betony ------- 2
	White oak --------- 3	White oak -------- 2	Hawthorn spp. ---- 2		Bramble spp. ------ 2
	Red pine ---------- 2	E.white pine ----- 2	Honeysuckle spp. 2		Cow-wheat --------- 2
	American basswood - 1	Red pine --------- 2			False Solomon's seal ------------ 2
	Paper birch ------- 1	American basswood 1			Hepatica spp. ----- 2
	Jack pine --------- 1	American beech --- 1			Pyrola spp. ------- 2
		Bigtooth aspen --- 1			Sedge spp. -------- 2
		Quaking aspen ---- 1			Sweetfern --------- 2
		Balsam fir ------- 1			Trailing arbutus -- 2
					Downy yellow violet 2
					Wintergreen ------- 2
					Canada mayflower -- 2
					Wild strawberry --- 2
					White lettuce ----- 1
					Wood anemone ------ 1
					Bearberry --------- 1
					Black snakeroot --- 1
					Rosy twistedstalk - 1
					Violet spp. ------- 1
					Starflower -------- 1

See footnote at end of table.

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*
393B, 393C------------ Morganlake	Sugar maple ------- 4 American basswood - 4 Bigtooth aspen ---- 3 Red maple --------- 3 American beech ---- 2 White ash --------- 2 Paper birch ------- 2 Northern red oak -- 2 Hophornbeam ------- 1 E.white pine ------ 1 Red pine ---------- 1	Sugar maple ------ 4 White ash -------- 3 Hophornbeam ------ 3 Northern red oak - 3 E.white pine ----- 3 American basswood 2 American beech --- 2 Black cherry ----- 2 Red maple -------- 2 Bigtooth aspen --- 1 Paper birch ------ 1 Chokecherry ------ 1 White oak -------- 1 Balsam fir ------- 1 White spruce ----- 1	Beaked hazelnut -- 3 Mapleleaved viburnum -------- 2 Serviceberry spp. 2 Witch hazel ------ 2 Moosewood -------- 2 Silky dogwood ---- 1 Hawthorn spp. ---- 1 American fly honeysuckle ----- 1	Brackenfern ------ 2 Rattlesnake fern - 1 Shield fern ------ 1 Running pine ----- 2 Shining clubmoss - 1	Grass spp. -------- 3 Largeleaf aster --- 3 Wild sarsaparilla - 3 Gaywings ---------- 2 Starflower -------- 2 Canada mayflower -- 2 Wood betony ------- 2 White lettuce ----- 2 Baneberry --------- 1 Bedstraw spp. ----- 1 Lowbush blueberry - 1 Downy yellow violet 1 Hairy Solomon's seal ------------ 1 Indian cucumber root ------------ 1 Moss spp. --------- 1 Partridgeberry ---- 1 Pyrola spp. ------- 1 Rosy twistedstalk - 1 Violet spp. ---- 1 Trailing arbutus -- 1 Trillium spp. ----- 1
420A----------------- Otisco	Quaking aspen ----- 4 Red maple --------- 3 White spruce ------ 3 Balsam fir -------- 2 Paper birch ------- 2 Bigtooth aspen ---- 1 Balsam poplar ----- 1 N.whitecedar ------ 1	Balsam fir ------- 3 Red maple -------- 3 White ash -------- 2 American basswood 1 American beech --- 1 Quaking aspen ---- 1 Black cherry ----- 1 Black oak -------- 1 Northern red oak - 1 White spruce ----- 1 Paper birch ------ 1 White oak -------- 1 Sugar maple	Northern bush honeysuckle ----- 3 Silky dogwood ---- 2 Speckled alder --- 2 Redosier dogwood - 1 Mapleleaved viburnum -------- 1 Alternateleaf dogwood --------- 1 American fly honeysuckle ----- 1 Serviceberry spp. 1 Striped maple ---- 1	Brackenfern ------ 5 Sensitive fern --- 2 Shield fern ------ 2 Interrupted fern - 1 Rattlesnake fern - 1 Running pine ----- 2 Shining clubmoss - 2 Ground pine ------ 2	Goldenrod spp. ---- 4 Largeleaf aster --- 4 Bunchberry -------- 3 Dewberry spp. ----- 3 Grass spp. -------- 3 Yellow beadlily --- 3 Sweet coltsfoot --- 3 Starflower -------- 3 Buttercup spp. ---- 3 Gaywings ---------- 2 Horsetail spp. ---- 2 Pyrola spp. ------- 2 Starflower -------- 2 Wild sarsaparilla - 2 Bedstraw spp. ----- 2 Bramble spp. ------ 1 Indian cucumber root ------------ 1 Canada mayflower -- 1 Black snakeroot --- 1 Goldthread -------- 1

See footnote at end of table.

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*
424B, 424C------------ Morganlake-Ossineke-Blue Lake	Sugar maple ------- 4	Sugar maple ------ 4	Silky dogwood ---- 1	Shield fern ------ 2	Sweet cicely ------ 5
	American basswood - 4	American beech --- 3		Rattlesnake fern - 1	Trout lily -------- 4
	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			Solomon's seal ---- 1
	Eastern hemlock --- 2				Moss spp. --------- 2
	Paper birch ------- 1				Trillium spp. ----- 2
	Hophornbeam ------- 1				Dutchman's breeches 2
					Sessileaf bellwort 1
					Sedge spp. -------- 1
					Baneberry --------- 1
					Bedstraw spp. ----- 1
					Currant spp. ------ 1
					Jack-in-the-pulpit 1
452D, 452E------------ Bamfield	Sugar maple ------- 5	Sugar maple ------ 4	---	Rattlesnake fern - 2	Trout lily -------- 4
	American basswood - 3	Hophornbeam ------ 3			Wild leek --------- 4
	American beech ---- 2	American beech --- 2			Sweet cicely ------ 3
	Paper birch ------- 2	White ash -------- 1			Trillium spp. ----- 3
	Yellow birch ------ 1				Downy yellow violet 3
	White ash --------- 1				Baneberry spp. ---- 2
					Currant spp. ------ 2
					Grass spp. -------- 2
					Sedge spp. -------- 2
					Spring beauty ----- 2
					Wild strawberry --- 2
					Bedstraw spp. ----- 1
					Bellwort spp. ----- 1
					Rosy twistedstalk - 1
					Violet spp. ------- 1
					Blue cohosh ------- 1

See footnote at end of table.

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*
453B----------------- Ossineke	Sugar maple ------- 5	Sugar maple ------ 3	Beaked hazelnut -- 3	Shield fern ------ 3	Sweet cicely ------ 4
	American basswood - 3	Yellow birch ----- 2		Rattlesnake fern - 2	Smooth yellow violet ----------- 4
	American beech ---- 2	White ash -------- 2		Maidenhair fern -- 1	Canada mayflower -- 3
	Bigtooth aspen ---- 2	American basswood 2		Cinnamon fern ---- 1	Grass spp. -------- 3
	Yellow birch ------ 2	Hophornbeam ------ 1			Trout lily -------- 3
	White ash --------- 2				Canada white violet 3
	Hophornbeam ------- 2				Wild leek --------- 3
					Bedstraw spp. ----- 3
					Baneberry spp. ---- 2
					Largeleaf aster --- 2
					Mint spp. --------- 2
					Rosy twistedstalk - 2
					Sedge spp. -------- 2
					Downy yellow violet 2
					Currant/gooseberry 2
					Hepatica spp. ----- 2
					Miterwort spp. ---- 2
					Dutchman's breeches 2
					Trillium spp. ----- 2
					Violet spp. ------- 2
					Wild sarsaparilla - 2
					Aster spp. -------- 2
					Jack-in-the-pulpit 1

* The extent of the plants listed is expressed as a number representing the amount of ground covered by the plants. The number 1 means that the plant covers less than 1 percent of the surface, 2 means 1 to 5 percent, 3 means 5 to 20 percent, 4 means 25 to 50 percent, 5 means 50 to 75 percent, 6 means 75 to 95 percent, and 7 means 95 to 100 percent.

Table 11.--Windbreaks and Environmental Plantings

(Only the soils suitable for windbreaks and environmental plantings are listed. Absence of an entry indicates that trees generally do not grow to the given height)

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
13:					
Tawas	Common ninebark, redosier dogwood, silky dogwood.	Nannyberry, southern arrowwood, black spruce.	Northern whitecedar, green ash.	---	---
Lupton.					
14:					
Dawson.					
Loxley	Common ninebark, gray dogwood, silky dogwood.	American cranberrybush, common lilac, nannyberry.	Northern whitecedar.	Siberian crabapple, Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
16B:					
Graycalm	Siberian peashrub	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
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.
24A:					
Kinross.					
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.
32B:					
Kellogg	American cranberrybush, Roselow sargent crabapple, Siberian peashrub, silky dogwood.	Common lilac, Amur maple, eastern redcedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, red 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
32C:					
Kellogg-----------	American cranberrybush, Roselow sargent crabapple, Siberian peashrub, silky dogwood.	Common lilac, Amur maple, eastern redcedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, red pine.	---
37B:					
Richter-----------	---	---	---	Common ninebark, silky dogwood, American cranberrybush, lily-of-the-valley.	Nannyberry, Amur maple, northern whitecedar, white spruce, Norway spruce, eastern white pine, green ash, imperial Carolina poplar.
44B:					
Ossineke----------	Roselow sargent crabapple, Siberian peashrub.	American cranberrybush, common lilac, northern whitecedar.	Blue spruce, white spruce, Austrian pine.	Manchurian crabapple, Norway spruce, green ash.	Imperial Carolina poplar.
44C:					
Ossineke----------	Roselow sargent crabapple, Siberian peashrub.	American cranberrybush, common lilac, northern whitecedar.	Blue spruce, white spruce, Austrian pine.	Manchurian crabapple, Norway spruce, green ash.	Imperial Carolina poplar.
47D:					
Graycalm----------	Siberian peashrub	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
47F:					
Graycalm----------	Siberian peashrub	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
53B:					
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.	---
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.	---

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
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.	---
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.					
62A:					
Allendale	Roselow sargent crabapple.	American cranberrybush, common lilac, nannyberry, northern whitecedar.	Blue spruce, white spruce.	Manchurian crabapple, Norway spruce, eastern white pine, red maple.	---
75B:					
Rubicon	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, red pine, eastern white pine.	---	---
75D:					
Rubicon	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, red pine, eastern white pine.	---	---
75E:					
Rubicon	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, 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
75F:					
Rubicon	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, red pine, eastern white pine.	---	---
81B:					
Grayling	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, red pine, eastern white pine.	---	---
81D:					
Grayling	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, red pine, eastern white pine.	---	---
81E:					
Grayling	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, red pine, eastern white pine.	---	---
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.					
95D:					
Menominee	Common lilac, sargent crabapple.	Amur maple, eastern redcedar, nannyberry.	Siberian crabapple, white spruce, Norway spruce.	Eastern white pine, green ash, red pine.	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
97: Colonville	Siberian peashrub, staghorn sumac.	Washington hawthorn, Norway spruce, nannyberry, silver buffaloberry.	Blue spruce, common lilac.	Green ash	Imperial Carolina poplar.
116B: Mancelona	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern whitecedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	Imperial Carolina poplar.
116C: Mancelona	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern whitecedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	Imperial Carolina poplar.
116D: Mancelona	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern whitecedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	Imperial Carolina poplar.
116E: Mancelona	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern whitecedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	Imperial Carolina poplar.
116F: Mancelona	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern whitecedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	Imperial Carolina poplar.
123D: 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.
125B: Melita	Siberian peashrub	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
147B: Lindquist	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, 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
147E:					
Lindquist	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, red pine, eastern white pine.	---	---
307B:					
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.
307E:					
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.
307F:					
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.
350B:					
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.	---	---
350D:					
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.	---	---
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.	---	---

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
351A:					
Allendale	Roselow sargent crabapple.	American cranberrybush, common lilac, nannyberry, northern whitecedar.	Blue spruce, white spruce.	Manchurian crabapple, Norway spruce, eastern white pine, red maple.	---
Wakeley.					
Dorval.					
352B:					
Deford	American cranberrybush, common ninebark, silky dogwood.	Common lilac, Amur maple, nannyberry, northern whitecedar.	White spruce, Norway spruce.	Eastern white pine, green ash.	Imperial Carolina poplar.
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.
Croswell	Siberian peashrub, manyflower cotoneaster.	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
353B:					
Mancelona	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern whitecedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	Imperial Carolina poplar.
Ossineke	Roselow sargent crabapple, Siberian peashrub.	American cranberrybush, common lilac, northern whitecedar.	Blue spruce, white spruce, Austrian pine.	Manchurian crabapple, Norway spruce, green 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.	---	---
354F:					
Mancelona	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern whitecedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	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
354F:					
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 whitecedar.	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.	---	---
362B:					
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.
362D:					
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.

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
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.
363D:					
Mancelona	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern whitecedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	Imperial Carolina poplar.
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.
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.	---	---
364E:					
Mancelona	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern whitecedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	Imperial Carolina poplar.
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.
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.	---	---
369:					
Deford	American cranberrybush, common ninebark, silky dogwood.	Common lilac, Amur maple, nannyberry, northern whitecedar.	White spruce, Norway spruce.	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
384B:					
Iosco	Common ninebark, silky dogwood.	American cranberrybush, common lilac, nannyberry, northern whitecedar.	White spruce	Manchurian crabapple, Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
385D:					
Lindquist	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, red pine, eastern white pine.	---	---
386B:					
Mancelona	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern whitecedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	Imperial Carolina poplar.
Rubicon	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, red pine, eastern white pine.	---	---
386D:					
Mancelona	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern whitecedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	Imperial Carolina poplar.
Rubicon	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, red pine, eastern white pine.	---	---
387E:					
Mancelona	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern whitecedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	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
387E:					
Rubicon	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, red pine, eastern white pine.	---	---
387F:					
Mancelona	Siberian peashrub	Common lilac, Amur maple, eastern redcedar, northern whitecedar.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, jack pine, red pine.	Imperial Carolina poplar.
Rubicon	Peking cotoneaster, Siberian peashrub, barberry, common lilac, silver buffaloberry, smooth sumac, staghorn sumac.	Eastern redcedar	Jack pine, red pine, eastern white pine.	---	---
388B:					
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.
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.
Graycalm	Siberian peashrub	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
388D:					
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.
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.
Graycalm	Siberian peashrub	Amur maple, common lilac, eastern redcedar.	Jack pine, 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
388E:					
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.
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.
Graycalm----------	Siberian peashrub	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
390B:					
Horsehead.					
Graycalm----------	Siberian peashrub	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
390D:					
Horsehead.					
Graycalm----------	Siberian peashrub	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
390E:					
Horsehead.					
Graycalm----------	Siberian peashrub	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
390F:					
Horsehead.					
Graycalm----------	Siberian peashrub	Amur maple, common lilac, eastern redcedar.	Jack pine, red pine.	Eastern white pine.	---
393B:					
Morganlake--------	American cranberrybush.	Common lilac, eastern redcedar, nannyberry, northern whitecedar.	Manchurian crabapple, Black Hills spruce, white spruce, Norway spruce.	Eastern white pine, green ash.	Imperial Carolina poplar.
393C:					
Morganlake--------	American cranberrybush.	Common lilac, eastern redcedar, nannyberry, northern whitecedar.	Manchurian crabapple, Black Hills spruce, white spruce, Norway spruce.	Eastern white pine, green ash.	Imperial Carolina poplar.
394B:					
Ocqueoc-----------	Siberian peashrub, common lilac, silky dogwood.	Amur maple, eastern redcedar.	Siberian crabapple, white spruce, Norway spruce.	Eastern white pine, green ash, jack pine, red 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
399D:					
Menominee	Common lilac, sargent crabapple.	Amur maple, eastern redcedar, nannyberry.	Siberian crabapple, white spruce, Norway spruce.	Eastern white pine, green ash, red pine.	Imperial Carolina poplar.
Bamfield	---	---	---	Siberian peashrub, American cranberrybush, common lilac.	Northern whitecedar, blue spruce, white spruce, Austrian pine, Manchurian crabapple, Norway spruce, green 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.	---	---
400F:					
Menominee	Common lilac, sargent crabapple.	Amur maple, eastern redcedar, nannyberry.	Siberian crabapple, white spruce, Norway spruce.	Eastern white pine, green ash, red pine.	Imperial Carolina poplar.
Bamfield	---	---	---	Siberian peashrub, American cranberrybush, common lilac.	Northern whitecedar, blue spruce, white spruce, Austrian pine, Manchurian crabapple, Norway spruce, green 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.	---	---
420A:					
Otisco	Roselow sargent crabapple, common ninebark, silky dogwood.	American cranberrybush, nannyberry, southern arrowwood.	Northern whitecedar, white spruce.	Manchurian crabapple, Norway spruce, eastern white 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
421A:					
Richter	---	---	---	Common ninebark, silky dogwood, American cranberrybush, lily-of-the-valley.	Nannyberry, Amur maple, northern whitecedar, white spruce, Norway spruce, eastern white pine, green ash, imperial Carolina poplar.
Caffey.					
422B:					
Morganlake	American cranberrybush.	Common lilac, eastern redcedar, nannyberry, northern whitecedar.	Manchurian crabapple, Black Hills spruce, white spruce, Norway spruce.	Eastern white pine, green ash.	Imperial Carolina poplar.
Iosco	Common ninebark, silky dogwood.	American cranberrybush, common lilac, nannyberry, northern whitecedar.	White spruce	Manchurian crabapple, Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
Deford	American cranberrybush, common ninebark, silky dogwood.	Common lilac, Amur maple, nannyberry, northern whitecedar.	White spruce, Norway spruce.	Eastern white pine, green ash.	Imperial Carolina poplar.
423B:					
Richter	---	---	---	Common ninebark, silky dogwood, American cranberrybush, lily-of-the-valley.	Nannyberry, Amur maple, northern whitecedar, white spruce, Norway spruce, eastern white pine, green ash, imperial Carolina poplar.
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.	---
424B:					
Morganlake	American cranberrybush.	Common lilac, eastern redcedar, nannyberry, northern whitecedar.	Manchurian crabapple, Black Hills spruce, white spruce, Norway spruce.	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
424B:					
Ossineke	---	---	---	Roselow sargent crabapple, Siberian peashrub, American cranberrybush, common lilac.	Northern whitecedar, 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.	---	---
424C:					
Morganlake	American cranberrybush.	Common lilac, eastern redcedar, nannyberry, northern whitecedar.	Manchurian crabapple, Black Hills spruce, white spruce, Norway spruce.	Eastern white pine, green ash.	Imperial Carolina poplar.
Ossineke	---	---	---	Roselow sargent crabapple, Siberian peashrub, American cranberrybush, common lilac.	Northern whitecedar, 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.	---	---
450B:					
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.

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
450B:					
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.	---	---
450D:					
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.
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.	---	---
450E:					
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.
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.	---	---
451B:					
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.
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.

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
452D:					
Bamfield	---	---	---	Siberian peashrub, American cranberrybush, common lilac.	Northern whitecedar, blue spruce, white spruce, Austrian pine, Manchurian crabapple, Norway spruce, green ash, imperial Carolina poplar.
452E:					
Bamfield	---	---	---	Siberian peashrub, American cranberrybush, common lilac.	Northern whitecedar, blue spruce, white spruce, Austrian pine, Manchurian crabapple, Norway spruce, green ash, imperial Carolina poplar.
453B:					
Ossineke	---	---	---	Roselow sargent crabapple, Siberian peashrub, American cranberrybush, common lilac.	Northern whitecedar, blue spruce, white spruce, Austrian pine, Manchurian crabapple, Norway spruce, white ash, imperial Carolina poplar.

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
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: too sandy.	Severe: too sandy.	Severe: droughty.
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.
24A:					
Kinross	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: ponding.
Au Gres	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: wetness.
32B:					
Kellogg	Severe: percs slowly, too sandy.	Severe: percs slowly, too sandy.	Severe: percs slowly, too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
32C:					
Kellogg	Severe: percs slowly, too sandy.	Severe: percs slowly, too sandy.	Severe: percs slowly, too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
37B:					
Richter	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
41B:					
McGinn	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
41C:					
McGinn	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
44B:					
Ossineke	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
44C:					
Ossineke	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
47D:					
Graycalm	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
47F:					
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.
59B:					
Algonquin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Springport	Severe: percs slowly, ponding, too clayey.	Severe: percs slowly, ponding, too clayey.	Severe: percs slowly, ponding, too clayey.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
62A:					
Allendale	Severe: percs slowly, wetness.	Severe: percs slowly, wetness.	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.
72:					
Dorval	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
75B:					
Rubicon-----------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
75D:					
Rubicon-----------	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
75E:					
Rubicon-----------	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
75F:					
Rubicon-----------	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
78:					
Pits, borrow.					
81B:					
Grayling----------	Severe: too acid, too sandy.	Severe: too acid, too sandy.	Severe: too acid, too sandy.	Severe: too sandy.	Severe: droughty, too acid.
81D:					
Grayling----------	Severe: too acid, too sandy.	Severe: too acid, too sandy.	Severe: slope, too acid, too sandy.	Severe: too sandy.	Severe: droughty, too acid.
81E:					
Grayling----------	Severe: slope, too acid, too sandy.	Severe: slope, too acid, too sandy.	Severe: slope, too acid, too sandy.	Severe: slope, too sandy.	Severe: droughty, slope, too acid.
82B:					
Udorthents---------	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
83B:					
Udipsamments-------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
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.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
90B:					
Chinwhisker	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
94F:					
Klacking	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
McGinn	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
95D:					
Menominee	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy.	Severe: slope.
97:					
Colonville	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: droughty, flooding, wetness.
116B:					
Mancelona	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, large stones.
116C:					
Mancelona	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, large stones.
116D:					
Mancelona	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: slope.
116E:					
Mancelona	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope.
116F:					
Mancelona	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope.
123D:					
Klacking	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
125B:					
Melita	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
147B:					
Lindquist	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
147E:					
Lindquist----------	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope.
307B:					
Klacking-----------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
307E:					
Klacking-----------	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope.
307F:					
Klacking-----------	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope.
350B:					
Blue Lake----------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
350D:					
Blue Lake----------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
350E:					
Blue Lake----------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
351A:					
Allendale----------	Severe: percs slowly, wetness.	Severe: percs slowly, wetness.	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.
Wakeley------------	Severe: excess humus, percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: ponding.	Severe: excess humus, ponding.
Dorval-------------	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
352B:					
Deford-------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: 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.
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
353B:					
Mancelona	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, large stones.
Ossineke	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
Blue Lake	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
354F:					
Mancelona	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope.
Blue Lake	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, 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.
360:					
Wakeley	Severe: excess humus, percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: percs slowly, ponding.	Severe: 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: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
362B:					
Millersburg	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty, large stones.
362D:					
Millersburg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	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
362E:					
Millersburg--------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
363D:					
Mancelona----------	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: slope.
Millersburg--------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: droughty, large stones, slope.
Blue Lake----------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
364E:					
Mancelona----------	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope.
Millersburg--------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Blue Lake----------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
369:					
Deford-------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
371:					
Springport---------	Severe: percs slowly, ponding, too clayey.	Severe: percs slowly, ponding, too clayey.	Severe: percs slowly, ponding, too clayey.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
380:					
Access denied.					
384B:					
Iosco--------------	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: wetness.
385D:					
Lindquist----------	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
386B:					
Mancelona----------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, large stones.
Rubicon------------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
386D:					
Mancelona	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: slope.
Rubicon	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
387E:					
Mancelona	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope.
Rubicon	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
387F:					
Mancelona	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope.
Rubicon	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
388B:					
Millersburg	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty, large stones.
Klacking	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
Graycalm	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
388D:					
Millersburg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, large stones, slope.
Klacking	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
Graycalm	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
388E:					
Millersburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Klacking	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope.
Graycalm	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
389B:					
Horsehead	Severe: too sandy.	Severe: too sandy.	Severe: small stones, too sandy.	Severe: too sandy.	Severe: droughty.
389D:					
Horsehead	Severe: too sandy.	Severe: too sandy.	Severe: small stones, too sandy.	Severe: too sandy.	Severe: droughty.
389E:					
Horsehead	Severe: too sandy.	Severe: too sandy.	Severe: small stones, too sandy.	Severe: too sandy.	Severe: droughty.
390B:					
Horsehead	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Graycalm	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
390D:					
Horsehead	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Graycalm	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
390E:					
Horsehead	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Graycalm	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
390F:					
Horsehead	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Graycalm	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
391B:					
Horsehead	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
391D:					
Horsehead	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
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.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
393C:					
Morganlake	Severe: too acid.	Severe: too acid.	Severe: too acid.	Moderate: too sandy.	Severe: too acid.
394B:					
Ocqueoc	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
399D:					
Menominee	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy.	Severe: slope.
Bamfield	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Slight	Moderate: slope.
Blue Lake	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
400F:					
Menominee	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy.	Severe: slope.
Bamfield	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Slight	Moderate: slope.
Blue Lake	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
420A:					
Otisco	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: wetness.
421A:					
Richter	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Caffey	Severe: ponding.	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: ponding.
422B:					
Morganlake	Severe: too acid.	Severe: too acid.	Severe: too acid.	Moderate: too sandy.	Severe: too acid.
Iosco	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.
423B:					
Richter	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Algonquin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
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: too sandy.	Severe: too sandy.	Moderate: droughty, 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: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
450B:					
Millersburg	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty, large stones.
Blue Lake	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
450D:					
Millersburg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, large stones, slope.
Blue Lake	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
450E:					
Millersburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Blue Lake	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
451B:					
Annalake	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
451C:					
Annalake	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
452D:					
Bamfield-----------	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Slight----------	Moderate: slope.
452E:					
Bamfield-----------	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Slight----------	Moderate: slope.
453B:					
Ossineke-----------	Moderate: slope, wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.

Table 13.--Wildlife Habitat

(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	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
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.
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.
24A:										
Kinross	Very poor.	Poor	Poor	Fair	Fair	Good	Good	Very poor.	Fair	Good.
Au Gres	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
32B:										
Kellogg	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
32C:										
Kellogg	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
37B:										
Richter	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
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.
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.

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
47D:										
Graycalm--------	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
47F:										
Graycalm--------	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Very 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.
59B:										
Algonquin-------	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
Springport------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
62A:										
Allendale-------	Fair	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor.
72:										
Dorval----------	Very poor.	Very poor.	Very poor.	Poor	Poor	Good	Good	Very poor.	Poor	Good.
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.
75F:										
Rubicon---------	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
78:										
Pits, borrow.										
81B:										
Grayling--------	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.
81D:										
Grayling--------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
81E:										
Grayling--------	Very 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: 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
82B:										
Udorthents.										
83B:										
Udipsamments.										
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.
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.
95D:										
Menominee--------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
97:										
Colonville-------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
116B:										
Mancelona--------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
116C:										
Mancelona--------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
116D:										
Mancelona--------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
116E:										
Mancelona--------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
116F:										
Mancelona--------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
123D:										
Klacking---------	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
125B:										
Melita-----------	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
147B:										
Lindquist	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
147E:										
Lindquist	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
307B:										
Klacking	Fair	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
307E:										
Klacking	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
307F:										
Klacking	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
350B:										
Blue Lake	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
350D:										
Blue Lake	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
350E:										
Blue Lake	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
351A:										
Allendale	Fair	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor.
Wakeley	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
Dorval	Very poor.	Very poor.	Very poor.	Poor	Poor	Good	Good	Very poor.	Poor	Good.
352B:										
Deford	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Au Gres	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Croswell	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
353B:										
Mancelona	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 herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
354F:										
Mancelona-------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Blue Lake-------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
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.
360:										
Wakeley---------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	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.
362B:										
Millersburg-----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	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.
363D:										
Mancelona-------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Millersburg-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Blue Lake-------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
364E:										
Mancelona-------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Millersburg-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Blue Lake-------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
369:										
Deford----------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

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
371:										
Springport	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
380:										
Access denied.										
384B:										
Iosco	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
385D:										
Lindquist	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
386B:										
Mancelona	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rubicon	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
386D:										
Mancelona	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rubicon	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
387E:										
Mancelona	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rubicon	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
387F:										
Mancelona	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rubicon	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
388B:										
Millersburg	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Klacking	Fair	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Graycalm	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
388D:										
Millersburg	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Klacking	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Graycalm	Poor	Poor	Fair	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
388E:										
Millersburg-----	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Klacking--------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Graycalm--------	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
389B:										
Horsehead-------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
389D:										
Horsehead-------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
389E:										
Horsehead-------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
390B:										
Horsehead-------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Graycalm--------	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
390D:										
Horsehead-------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Graycalm--------	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
390E:										
Horsehead-------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Graycalm--------	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
390F:										
Horsehead-------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Graycalm--------	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
391B:										
Horsehead-------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
391D:										
Horsehead-------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
392:										
Caffey----------	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

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
393B:										
Morganlake------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
393C:										
Morganlake------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
394B:										
Ocqueoc---------	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
399D:										
Menominee-------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Bamfield--------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Blue Lake-------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
400F:										
Menominee-------	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Bamfield--------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Blue Lake-------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
420A:										
Otisco----------	Fair	Good	Good	Fair	Good	Fair	Very poor.	Good	Fair	Very poor.
421A:										
Richter---------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Caffey----------	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
422B:										
Morganlake------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Iosco-----------	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Deford----------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
423B:										
Richter---------	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
Algonquin-------	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
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 herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
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.
450B:										
Millersburg	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.
450D:										
Millersburg	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Blue Lake	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
450E:										
Millersburg	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Blue Lake	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
451B:										
Annalake	Fair	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.
452D:										
Bamfield	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
452E:										
Bamfield	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
453B:										
Ossineke	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	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
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: 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.
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.	Slight	Slight	Slight	Slight	Severe: droughty.
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.
24A:						
Kinross	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Au Gres	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
32B:						
Kellogg	Severe: cutbanks cave.	Slight	Severe: shrink-swell.	Slight	Slight	Moderate: droughty, too sandy.
32C:						
Kellogg	Severe: cutbanks cave.	Slight	Severe: shrink-swell.	Slight	Slight	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
37B:						
Richter	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
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.
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.
47D:						
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
47F:						
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.
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, too clayey.
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
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.
75B:						
Rubicon	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
75D:						
Rubicon	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
75E:						
Rubicon	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
75F:						
Rubicon	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
78:						
Pits, borrow.						
81B:						
Grayling	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty, too acid.
81D:						
Grayling	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty, too acid.
81E:						
Grayling	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope, too acid.
82B:						
Udorthents	Variable	Variable	Variable	Variable	Variable	Variable.
83B:						
Udipsamments	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
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.
94F:						
Klacking-----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
McGinn-------------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: large stones.
95D:						
Menominee----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
97:						
Colonville---------	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: droughty, flooding, wetness.
116B:						
Mancelona----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty, large stones.
116C:						
Mancelona----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty, large stones.
116D:						
Mancelona----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
116E:						
Mancelona----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
116F:						
Mancelona----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
123D:						
Klacking-----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
125B:						
Melita-------------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: droughty.
147B:						
Lindquist----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	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
147E:						
Lindquist	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
307B:						
Klacking	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
307E:						
Klacking	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
307F:						
Klacking	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
350B:						
Blue Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
350D:						
Blue Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
350E:						
Blue Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
351A:						
Allendale	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Wakeley	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
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.
352B:						
Deford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
Au Gres	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
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
353B:						
Mancelona	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, large stones.
Ossineke	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, wetness.	Moderate: low strength, shrink-swell, wetness.	Moderate: wetness.
Blue Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
354F:						
Mancelona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Blue Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, 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.
360:						
Wakeley	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding.	Severe: ponding.	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.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
362B:						
Millersburg	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty, large stones.

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
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, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
363D:						
Mancelona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Millersburg	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: frost action, slope.	Moderate: droughty, large stones, slope.
Blue Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
364E:						
Mancelona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Millersburg	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Blue Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
369:						
Deford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
371:						
Springport	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding, too clayey.
380:						
Access denied.						
384B:						
Iosco	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
385D:						
Lindquist	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
386B:						
Mancelona	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, large stones.
Rubicon	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
386D:						
Mancelona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rubicon	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
387E:						
Mancelona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rubicon	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
387F:						
Mancelona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rubicon	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
388B:						
Millersburg	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty, large stones.
Klacking	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
Graycalm	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
388D:						
Millersburg	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: frost action, slope.	Moderate: droughty, large stones, slope.
Klacking	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
388E:						
Millersburg	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: 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
388E:						
Klacking	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
389B:						
Horsehead	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
389D:						
Horsehead	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
389E:						
Horsehead	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
390B:						
Horsehead	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
Graycalm	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
390D:						
Horsehead	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
390E:						
Horsehead	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
390F:						
Horsehead	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
391B:						
Horsehead	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
391D:						
Horsehead	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
392:						
Caffey	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: 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
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.
394B:						
Ocqueoc	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
399D:						
Menominee	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Bamfield	Moderate: dense layer, slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Blue Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
400F:						
Menominee	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Bamfield	Moderate: dense layer, slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Blue Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
420A:						
Otisco	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
421A:						
Richter	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
Caffey	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
422B:						
Morganlake	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid.
Iosco	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: 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
422B:						
Deford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
423B:						
Richter	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
Algonquin	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell, 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.	Slight	Slight	Slight	Slight	Moderate: droughty, 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.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
450B:						
Millersburg	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty, large stones.
Blue Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
450D:						
Millersburg	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: frost action, slope.	Moderate: droughty, large stones, slope.
Blue Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	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
450E:						
Millersburg	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Blue Lake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
451B:						
Annalake	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
451C:						
Annalake	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
452D:						
Bamfield	Moderate: dense layer, slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
452E:						
Bamfield	Moderate: dense layer, slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
453B:						
Ossineke	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, slope, wetness.	Moderate: low strength, shrink-swell, wetness.	Moderate: wetness.

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
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: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding, seepage.	Severe: 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.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
17B:					
Croswell	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	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.
24A:					
Kinross	Severe: ponding, poor filter.	Severe: 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.
32B:					
Kellogg	Severe: percs slowly, poor filter, wetness.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: hard to pack, too clayey.

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
32C:					
Kellogg------------	Severe: percs slowly, poor filter, wetness.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: hard to pack, too clayey.
37B:					
Richter------------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
41B:					
McGinn-------------	Moderate: percs slowly.	Severe: seepage.	Slight-----------	Severe: seepage.	Good.
41C:					
McGinn-------------	Moderate: percs slowly.	Severe: seepage.	Slight-----------	Severe: seepage.	Good.
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.
47D:					
Graycalm-----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
47F:					
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.
59B:					
Algonquin----------	Severe: percs slowly, wetness.	Moderate: 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
59B:					
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.
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.
75B:					
Rubicon	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
75D:					
Rubicon	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
75E:					
Rubicon	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
75F:					
Rubicon	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
78:					
Pits, borrow.					
81B:					
Grayling	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
81D:					
Grayling	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
81E:					
Grayling	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, slope, too sandy.
82B:					
Udorthents	Variable	Variable	Variable	Variable	Variable.

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
83B:					
Udipsamments-------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, 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.
94F:					
Klacking-----------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, slope, too sandy.
McGinn-------------	Moderate: percs slowly.	Severe: seepage.	Slight-----------	Severe: seepage.	Good.
95D:					
Menominee----------	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: slope.	Severe: seepage, slope.	Poor: slope.
97:					
Colonville---------	Severe: flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: too sandy, wetness.
116B:					
Mancelona----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
116C:					
Mancelona----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
116D:					
Mancelona----------	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
116E:					
Mancelona----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, small stones, too sandy.
116F:					
Mancelona----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, small stones, too sandy.
123D:					
Klacking-----------	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
125B:					
Melita-------------	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
147B:					
Lindquist----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
147E:					
Lindquist----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, slope, too sandy.
307B:					
Klacking-----------	Slight-----------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
307E:					
Klacking-----------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, slope, too sandy.
307F:					
Klacking-----------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, slope, too sandy.
350B:					
Blue Lake----------	Slight-----------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
350D:					
Blue Lake----------	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
350E:					
Blue Lake	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
351A:					
Allendale	Severe: percs slowly, poor filter, wetness.	Severe: seepage.	Severe: too clayey, wetness.	Severe: seepage, wetness.	Poor: hard to pack, too clayey, wetness.
Wakeley	Severe: percs slowly, ponding, poor filter.	Severe: excess humus, ponding, seepage.	Severe: ponding, too clayey.	Severe: ponding, seepage.	Poor: hard to pack, ponding, too clayey.
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.
352B:					
Deford	Severe: ponding, poor filter.	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.
Croswell	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
353B:					
Mancelona	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
Ossineke	Severe: percs slowly, wetness.	Moderate: seepage, slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Blue Lake	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
354F:					
Mancelona	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, small stones, too sandy.
Blue Lake	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
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.
360:					
Wakeley	Severe: percs slowly, ponding, poor filter.	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	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
362B:					
Millersburg	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Poor: thin layer.
362D:					
Millersburg	Moderate: percs slowly, slope.	Severe: seepage, slope.	Moderate: slope.	Severe: seepage.	Poor: thin layer.
362E:					
Millersburg	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: seepage, slope.	Poor: slope, thin layer.
363D:					
Mancelona	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, small stones, too sandy.
Millersburg	Moderate: percs slowly, slope.	Severe: seepage, slope.	Moderate: slope.	Severe: seepage.	Poor: thin layer.
Blue Lake	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
364E:					
Mancelona	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, small stones, too sandy.
Millersburg	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: seepage, slope.	Poor: slope, thin layer.
Blue Lake	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: 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.
380:					
Access denied.					
384B:					
Iosco	Severe: percs slowly, poor filter, wetness.	Severe: seepage, wetness.	Severe: too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
385D:					
Lindquist	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
386B:					
Mancelona	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
Rubicon	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
386D:					
Mancelona	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, small stones, too sandy.
Rubicon	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
387E:					
Mancelona	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, small stones, too sandy.
Rubicon	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
387F:					
Mancelona	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, small stones, too sandy.
Rubicon	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
388B:					
Millersburg	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Poor: thin layer.
Klacking	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Graycalm	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
388D:					
Millersburg	Moderate: percs slowly, slope.	Severe: seepage, slope.	Moderate: slope.	Severe: seepage.	Poor: thin layer.
Klacking	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Graycalm	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
388E:					
Millersburg	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: seepage, slope.	Poor: slope, thin layer.
Klacking	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, slope, too sandy.
Graycalm	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
389B:					
Horsehead	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
389D:					
Horsehead----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
389E:					
Horsehead----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
390B:					
Horsehead----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
Graycalm-----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
390D:					
Horsehead----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
Graycalm-----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
390E:					
Horsehead----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
Graycalm-----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
390F:					
Horsehead----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
Graycalm-----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
391B:					
Horsehead----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
391D:					
Horsehead----------	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
392:					
Caffey	Severe: percs slowly, ponding.	Severe: ponding, seepage.	Severe: ponding.	Severe: ponding, seepage.	Poor: ponding.
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.
394B:					
Ocqueoc	Severe: percs slowly.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: too sandy.
399D:					
Menominee	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: slope.	Severe: seepage, slope.	Poor: slope.
Bamfield	Severe: percs slowly.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope, too clayey.
Blue Lake	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
400F:					
Menominee	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: slope.	Severe: seepage, slope.	Poor: slope.
Bamfield	Severe: percs slowly.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope, too clayey.
Blue Lake	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
420A:					
Otisco	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
421A:					
Richter	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
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
422B:					
Morganlake	Severe: percs slowly, poor filter, wetness.	Severe: seepage, wetness.	Severe: too acid.	Severe: seepage.	Fair: too clayey, wetness.
Iosco	Severe: percs slowly, poor filter, wetness.	Severe: seepage, wetness.	Severe: 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.
423B:					
Richter	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
Algonquin	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, 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	Slight	Severe: seepage.	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	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
450B:					
Millersburg	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Poor: thin layer.
Blue Lake	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
450D:					
Millersburg	Moderate: percs slowly, slope.	Severe: seepage, slope.	Moderate: slope.	Severe: seepage.	Poor: thin layer.
Blue Lake	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
450E:					
Millersburg	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: seepage, slope.	Poor: slope, thin layer.
Blue Lake	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
451B:					
Annalake	Severe: wetness.	Severe: wetness.	Severe: too sandy.	Moderate: wetness.	Poor: too sandy.
451C:					
Annalake	Severe: wetness.	Severe: wetness.	Severe: too sandy.	Moderate: wetness.	Poor: too sandy.
452D:					
Bamfield	Severe: percs slowly.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope, too clayey.
452E:					
Bamfield	Severe: percs slowly.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope, too clayey.
453B:					
Ossineke	Severe: wetness.	Severe: wetness.	Severe: seepage, wetness.	Moderate: slope, wetness.	Fair: slope, wetness.

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
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.	Probable	Improbable: too sandy.	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.
17B:				
Croswell	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
18A:				
Au Gres	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
24A:				
Kinross	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Au Gres	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
32B:				
Kellogg	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
32C:				
Kellogg	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
37B:				
Richter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
41B:				
McGinn	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
41C:				
McGinn	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too sandy.
44B:				
Ossineke	Fair: shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too clayey.
44C:				
Ossineke	Fair: shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too clayey.
47D:				
Graycalm	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
47F:				
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.
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.
62A:				
Allendale	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
72:				
Dorval	Poor: low strength, shrink-swell, 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
75B:				
Rubicon	Good	Probable	Improbable: too sandy.	Poor: too sandy.
75D:				
Rubicon	Good	Probable	Improbable: too sandy.	Poor: too sandy.
75E:				
Rubicon	Good	Probable	Improbable: too sandy.	Poor: too sandy.
75F:				
Rubicon	Good	Probable	Improbable: too sandy.	Poor: too sandy.
78:				
Pits, borrow.				
81B:				
Grayling	Good	Probable	Improbable: too sandy.	Poor: too sandy.
81D:				
Grayling	Good	Probable	Improbable: too sandy.	Poor: too sandy.
81E:				
Grayling	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
82B:				
Udorthents	Variable	Variable	Variable	Variable.
83B:				
Udipsamments	Good	Probable	Improbable: too sandy.	Poor: too sandy.
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.
94F:				
Klacking	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, small stones, too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
94F:				
McGinn	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too sandy.
95D:				
Menominee	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
97:				
Colonville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
116B:				
Mancelona	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
116C:				
Mancelona	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
116D:				
Mancelona	Fair: slope.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
116E:				
Mancelona	Poor: slope.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
116F:				
Mancelona	Poor: slope.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
123D:				
Klacking	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
125B:				
Melita	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
147B:				
Lindquist	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
147E:				
Lindquist	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, small stones, too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
307B:				
Klacking	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
307E:				
Klacking	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, small stones, too sandy.
307F:				
Klacking	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, small stones, too sandy.
350B:				
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
350D:				
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
350E:				
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
351A:				
Allendale	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
Wakeley	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.
352B:				
Deford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Au Gres	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Croswell	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
353B:				
Mancelona	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
353B:				
Ossineke	Fair: shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too clayey.
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
354F:				
Mancelona	Poor: slope.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
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.
360:				
Wakeley	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, 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.
362B:				
Millersburg	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
362D:				
Millersburg	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
362E:				
Millersburg	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, small stones, too sandy.
363D:				
Mancelona	Fair: slope.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
Millersburg	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
364E:				
Mancelona	Poor: slope.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
Millersburg	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, small stones, too sandy.
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
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.
380:				
Access denied.				
384B:				
Iosco	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
385D:				
Lindquist	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
386B:				
Mancelona	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
386B:				
Rubicon	Good	Probable	Improbable: too sandy.	Poor: too sandy.
386D:				
Mancelona	Fair: slope.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
Rubicon	Good	Probable	Improbable: too sandy.	Poor: too sandy.
387E:				
Mancelona	Poor: slope.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
Rubicon	Good	Probable	Improbable: too sandy.	Poor: too sandy.
387F:				
Mancelona	Poor: slope.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
Rubicon	Good	Probable	Improbable: too sandy.	Poor: too sandy.
388B:				
Millersburg	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
Klacking	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
Graycalm	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
388D:				
Millersburg	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
Klacking	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
Graycalm	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
388E:				
Millersburg	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, small stones, too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
388E:				
Klacking	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, small stones, too sandy.
Graycalm	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
389B:				
Horsehead	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
389D:				
Horsehead	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
389E:				
Horsehead	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
390B:				
Horsehead	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
Graycalm	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
390D:				
Horsehead	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
Graycalm	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
390E:				
Horsehead	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
Graycalm	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
390F:				
Horsehead	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
390F:				
Graycalm	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
391B:				
Horsehead	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
391D:				
Horsehead	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
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.
394B:				
Ocqueoc	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
399D:				
Menominee	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Bamfield	Good	Probable	Improbable: too sandy.	Fair: area reclaim, slope, small stones.
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
400F:				
Menominee	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Bamfield	Good	Probable	Improbable: too sandy.	Fair: area reclaim, slope, small stones.
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
420A:				
Otisco	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
421A:				
Richter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Caffey	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
422B:				
Morganlake	Fair: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too acid, too sandy.
Iosco	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Deford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
423B:				
Richter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Algonquin	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, 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
450B:				
Millersburg	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
450D:				
Millersburg	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
450E:				
Millersburg	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, small stones, too sandy.
Blue Lake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
451B:				
Annalake	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
451C:				
Annalake	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
452D:				
Bamfield	Good	Probable	Improbable: too sandy.	Fair: area reclaim, slope, small stones.
452E:				
Bamfield	Good	Probable	Improbable: too sandy.	Fair: area reclaim, slope, small stones.
453B:				
Ossineke	Fair: wetness.	Probable	Improbable: too sandy.	Fair: small stones, too clayey.

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	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
13:							
Tawas	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave, slow refill.	Frost action, ponding, subsides.	Ponding, soil blowing.	Ponding, soil blowing, too sandy.	Wetness.
Lupton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Frost action, ponding, subsides.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
14:							
Dawson	Severe: seepage.	Severe: excess humus, ponding.	Severe: cutbanks cave, slow refill.	Frost action, ponding, subsides.	Ponding, rooting depth.	Ponding	Rooting depth, wetness.
Loxley	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Frost action, ponding, subsides.	Ponding, too acid.	Ponding	Wetness.
16B:							
Graycalm	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
17B:							
Croswell	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Cutbanks cave, slope.	Droughty, slope, wetness.	Too sandy, wetness.	Droughty.
18A:							
Au Gres	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Droughty, wetness.	Soil blowing, too sandy, wetness.	Droughty, wetness.
24A:							
Kinross	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Cutbanks cave, ponding.	Droughty, fast intake, ponding.	Ponding, soil blowing, too sandy.	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
24A:							
Au Gres------------	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Droughty, wetness.	Soil blowing, too sandy, wetness.	Droughty, wetness.
32B:							
Kellogg------------	Severe: seepage.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Droughty, slope, wetness.	Soil blowing, wetness.	Droughty, percs slowly.
32C:							
Kellogg------------	Severe: seepage.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Droughty, slope, wetness.	Soil blowing, wetness.	Droughty, percs slowly.
37B:							
Richter------------	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave, frost action, slope.	Droughty, slope, wetness.	Soil blowing, too sandy, wetness.	Droughty, wetness.
41B:							
McGinn-------------	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Fast intake, slope, soil blowing.	Soil blowing	Rooting depth.
41C:							
McGinn-------------	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Fast intake, slope, soil blowing.	Soil blowing	Rooting depth.
44B:							
Ossineke-----------	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Slope---------	Slope, soil blowing, wetness.	Erodes easily, wetness.	Erodes easily, rooting depth.
44C:							
Ossineke-----------	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Slope---------	Slope, soil blowing, wetness.	Erodes easily, wetness.	Erodes easily, rooting depth.
47D:							
Graycalm-----------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
47F:							
Graycalm	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
53B:							
Negwegon	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Percs slowly, slope, wetness.	Erodes easily, wetness.	Erodes easily, wetness.
53C:							
Negwegon	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Percs slowly, slope, wetness.	Erodes easily, wetness.	Erodes easily, wetness.
54A:							
Algonquin	Slight	Severe: wetness.	Severe: no water.	Frost action, percs slowly.	Percs slowly, wetness.	Erodes easily, percs slowly, wetness.	Erodes easily, percs slowly, wetness.
59B:							
Algonquin	Moderate: slope.	Severe: wetness.	Severe: no water.	Frost action, percs slowly, slope.	Percs slowly, slope, wetness.	Erodes easily, percs slowly, wetness.	Erodes easily, percs slowly, wetness.
Springport	Slight	Severe: ponding.	Severe: no water.	Frost action, percs slowly, ponding.	Percs slowly, ponding, slow intake.	Percs slowly, ponding.	Percs slowly, wetness.
62A:							
Allendale	Severe: seepage.	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly	Droughty, wetness.	Percs slowly, soil blowing, wetness.	Droughty, percs slowly, wetness.
72:							
Dorval	Severe: seepage.	Severe: ponding.	Severe: no water.	Percs slowly, ponding, subsides.	Percs slowly, ponding, soil blowing.	Percs slowly, ponding, soil blowing.	Percs slowly, wetness.
75B:							
Rubicon	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
75D:							
Rubicon	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	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.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
75F:							
Rubicon	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
78:							
Pits, borrow.							
81B:							
Grayling	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
81D:							
Grayling	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
81E:							
Grayling	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
82B:							
Udorthents	Variable	Variable	Variable	Variable	Variable	Variable	Variable.
83B:							
Udipsamments	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
86:							
Histosols	Slight	Severe: excess humus, ponding.	Slight	Frost action, ponding.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
Aquents	Slight	Severe: ponding.	Slight	Frost action, ponding.	Ponding	Ponding	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
87:							
Ausable------------	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Cutbanks cave, flooding, ponding.	Flooding, ponding, soil blowing.	Ponding, soil blowing, too sandy.	Wetness.
90B:							
Chinwhisker--------	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Cutbanks cave	Droughty, wetness.	Soil blowing, too sandy, wetness.	Droughty.
94F:							
Klacking-----------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
McGinn-------------	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Fast intake, slope, soil blowing.	Soil blowing	Rooting depth.
95D:							
Menominee----------	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing.	Droughty, slope.
97:							
Colonville---------	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave, flooding, frost action.	Droughty, soil blowing, wetness.	Soil blowing, too sandy, wetness.	Droughty, wetness.
116B:							
Mancelona----------	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
116C:							
Mancelona----------	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
116D:							
Mancelona----------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	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
116E:							
Mancelona	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
116F:							
Mancelona	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
123D:							
Klacking	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
125B:							
Melita	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
147B:							
Lindquist	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
147E:							
Lindquist	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
307B:							
Klacking	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
307E:							
Klacking	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
307F:							
Klacking	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	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
350B:							
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
350D:							
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
350E:							
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
351A:							
Allendale	Severe: seepage.	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly	Droughty, wetness.	Percs slowly, soil blowing, wetness.	Droughty, percs slowly, wetness.
Wakeley	Severe: seepage.	Severe: ponding.	Severe: no water.	Percs slowly, ponding.	Droughty, ponding.	Percs slowly, ponding, soil blowing.	Droughty, percs slowly, wetness.
Dorval	Severe: seepage.	Severe: ponding.	Severe: no water.	Percs slowly, ponding, subsides.	Percs slowly, ponding, soil blowing.	Percs slowly, ponding, soil blowing.	Percs slowly, wetness.
352B:							
Deford	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Cutbanks cave, ponding.	Droughty, ponding.	Ponding, soil blowing, too sandy.	Droughty, wetness.
Au Gres	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Droughty, wetness.	Soil blowing, too sandy, wetness.	Droughty, wetness.
Croswell	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Cutbanks cave, slope.	Droughty, slope, wetness.	Too sandy, wetness.	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
353B:							
Mancelona	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
Ossineke	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Slope	Slope, soil blowing, wetness.	Erodes easily, wetness.	Erodes easily, rooting depth.
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
354F:							
Mancelona	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
359C:							
Algonquin	Slight	Severe: wetness.	Severe: no water.	Frost action, percs slowly.	Percs slowly, wetness.	Erodes easily, percs slowly, wetness.	Erodes easily, percs slowly, wetness.
Negwegon	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Percs slowly, slope, wetness.	Erodes easily, wetness.	Erodes easily, wetness.
Dorval	Severe: seepage.	Severe: ponding.	Severe: no water.	Percs slowly, ponding, subsides.	Percs slowly, ponding, soil blowing.	Percs slowly, ponding, soil blowing.	Percs slowly, wetness.
360:							
Wakeley	Severe: seepage.	Severe: ponding.	Severe: no water.	Percs slowly, ponding.	Droughty, ponding.	Percs slowly, ponding, soil blowing.	Droughty, percs slowly, wetness.
361B:							
Allendale	Severe: seepage.	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly	Droughty, wetness.	Percs slowly, soil blowing, wetness.	Droughty, percs slowly, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
361B:							
Dorval	Severe: seepage.	Severe: ponding.	Severe: no water.	Percs slowly, ponding, subsides.	Percs slowly, ponding, soil blowing.	Percs slowly, ponding, soil blowing.	Percs slowly, wetness.
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
362B:							
Millersburg	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing	Droughty.
362D:							
Millersburg	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing.	Droughty, slope.
362E:							
Millersburg	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing.	Droughty, slope.
363D:							
Mancelona	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
Millersburg	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing.	Droughty, slope.
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
364E:							
Mancelona	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
Millersburg	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing.	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
364E:							
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
369:							
Deford	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Cutbanks cave, ponding.	Droughty, ponding.	Ponding, soil blowing, too sandy.	Droughty, wetness.
371:							
Springport	Slight	Severe: ponding.	Severe: no water.	Frost action, percs slowly, ponding.	Percs slowly, ponding, slow intake.	Percs slowly, ponding.	Percs slowly, wetness.
380:							
Access denied.							
384B:							
Iosco	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave, slow refill.	Cutbanks cave, slope.	Droughty, slope, wetness.	Erodes easily, too sandy, wetness.	Droughty, erodes easily, wetness.
385D:							
Lindquist	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
386B:							
Mancelona	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
Rubicon	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
386D:							
Mancelona	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
Rubicon	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	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
387E:							
Mancelona----------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
Rubicon------------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
387F:							
Mancelona----------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
Rubicon------------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
388B:							
Millersburg--------	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing	Droughty.
Klacking-----------	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
Graycalm-----------	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
388D:							
Millersburg--------	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing.	Droughty, slope.
Klacking-----------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
Graycalm-----------	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	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
388E:							
Millersburg	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing.	Droughty, slope.
Klacking	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
Graycalm	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
389B:							
Horsehead	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Large stones, too sandy.	Droughty, large stones.
389D:							
Horsehead	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Large stones, too sandy.	Droughty, large stones.
389E:							
Horsehead	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Large stones, too sandy.	Droughty, large stones.
390B:							
Horsehead	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Large stones, soil blowing, too sandy.	Droughty, large stones.
Graycalm	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
390D:							
Horsehead	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Large stones, soil blowing, too sandy.	Droughty, large stones.
Graycalm	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	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
390E:							
Horsehead	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Large stones, soil blowing, too sandy.	Droughty, large stones.
Graycalm	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
390F:							
Horsehead	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Large stones, soil blowing, too sandy.	Droughty, large stones.
Graycalm	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
391B:							
Horsehead	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Large stones, soil blowing, too sandy.	Droughty, large stones.
391D:							
Horsehead	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Large stones, soil blowing, too sandy.	Droughty, large stones.
392:							
Caffey	Severe: seepage.	Severe: piping, ponding.	Severe: cutbanks cave, slow refill.	Cutbanks cave, ponding.	Droughty, fast intake, ponding.	Erodes easily, ponding, soil blowing.	Droughty, erodes easily, wetness.
393B:							
Morganlake	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Slope, too acid.	Droughty, slope, wetness.	Erodes easily, wetness.	Droughty, erodes easily.
393C:							
Morganlake	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Slope, too acid.	Droughty, slope, wetness.	Erodes easily, wetness.	Droughty, erodes easily.

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
394B:							
Ocqueoc	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Erodes easily, too sandy.	Droughty, erodes easily.
399D:							
Menominee	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing.	Droughty, slope.
Bamfield	Severe: slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Percs slowly, slope, soil blowing.	Percs slowly, slope, soil blowing.	Percs slowly, rooting depth, slope.
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
400F:							
Menominee	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing.	Droughty, slope.
Bamfield	Severe: slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Percs slowly, slope, soil blowing.	Percs slowly, slope, soil blowing.	Percs slowly, rooting depth, slope.
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
420A:							
Otisco	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Droughty, wetness.	Soil blowing, too sandy, wetness.	Droughty, wetness.
421A:							
Richter	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave, frost action, slope.	Droughty, slope, wetness.	Soil blowing, too sandy, wetness.	Droughty, wetness.
Caffey	Severe: seepage.	Severe: piping, ponding.	Severe: cutbanks cave, slow refill.	Cutbanks cave, ponding.	Droughty, fast intake, ponding.	Erodes easily, ponding, soil blowing.	Droughty, erodes easily, 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
422B:							
Morganlake	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Slope, too acid.	Droughty, slope, wetness.	Erodes easily, wetness.	Droughty, erodes easily.
Iosco	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave, slow refill.	Cutbanks cave, slope.	Droughty, slope, wetness.	Erodes easily, too sandy, wetness.	Droughty, erodes easily, wetness.
Deford	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Cutbanks cave, ponding.	Droughty, ponding.	Ponding, soil blowing, too sandy.	Droughty, wetness.
423B:							
Richter	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave, frost action, slope.	Droughty, slope, wetness.	Soil blowing, too sandy, wetness.	Droughty, wetness.
Algonquin	Slight	Severe: wetness.	Severe: no water.	Frost action, percs slowly.	Percs slowly, wetness.	Erodes easily, percs slowly, wetness.	Erodes easily, percs slowly, wetness.
424B:							
Morganlake	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Slope, too acid.	Droughty, slope, wetness.	Erodes easily, wetness.	Droughty, erodes easily.
Ossineke	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Slope	Slope, soil blowing, wetness.	Erodes easily, wetness.	Erodes easily, rooting depth.
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
424C:							
Morganlake	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Slope, too acid.	Droughty, slope, wetness.	Erodes easily, wetness.	Droughty, erodes easily.
Ossineke	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Slope	Slope, soil blowing, wetness.	Erodes easily, wetness.	Erodes easily, rooting depth.

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
424C:							
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
450B:							
Millersburg	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing	Droughty.
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
450D:							
Millersburg	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing.	Droughty, slope.
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
450E:							
Millersburg	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing.	Droughty, slope.
Blue Lake	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
451B:							
Annalake	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Cutbanks cave, slope.	Droughty, slope, wetness.	Too sandy, wetness.	Droughty.
451C:							
Annalake	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Cutbanks cave, slope.	Droughty, slope, wetness.	Too sandy, wetness.	Droughty.
452D:							
Bamfield	Severe: slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Percs slowly, slope, soil blowing.	Percs slowly, slope, soil blowing.	Percs slowly, rooting depth, slope.

Table 17.--Water Management--Continued

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
452E:							
Bamfield-----------	Severe: slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Percs slowly, slope, soil blowing.	Percs slowly, slope, soil blowing.	Percs slowly, rooting depth, slope.
453B:							
Ossineke-----------	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Slope---------	Slope, soil blowing, wetness.	Erodes easily, wetness.	Erodes easily, rooting depth.

Table 18.--Engineering Index Properties

(NP means nonplastic. 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	
13:												
Tawas-----------	0-10	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
	10-22	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
	22-80	Sand, loamy fine sand, gravelly sand.	SM, SP, SP-SM	A-1-b, A-2-4, A-4, A-3	0	0	100	100	30-80	0-40	0-14	NP
Lupton----------	0-8	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
	8-80	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
14:												
Dawson----------	0-4	Peat-------------	PT	A-8	0	0	---	---	---	---	---	---
	4-8	Mucky peat-------	PT	A-8	0	0	---	---	---	---	---	---
	8-28	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
	28-80	Sand-------------	SM, SC, SP	A-2, A-3, A-4	0	0	100	100	50-90	0-45	0-20	NP-10
Loxley----------	0-5	Peat-------------	PT	A-8	0	0	---	---	---	---	---	---
	5-80	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
16B:												
Graycalm--------	0-2	Sand-------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
	2-16	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	16-27	Sand-------------	SP, SM, SP-SM	A-1, A-3, A-2	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	27-80	Sand, loamy sand, sandy loam.	SP, SM, SP-SM	A-1, A-3, A-2	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
17B:												
Croswell--------	0-2	Peat-------------	PT	A-8	0	0	---	---	---	---	---	---
	2-5	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	90-100	80-100	40-70	5-15	0-14	NP
	5-11	Sand-------------	SP, SM, SP-SM	A-1-b, A-3, A-2-4	0	0	90-100	80-100	40-70	3-15	0-14	NP
	11-17	Sand-------------	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	90-100	80-100	40-70	3-15	0-14	NP
	17-33	Sand-------------	SM, SP, SP-SM	A-2-4, A-1-b, A-3	0	0	90-100	80-100	40-70	3-15	0-14	NP
	33-80	Sand-------------	SM, SP-SM, SP	A-1-b, A-3, A-2-4	0	0	90-100	80-100	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---------	0-2	Mucky peat-------	PT	A-8	0	0	---	---	---	---	---	---
	2-8	Sand-------------	SM, SP-SM, SP	A-1-b, A-3, A-2-4	0	0	95-100	90-100	35-70	0-15	0-14	NP
	8-18	Sand-------------	SM, SC-SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-75	0-30	0-14	NP
	18-35	Sand-------------	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-70	0-15	0-14	NP
	35-80	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
24A:												
Kinross---------	0-4	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
	4-11	Sand, fine sand, loamy sand.	SM, SP-SM	A-2-4, A-3	0	0	100	90-100	50-80	5-30	0-14	NP
	11-13	Sand, fine sand, loamy sand.	SM, SP-SM	A-2-4, A-3	0	0	100	90-100	50-80	5-30	0-14	NP
	13-21	Sand, fine sand--	SM, SP-SM	A-2-4, A-3	0	0	100	90-100	50-80	5-30	0-14	NP
	21-30	Sand, fine sand--	SM, SP-SM	A-2-4, A-3	0	0	100	90-100	50-80	5-30	0-14	NP
	30-80	Sand, fine sand--	SM, SP-SM	A-2-4, A-3	0	0	100	90-100	50-80	5-30	0-14	NP
Au Gres---------	0-2	Mucky peat-------	PT	A-8	0	0	---	---	---	---	---	---
	2-8	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
	8-18	Sand-------------	SM, SC-SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-75	0-30	0-14	NP
	18-35	Sand-------------	SM, SP, SP-SM	A-1-b, A-3, A-2-4	0	0	95-100	90-100	35-70	0-15	0-14	NP
	35-80	Sand-------------	SP, SM, SP-SM	A-1-b, A-3, A-2-4	0	0	95-100	90-100	35-70	0-15	0-14	NP
32B:												
Kellogg---------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	90-100	85-100	40-70	5-15	0-14	NP
	3-10	Sand, loamy sand	SM, SP-SM	A-2-4, A-1-b, A-3	0	0	90-100	85-100	40-75	5-30	0-14	NP
	10-30	Sand, loamy sand	SM, SP-SM	A-1-b, A-3, A-2-4	0	0	90-100	85-100	40-75	5-30	0-14	NP
	30-39	Fine sand--------	SM, SP-SM	A-2-4, A-1-b, A-3	0	0	90-100	85-100	40-75	5-30	0-14	NP
	39-46	Clay, silty clay, silty clay loam.	CH, CL	A-7	0	0	95-100	95-100	90-100	80-95	40-65	20-40
	46-80	Clay, silty clay, silty clay loam.	CH, CL	A-7	0	0	95-100	95-100	90-100	80-95	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	Plasticity index
	In				Pct	Pct					Pct	
32C:												
Kellogg	0-3	Sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	90-100	85-100	40-70	5-15	0-14	NP
	3-10	Sand, loamy sand	SM, SP-SM	A-1-b, A-3, A-2-4	0	0	90-100	85-100	40-75	5-30	0-14	NP
	10-30	Sand, loamy sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	90-100	85-100	40-75	5-30	0-14	NP
	30-39	Fine sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	90-100	85-100	40-75	5-30	0-14	NP
	39-46	Clay, silty clay, silty clay loam.	CH, CL	A-7	0	0	95-100	92-100	90-100	80-95	40-65	20-40
	46-80	Clay, silty clay, silty clay loam.	CH, CL	A-7	0	0	95-100	92-100	90-100	80-95	40-65	20-40
37B:												
Richter	0-7	Loamy fine sand	SM, SP-SM	A-2-4	0	0	98-100	97-100	45-80	10-35	0-20	NP-4
	7-11	Loamy fine sand, fine sandy loam.	SC-SM, SM	A-4, A-2, A-6	0	0	98-100	97-100	50-95	30-50	10-30	NP-16
	11-19	Loamy fine sand, fine sandy loam.	SC-SM, SM	A-2, A-6, A-4	0	0	98-100	97-100	50-95	30-50	10-30	NP-16
	19-25	Loamy fine sand, fine sandy loam, loam.	SC-SM, SM	A-2, A-6, A-4	0	0	98-100	97-100	50-95	30-50	10-30	NP-16
	25-29	Fine sandy loam, loamy fine sand, loam.	SC-SM, SM	A-2, A-6, A-4	0	0	98-100	97-100	50-95	30-50	10-30	NP-16
	29-80	Stratified very fine sand to silt loam.	CL-ML, SM	A-4	0	0	98-100	97-100	75-95	35-90	15-40	NP-10
41B:												
McGinn	0-1	Peat	PT	A-8	0	0	---	---	---	---	---	---
	1-2	Loamy sand	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-97	35-75	10-30	0-14	NP
	2-4	Loamy sand	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-97	35-75	10-30	0-14	NP
	4-16	Loamy sand	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-97	35-75	10-30	0-14	NP
	16-21	Loamy sand, sandy loam, loam.	SC-SM, ML, SM, SP-SM	A-1-b, A-2-4, A-4	0	0-8	90-100	85-97	35-95	10-60	0-25	NP-7
	21-25	Loamy sand, sandy loam, loam.	ML, SC-SM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-8	90-100	85-97	35-95	10-60	0-25	NP-7
	25-35	Sandy loam, loam	CL-ML, SC, CL, SC-SM	A-2-4, A-6, A-4	0	0-8	90-100	85-97	45-95	20-60	25-30	7-11
	35-80	Sandy loam	SC-SM, SM	A-1-b, A-2-4, A-4	0	0-8	90-100	85-97	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	Plas-ticity index
	In				Pct	Pct					Pct	
41C:												
McGinn----------	0-1	Peat-------------	PT	A-8	0	0	---	---	---	---	---	---
	1-2	Loamy sand-------	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-97	35-75	10-30	0-14	NP
	2-4	Loamy sand-------	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-97	35-75	10-30	0-14	NP
	4-16	Loamy sand-------	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-97	35-75	10-30	0-14	NP
	16-21	Loamy sand, sandy loam, loam.	SC-SM, SM, ML, SP-SM	A-2-4, A-1-b, A-4	0	0-8	90-100	85-97	35-95	10-60	0-25	NP-7
	21-25	Loamy sand, sandy loam, loam.	SC-SM, ML, SM, SP-SM	A-1-b, A-2-4, A-4	0	0-8	90-100	85-97	35-95	10-60	0-25	NP-7
	25-35	Sandy loam, loam	CL-ML, SC, CL, SC-SM	A-2-4, A-6, A-4	0	0-8	90-100	85-97	45-95	20-60	25-30	7-11
	35-80	Sandy loam-------	SC-SM, SM	A-1-b, A-2-4, A-4	0	0-8	90-100	85-97	45-80	20-50	0-25	NP-7
44B:												
Ossineke--------	0-10	Fine sandy loam--	SC, SM, SC-SM	A-2-4, A-4, A-6	0	0-6	90-100	85-95	55-85	30-50	0-30	NP-11
	10-15	Sandy loam, fine sandy loam.	SC-SM, SC, SM	A-2-4, A-6, A-4	0	0-6	90-100	85-95	55-85	30-50	0-30	NP-11
	15-22	Loamy sand, loamy fine sand, sandy loam, fine sandy loam.	CL-ML, SC-SM	A-2, A-6, A-4	0	0-6	90-100	85-95	55-95	30-80	25-40	7-15
	22-35	Clay loam, sandy clay loam, loamy sand, sandy loam, fine sandy loam.	CL	A-6, A-7-6	0	0-6	90-100	85-95	70-95	50-80	25-45	10-20
	35-41	Clay loam, sandy clay loam.	CL	A-6, A-7-6	0	0-6	90-100	85-95	70-95	50-80	25-45	10-20
	41-80	Clay loam, loam, fine sandy loam.	CL-ML, SC-SM	A-2, A-6, A-4	0	0-6	90-100	85-95	45-95	30-80	25-40	7-15

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	
44C:												
Ossineke--------	0-10	Fine sandy loam--	SC, SC-SM, SM	A-2-4, A-4, A-6	0	0-6	90-100	85-95	55-85	30-50	0-30	NP-11
	10-15	Sandy loam, fine sandy loam.	SC, SC-SM, SM	A-2-4, A-6, A-4	0	0-6	90-100	85-95	55-85	30-50	0-30	NP-11
	15-22	Loamy sand, loamy fine sand, sandy loam, fine sandy loam.	CL-ML, SC-SM	A-2, A-6, A-4	0	0-6	90-100	85-95	55-95	30-80	25-40	7-15
	22-35	Clay loam, sandy clay loam, loamy sand, sandy loam, fine sandy loam.	CL	A-6, A-7-6	0	0-6	90-100	85-95	70-95	50-80	25-45	10-20
	35-41	Clay loam, sandy clay loam.	CL	A-6, A-7-6	0	0-6	90-100	85-95	70-95	50-80	25-45	10-20
	41-80	Clay loam, loam, fine sandy loam.	CL-ML, SC-SM	A-2, A-6, A-4	0	0-6	90-100	85-95	45-95	30-80	25-40	7-15
47D:												
Graycalm--------	0-2	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
	2-16	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	16-27	Sand-------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	27-80	Sand, loamy sand, sandy loam.	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
47F:												
Graycalm--------	0-2	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
	2-16	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	16-27	Sand-------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	27-80	Sand, loamy sand, sandy loam.	SM, SP-SM, SP	A-3, A-2, A-1	0	0-5	95-100	80-100	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	
53B:												
Negwegon--------	0-5	Silt loam--------	CL, CL-ML	A-4, A-6	0	0	95-100	95-100	80-100	65-90	20-40	5-15
	5-8	Silt loam, silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	95-100	95-100	85-100	75-95	40-65	20-40
	8-13	Silty clay, silt loam, clay, silty clay loam.	CH, CL	A-7	0	0	95-100	95-100	85-100	75-95	40-65	20-40
	13-34	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	95-100	95-100	85-100	75-95	40-65	20-40
	34-80	Stratified silty clay to silty clay loam to silt loam.	CH, CL	A-7	0	0	95-100	95-100	80-100	65-95	40-65	20-40
53C:												
Negwegon--------	0-5	Silt loam--------	CL, CL-ML	A-4, A-6	0	0	95-100	95-100	80-100	65-90	20-40	5-15
	5-8	Silt loam, silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	95-100	95-100	85-100	75-95	40-65	20-40
	8-13	Silty clay, silt loam, clay, silty clay loam.	CH, CL	A-7	0	0	95-100	95-100	85-100	75-95	40-65	20-40
	13-34	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	95-100	95-100	85-100	75-95	40-65	20-40
	34-80	Stratified silty clay to silty clay loam to silt loam.	CH, CL	A-7	0	0	95-100	95-100	80-100	65-95	40-65	20-40
54A:												
Algonquin-------	0-5	Silt loam--------	CL	A-4, A-6	0	0	98-100	98-100	80-100	70-90	25-40	7-15
	5-10	Fine sandy loam--	CL, CL-ML, SC-SM, SC	A-4, A-6	0	0	98-100	98-100	65-85	40-60	20-30	4-11
	10-17	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	17-24	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	24-80	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	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	Plasticity index
	In				Pct	Pct					Pct	
59B:												
Algonquin-------	0-5	Silt loam--------	CL	A-4, A-6	0	0	98-100	98-100	80-100	70-90	25-40	7-15
	5-10	Fine sandy loam--	CL, SC-SM, CL-ML, SC	A-4, A-6	0	0	98-100	98-100	65-85	40-60	20-30	4-11
	10-17	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	17-24	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	24-80	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
Springport------	0-3	Silt loam--------	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	3-9	Silt loam, silty clay loam.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	9-13	Silty clay loam, silt loam.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	13-35	Silty clay, silty clay loam.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	35-80	Silty clay, silty clay loam.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
62A:												
Allendale-------	0-10	Loamy sand-------	SM, SP-SM	A-1-b, A-2-4, A-4	0	0	95-100	90-100	45-80	10-40	0-14	NP
	10-18	Loamy sand-------	SM, SP-SM	A-1-b, A-2-4, A-4, A-3	0	0	95-100	90-100	45-80	5-40	0-14	NP
	18-25	Sand-------------	SM, SP-SM	A-2-4, A-1-b, A-3, A-4	0	0	95-100	90-100	45-80	5-40	0-14	NP
	25-45	Silty clay, clay	CH, MH	A-7	0	0	95-100	90-100	90-100	75-95	50-70	20-40
	45-80	Silty clay-------	CH, MH	A-7	0	0	95-100	90-100	90-100	75-95	50-70	20-40
72:												
Dorval----------	0-18	Muck-------------	PT	A-8	0	0	---	---	---	---	0-14	---
	18-80	Silty clay, clay	CH, CL	A-7	0	0	100	100	90-100	80-100	45-70	25-40
75B:												
Rubicon---------	0-4	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	4-9	Sand, loamy sand	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	9-22	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	22-47	Sand-------------	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	47-80	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	90-100	30-70	0-15	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	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
75D:												
Rubicon---------	0-4	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	4-9	Sand, loamy sand	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	9-22	Sand-------------	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	22-47	Sand-------------	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	47-80	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	90-100	30-70	0-15	0-14	NP
75E:												
Rubicon---------	0-4	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	4-9	Sand, loamy sand	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	9-22	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	22-47	Sand-------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	47-80	Sand-------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	90-100	30-70	0-15	0-14	NP
75F:												
Rubicon---------	0-4	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	4-9	Sand, loamy sand	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	9-22	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	22-47	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	47-80	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	90-100	30-70	0-15	0-14	NP
78:												
Pits, borrow.												
81B:												
Grayling--------	0-5	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0	95-100	90-100	45-70	3-15	0-14	NP
	5-17	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	17-80	Sand, coarse sand	SM, SP, SP-SM	A-1, A-2, A-3	0	0	95-100	90-100	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	Plas- ticity index
	In				Pct	Pct					Pct	
81D:												
Grayling--------	0-5	Sand------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0	95-100	90-100	45-70	3-15	0-14	NP
	5-17	Sand------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0	95-100	90-100	45-70	3-15	0-14	NP
	17-80	Sand, coarse sand	SM, SP, SP-SM	A-1, A-2, A-3	0	0	95-100	90-100	40-70	0-15	0-14	NP
81E:												
Grayling--------	0-5	Sand------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0	95-100	90-100	45-70	3-15	0-14	NP
	5-17	Sand------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0	95-100	90-100	45-70	3-15	0-14	NP
	17-80	Sand, coarse sand	SM, SP-SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	40-70	0-15	0-14	NP
82B:												
Udorthents.												
83B:												
Udipsamments.												
86:												
Histosols-------	0-51	Muck------------	PT	A-8	0	0	---	---	---	---	---	NP
	51-80	Variable---------	---	---	---	---	---	---	---	---	---	---
Aquents---------	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
87:												
Ausable---------	0-10	Muck------------	PT	A-8	0	0	---	---	---	---	---	---
	10-80	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0	80-100	70-100	35-75	0-30	0-14	NP
90B:												
Chinwhisker-----	0-2	Sand------------	SM, SP-SM, SP	A-2-4, A-1-b, A-3	0	0	95-100	80-100	35-70	0-15	0-14	NP
	2-7	Sand------------	SM, SP-SM, SP	A-1-b, A-2-4, A-3	0	0	95-100	80-100	35-70	0-15	0-14	NP
	7-18	Sand------------	SM, SP, SP-SM	A-1-b, A-3, A-2-4	0	0	95-100	80-100	35-70	0-15	0-14	NP
	18-27	Sand------------	SP, SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	80-100	35-70	0-15	0-14	NP
	27-80	Sand, loamy sand	SP, SM, SP-SM	A-2-4, A-1-b, A-3	0	0	95-100	80-100	35-75	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	
94F:												
Klacking--------	0-4	Loamy sand-------	SM, SP-SM	A-1, A-2	0	0-5	90-100	80-100	35-75	10-30	0-14	NP
	4-12	Loamy sand-------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	12-25	Sand, loamy sand	SP, SM, SP-SM	A-1, A-3, A-2	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	25-33	Sand, loamy sand, sandy loam.	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	90-100	80-100	35-75	0-30	0-14	NP-5
	33-64	Sand, loamy sand, sandy loam.	SM, SC-SM, SP, SP-SM	A-2, A-1, A-3, A-4	0	0-5	90-100	80-100	35-70	0-40	0-25	NP-7
	64-80	Sand, loamy sand	SP, SM, SP-SM	A-1, A-2, A-3	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
McGinn----------	0-1	Peat-------------	PT	A-8	0	0	---	---	---	---	---	---
	1-2	Loamy sand-------	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-97	35-75	10-30	0-14	NP
	2-4	Loamy sand-------	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-97	35-75	10-30	0-14	NP
	4-16	Loamy sand-------	SM, SP-SM	A-1-b, A-2-4	0	0-8	90-100	85-97	35-75	10-30	0-14	NP
	16-21	Loamy sand, sandy loam, loam.	ML, SC-SM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-8	90-100	85-97	35-95	10-60	0-25	NP-7
	21-25	Loamy sand, sandy loam, loam.	SC-SM, SM, ML, SP-SM	A-1-b, A-4, A-2-4	0	0-8	90-100	85-97	35-95	10-60	0-25	NP-7
	25-35	Sandy loam, loam	CL-ML, SC, CL, SC-SM	A-2-4, A-6, A-4	0	0-8	90-100	85-97	45-95	20-60	25-30	7-11
	35-80	Sandy loam-------	SC-SM, SM	A-1-b, A-2-4, A-4	0	0-8	90-100	85-97	45-80	20-50	0-25	NP-7
95D:												
Menominee-------	0-4	Loamy sand-------	SM	A-2-4	0	0-7	95-100	85-100	50-75	15-30	0-14	NP
	4-6	Sand, loamy sand	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0-7	95-100	85-100	30-75	0-15	0-14	NP
	6-13	Sand, loamy sand	SM, SP-SM, SP	A-1-b, A-2-4, A-3	0	0-7	95-100	85-100	30-75	0-15	0-14	NP
	13-24	Sand, loamy sand	SM, SP-SM, SP	A-1-b, A-2-4, A-3	0	0-7	95-100	85-100	30-75	0-15	0-14	NP
	24-40	Sandy clay loam, clay loam, sandy loam.	CL, CL-ML	A-4, A-6	0	0-7	95-100	85-100	50-95	25-80	25-40	5-20
	40-80	Sandy clay loam, clay loam, loam, silty clay loam.	CL-ML, CL, SC, SC-SM	A-1, A-2, A-6, A-4	0	0-7	95-100	85-100	45-95	20-80	25-40	5-20

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	
97:												
Colonville------	0-19	Very fine sandy loam.	CL, CL-ML	A-4	0	0	98-100	98-100	85-95	50-65	20-25	4-8
	19-35	Very fine sandy loam, loam, fine sandy loam.	CL, ML, SM, SC	A-2-4, A-1-b, A-4	0	0	98-100	98-100	35-85	5-55	0-30	NP-9
	35-80	Very fine sandy loam, loam, fine sandy loam.	ML, SC, CL, SM	A-1-b, A-2-4, A-4	0	0	98-100	98-100	35-85	5-55	0-30	NP-9
116B:												
Mancelona-------	0-3	Sand------------	SP, SM, SP-SM	A-1-b, A-3, A-2	0	0-15	90-100	80-100	35-70	0-15	0-14	NP
	3-6	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-2, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	6-20	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	20-29	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-2, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	29-35	Gravelly loamy sand, sandy clay loam, gravelly sandy loam.	SC, SC-SM, SP-SC	A-2, A-1, A-4, A-6	0	0-15	85-100	60-100	35-80	10-50	20-35	4-15
	35-80	Very gravelly sand, gravelly sand, sand.	GW, GP, SP, SW	A-2, A-1, A-3	0	0-15	40-90	35-70	20-60	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	
116C:												
Mancelona-------	0-3	Sand------------	SP, SM, SP-SM	A-2, A-1-b, A-3	0	0-15	90-100	80-100	35-70	0-15	0-14	NP
	3-6	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-2, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	6-20	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	20-29	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	29-35	Gravelly loamy sand, sandy clay loam, gravelly sandy loam.	SC, SP-SC, SC-SM	A-2, A-1, A-4, A-6	0	0-15	85-100	60-100	35-80	10-50	20-35	4-15
	35-80	Very gravelly sand, gravelly sand, sand.	GW, GP, SP, SW	A-1, A-2, A-3	0	0-15	40-90	35-70	20-60	0-15	0-14	NP
116D:												
Mancelona-------	0-3	Sand------------	SP, SM, SP-SM	A-1-b, A-2, A-3	0	0-15	90-100	80-100	35-70	0-15	0-14	NP
	3-6	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	6-20	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-2, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	20-29	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	29-35	Gravelly loamy sand, sandy clay loam, gravelly sandy loam.	SC, SP-SC, SC-SM	A-2, A-1, A-4, A-6	0	0-15	85-100	60-100	35-80	10-50	20-35	4-15
	35-80	Very gravelly sand, gravelly sand, sand.	GW, GP, SP, SW	A-1, A-2, A-3	0	0-15	40-90	35-70	20-60	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	
116E:												
Mancelona-------	0-3	Sand-------------	SP, SM, SP-SM	A-1-b, A-3, A-2	0	0-15	90-100	80-100	35-70	0-15	0-14	NP
	3-6	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	6-20	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	20-29	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	29-35	Gravelly loamy sand, sandy clay loam, gravelly sandy loam.	SC, SC-SM, SP-SC	A-2, A-1, A-4, A-6	0	0-15	85-100	60-100	35-80	10-50	20-35	4-15
	35-80	Very gravelly sand, gravelly sand, sand.	GW, GP, SP, SW	A-1, A-2, A-3	0	0-15	40-90	35-70	20-60	0-15	0-14	NP
116F:												
Mancelona-------	0-3	Sand-------------	SM, SP, SP-SM	A-1-b, A-2, A-3	0	0-15	90-100	80-100	35-70	0-15	0-14	NP
	3-6	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-2, A-1-b, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	6-20	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-2, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	20-29	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	29-35	Gravelly loamy sand, sandy clay loam, gravelly sandy loam.	SC, SP-SC, SC-SM	A-1, A-6, A-2, A-4	0	0-15	85-100	60-100	35-80	10-50	20-35	4-15
	35-80	Very gravelly sand, gravelly sand, sand.	GP, SW, GW, SP	A-1, A-2, A-3	0	0-15	40-90	35-70	20-60	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	
123D:												
Klacking--------	0-4	Sand-------------	SP, SM, SP-SM	A-1, A-2, A-3	0	0-5	90-100	80-100	35-75	0-15	0-14	NP
	4-23	Sand, loamy sand	SM, SP, SP-SM	A-2, A-1, A-3	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	23-30	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	30-80	Sand, loamy sand, sandy loam.	SM, SP, SC-SM, SP-SM	A-1, A-4, A-2, A-3	0	0-5	90-100	80-100	35-70	0-40	0-25	NP-7
125B:												
Melita----------	0-4	Sand-------------	SM, SP-SM	A-1, A-2, A-3	0	0-5	95-100	92-100	45-80	5-35	0-14	NP
	4-8	Sand-------------	SM, SP-SM	A-1, A-3, A-2	0	0-5	95-100	92-100	45-80	5-35	0-14	NP
	8-16	Sand, loamy sand	SM, SP-SM	A-1, A-3, A-2	0	0-5	95-100	92-100	45-80	5-35	0-14	NP
	16-43	Sand, loamy sand	SM, SP-SM	A-1, A-2, A-3	0	0-5	95-100	92-100	45-80	5-35	0-14	NP
	43-47	Silty clay loam, loam, clay loam.	CL-ML, ML	A-6, A-4, A-7	0	0-5	95-100	92-100	75-100	55-95	25-45	4-15
	47-80	Sandy clay loam, clay loam, silty clay loam, loam, sandy loam.	CL, CL-ML	A-4, A-6	0	0-5	95-100	92-100	75-100	55-95	25-40	4-15
147B:												
Lindquist-------	0-1	Sand-------------	SM, SP, SP-SM	A-2-4, A-1-b, A-3	0	0-5	90-100	80-100	35-70	0-15	0-14	NP
	1-3	Sand-------------	SM, SP-SM, SP	A-1-b, A-2-4, A-3	0	0-5	90-100	80-100	35-70	0-15	0-14	NP
	3-22	Sand-------------	SM, SP, SP-SM	A-1-b, A-3, A-2-4	0	0-5	90-100	80-100	35-70	0-15	0-14	NP
	22-80	Sand, loamy sand	SM, SP-SM	A-1-b, A-3, A-2-4	0	0-5	90-100	80-100	35-75	5-25	0-14	NP
147E:												
Lindquist-------	0-1	Sand-------------	SM, SP-SM, SP	A-1-b, A-2-4, A-3	0	0-5	90-100	80-100	35-70	0-15	0-14	NP
	1-3	Sand-------------	SM, SP-SM, SP	A-1-b, A-3, A-2-4	0	0-5	90-100	80-100	35-70	0-15	0-14	NP
	3-22	Sand-------------	SP, SM, SP-SM	A-1-b, A-3, A-2-4	0	0-5	90-100	80-100	35-70	0-15	0-14	NP
	22-80	Sand, loamy sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0-5	90-100	80-100	35-75	5-25	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	
307B:												
Klacking--------	0-4	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	90-100	80-100	35-75	0-15	0-14	NP
	4-23	Sand, loamy sand	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	23-30	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	30-80	Sand, loamy sand, sandy loam.	SC-SM, SP-SM, SM, SP	A-2, A-1, A-3, A-4	0	0-5	90-100	80-100	35-70	0-40	0-25	NP-7
307E:												
Klacking--------	0-4	Sand-------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	90-100	80-100	35-75	0-15	0-14	NP
	4-23	Sand, loamy sand	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	23-30	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	30-80	Sand, loamy sand, sandy loam.	SM, SP, SC-SM, SP-SM	A-2, A-3, A-1, A-4	0	0-5	90-100	80-100	35-70	0-40	0-25	NP-7
307F:												
Klacking--------	0-4	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	90-100	80-100	35-75	0-15	0-14	NP
	4-23	Sand, loamy sand	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	23-30	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	30-80	Sand, loamy sand, sandy loam.	SC-SM, SP-SM, SM, SP	A-2, A-1, A-3, A-4	0	0-5	90-100	80-100	35-70	0-40	0-25	NP-7
350B:												
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	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-1-b, A-3, A-2-4	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam.	SM, SP-SM	A-1, A-2-4, A-4, A-3	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	Plasticity index
	In				Pct	Pct					Pct	
350D:												
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	95-100	40-70	5-15	0-14	NP
	3-6	Sand-------------	SM, SP-SM	A-1-b, A-3, A-2-4	0	0	95-100	95-100	40-75	5-30	0-14	NP
	6-25	Sand-------------	SM, SP-SM	A-1-b, A-3, A-2-4	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam.	SM, SP-SM	A-2-4, A-1, A-3, A-4	0	0	95-100	95-100	40-75	5-40	0-14	NP
350E:												
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	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-1-b, A-3, A-2-4	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam.	SM, SP-SM	A-1, A-4, A-2-4, A-3	0	0	95-100	95-100	40-75	5-40	0-14	NP
351A:												
Allendale-------	0-10	Loamy sand-------	SM, SP-SM	A-1-b, A-2-4, A-4	0	0	95-100	90-100	45-80	10-40	0-14	NP
	10-18	Loamy sand-------	SM, SP-SM	A-2-4, A-3, A-1-b, A-4	0	0	95-100	90-100	45-80	5-40	0-14	NP
	18-25	Sand-------------	SM, SP-SM	A-2-4, A-3, A-1-b, A-4	0	0	95-100	90-100	45-80	5-40	0-14	NP
	25-45	Silty clay, clay	CH, MH	A-7	0	0	95-100	90-100	90-100	75-95	50-70	20-40
	45-80	Silty clay-------	CH, MH	A-7	0	0	95-100	90-100	90-100	75-95	50-70	20-40
Wakeley---------	0-3	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
	3-7	Sand, loamy sand	SM, SC-SM, SP, SP-SM	A-2-4, A-4, A-3	0	0	97-100	97-100	35-95	0-50	0-25	NP-7
	7-41	Sand, loamy sand	SC-SM, SP-SM, SM, SP	A-2-4, A-3, A-4	0	0	97-100	97-100	35-95	0-50	0-25	NP-7
	41-80	Stratified sandy clay to silty clay loam.	SC, CL	A-6, A-7	0	0	97-100	97-100	80-95	30-60	40-65	20-40
Dorval----------	0-18	Muck-------------	PT	A-8	0	0	---	---	---	---	0-14	---
	18-80	Silty clay, clay	CH, CL	A-7	0	0	100	100	90-100	80-100	45-70	25-40
352B:												
Deford----------	0-6	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
	6-80	Sand-------------	SM, SP-SM, SP	A-2-4, A-3	0	0-5	95-100	90-100	50-80	0-35	15-20	NP-4

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	
352B:												
Au Gres	0-2	Mucky peat	PT	A-8	0	0	---	---	---	---	---	---
	2-8	Sand	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-70	0-15	0-14	NP
	8-18	Sand	SM, SP, SC-SM, SP-SM	A-1-b, A-3, A-2-4	0	0	95-100	90-100	35-75	0-30	0-14	NP
	18-35	Sand	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-70	0-15	0-14	NP
	35-80	Sand	SM, SP-SM, SP	A-1-b, A-3, A-2-4	0	0	95-100	90-100	35-70	0-15	0-14	NP
Croswell	0-2	Peat	PT	A-8	0	0	---	---	---	---	---	---
	2-5	Sand	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	90-100	80-100	40-70	5-15	0-14	NP
	5-11	Sand	SM, SP-SM, SP	A-2-4, A-1-b, A-3	0	0	90-100	80-100	40-70	3-15	0-14	NP
	11-17	Sand	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	90-100	80-100	40-70	3-15	0-14	NP
	17-33	Sand	SP, SM, SP-SM	A-1-b, A-3, A-2-4	0	0	90-100	80-100	40-70	3-15	0-14	NP
	33-80	Sand	SP, SM, SP-SM	A-1-b, A-2-4, A-3	0	0	90-100	80-100	40-70	3-15	0-14	NP
353B:												
Mancelona	0-3	Sand	SP, SM, SP-SM	A-1-b, A-2, A-3	0	0-15	90-100	80-100	35-70	0-15	0-14	NP
	3-6	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	6-20	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	20-29	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-2, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	29-35	Gravelly loamy sand, sandy clay loam, gravelly sandy loam.	SC, SP-SC, SC-SM	A-2, A-1, A-4, A-6	0	0-15	85-100	60-100	35-80	10-50	20-35	4-15
	35-80	Very gravelly sand, gravelly sand, sand.	GW, GP, SP, SW	A-1, A-2, A-3	0	0-15	40-90	35-70	20-60	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	
353B:												
Ossineke--------	0-10	Fine sandy loam--	SC, SM, SC-SM	A-2-4, A-4, A-6	0	0-6	90-100	85-95	55-85	30-50	0-30	NP-11
	10-15	Sandy loam, fine sandy loam.	SC, SC-SM, SM	A-4, A-2-4, A-6	0	0-6	90-100	85-95	55-85	30-50	0-30	NP-11
	15-22	Loamy sand, loamy fine sand, sandy loam, fine sandy loam.	CL-ML, SC-SM	A-4, A-2, A-6	0	0-6	90-100	85-95	55-95	30-80	25-40	7-15
	22-35	Clay loam, sandy clay loam, loamy sand, sandy loam, fine sandy loam.	CL	A-6, A-7-6	0	0-6	90-100	85-95	70-95	50-80	25-45	10-20
	35-41	Clay loam, sandy clay loam.	CL	A-6, A-7-6	0	0-6	90-100	85-95	70-95	50-80	25-45	10-20
	41-80	Clay loam, loam, fine sandy loam.	CL-ML, SC-SM	A-4, A-2, A-6	0	0-6	90-100	85-95	45-95	30-80	25-40	7-15
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	95-100	40-70	5-15	0-14	NP
	3-6	Sand-------------	SM, SP-SM	A-1-b, A-3, A-2-4	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.	SM, SP-SM	A-2-4, A-3, 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	
354F:												
Mancelona-------	0-3	Sand-------------	SP, SM, SP-SM	A-2, A-1-b, A-3	0	0-15	90-100	80-100	35-70	0-15	0-14	NP
	3-6	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-2, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	6-20	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	20-29	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	29-35	Gravelly loamy sand, sandy clay loam, gravelly sandy loam.	SC, SP-SC, SC-SM	A-2, A-1, A-4, A-6	0	0-15	85-100	60-100	35-80	10-50	20-35	4-15
	35-80	Very gravelly sand, gravelly sand, sand.	GP, SW, GW, SP	A-1, A-2, A-3	0	0-15	40-90	35-70	20-60	0-15	0-14	NP
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	95-100	40-70	5-15	0-14	NP
	3-6	Sand-------------	SM, SP-SM	A-1-b, A-3, A-2-4	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.	SM, SP-SM	A-2-4, A-1, A-3, A-4	0	0	95-100	95-100	40-75	5-40	0-14	NP
359C:												
Algonquin-------	0-5	Silt loam--------	CL	A-4, A-6	0	0	98-100	98-100	80-100	70-90	25-40	7-15
	5-10	Fine sandy loam--	CL, CL-ML, SC-SM, SC	A-4, A-6	0	0	98-100	98-100	65-85	40-60	20-30	4-11
	10-17	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	17-24	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	24-80	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	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	Plasticity index
	In				Pct	Pct					Pct	
359C:												
Negwegon	0-5	Silt loam	CL, CL-ML	A-4, A-6	0	0	95-100	95-100	80-100	65-90	20-40	5-15
	5-8	Silt loam, silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	95-100	95-100	85-100	75-95	40-65	20-40
	8-13	Silty clay, silt loam, clay, silty clay loam.	CH, CL	A-7	0	0	95-100	95-100	85-100	75-95	40-65	20-40
	13-34	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	95-100	95-100	85-100	75-95	40-65	20-40
	34-80	Stratified silty clay to silty clay loam to silt loam.	CH, CL	A-7	0	0	95-100	95-100	80-100	65-95	40-65	20-40
Dorval	0-18	Muck	PT	A-8	0	0	---	---	---	---	0-14	---
	18-80	Silty clay, clay	CH, CL	A-7	0	0	100	100	90-100	80-100	45-70	25-40
360:												
Wakeley	0-3	Muck	PT	A-8	0	0	---	---	---	---	---	---
	3-7	Sand, loamy sand	SC-SM, SM, SP-SM, SP	A-2-4, A-3, A-4	0	0	97-100	97-100	35-95	0-50	0-25	NP-7
	7-41	Sand, loamy sand	SC-SM, SP-SM, SM, SP	A-2-4, A-4, A-3	0	0	97-100	97-100	35-95	0-50	0-25	NP-7
	41-80	Stratified sandy clay to silty clay loam.	SC, CL	A-6, A-7	0	0	97-100	97-100	80-95	30-60	40-65	20-40
361B:												
Allendale	0-10	Loamy sand	SM, SP-SM	A-2-4, A-1-b, A-4	0	0	95-100	90-100	45-80	10-40	0-14	NP
	10-18	Loamy sand	SM, SP-SM	A-2-4, A-1-b, A-3, A-4	0	0	95-100	90-100	45-80	5-40	0-14	NP
	18-25	Sand	SM, SP-SM	A-2-4, A-3, A-1-b, A-4	0	0	95-100	90-100	45-80	5-40	0-14	NP
	25-45	Silty clay, clay	CH, MH	A-7	0	0	98-100	90-100	90-100	75-95	50-70	20-40
	45-80	Silty clay	CH, MH	A-7	0	0	98-100	90-100	90-100	75-95	50-70	20-40
Dorval	0-18	Muck	PT	A-8	0	0	---	---	---	---	0-14	---
	18-80	Silty clay, clay	CH, CL	A-7	0	0	100	100	90-100	80-100	45-70	25-40

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	
361B:												
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-2-4, A-1-b, A-3	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-1-b, A-3, A-2-4	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam.	SM, SP-SM	A-1, A-4, A-2-4, A-3	0	0	95-100	95-100	40-75	5-40	0-14	NP
362B:												
Millersburg-----	0-2	Loamy sand-------	SC-SM, SM	A-1-b, A-2-4	0	0-8	95-100	80-100	40-75	15-25	0-20	NP-5
	2-5	Sand, loamy sand	SC-SM, SM, SP-SM	A-2-4, A-1-b, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	5-10	Sand, loamy sand	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	10-18	Sand, loamy sand, sandy loam.	SC-SM, SM, SP-SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	18-26	Sand, loamy sand, sandy loam.	SM, SC-SM, SP-SM	A-2-4, A-1-b, A-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	26-34	Sandy loam, loam	ML, SC, CL, SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	34-43	Sandy loam-------	ML, SC, CL, SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	43-80	Loamy sand, sandy loam.	SM, SP-SM	A-1-b, A-2-4	0	0-8	85-100	80-100	40-65	10-35	0-30	NP-5
362D:												
Millersburg-----	0-2	Loamy sand-------	SC-SM, SM	A-1-b, A-2-4	0	0-8	95-100	80-100	40-75	15-25	0-20	NP-5
	2-5	Sand, loamy sand	SC-SM, SP-SM, SM	A-1-b, A-3, A-2-4	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	5-10	Sand, loamy sand	SC-SM, SM, SP-SM	A-1-b, A-2-4, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	10-18	Sand, loamy sand, sandy loam.	SC-SM, SM, SP-SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	18-26	Sand, loamy sand, sandy loam.	SC-SM, SP-SM, SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	26-34	Sandy loam, loam	CL, ML, SM, SC	A-2-4, A-1-b, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	34-43	Sandy loam-------	ML, SC, CL, SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	43-80	Loamy sand, sandy loam.	SM, SP-SM	A-1-b, A-2-4	0	0-8	85-100	80-100	40-65	10-35	0-30	NP-5

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	
362E:												
Millersburg-----	0-2	Loamy sand-------	SC-SM, SM	A-1-b, A-2-4	0	0-8	95-100	80-100	40-75	15-25	0-20	NP-5
	2-5	Sand, loamy sand	SM, SC-SM, SP-SM	A-1-b, A-3, A-2-4	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	5-10	Sand, loamy sand	SC-SM, SM, SP-SM	A-2-4, A-1-b, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	10-18	Sand, loamy sand, sandy loam.	SC-SM, SM, SP-SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	18-26	Sand, loamy sand, sandy loam.	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	26-34	Sandy loam, loam	ML, SC, CL, SM	A-2-4, A-1-b, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	34-43	Sandy loam-------	CL, SM, ML, SC	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	43-80	Loamy sand, sandy loam.	SM, SP-SM	A-1-b, A-2-4	0	0-8	85-100	80-100	40-65	10-35	0-30	NP-5
363D:												
Mancelona-------	0-3	Sand-------------	SM, SP, SP-SM	A-1-b, A-2, A-3	0	0-15	90-100	80-100	35-70	0-15	0-14	NP
	3-6	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-2, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	6-20	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	20-29	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	29-35	Gravelly loamy sand, sandy clay loam, gravelly sandy loam.	SC, SP-SC, SC-SM	A-2, A-1, A-4, A-6	0	0-15	85-100	60-100	35-80	10-50	20-35	4-15
	35-80	Very gravelly sand, gravelly sand, sand.	GW, GP, SP, SW	A-1, A-2, A-3	0	0-15	40-90	35-70	20-60	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	
363D:												
Millersburg-----	0-2	Loamy sand-------	SC-SM, SM	A-1-b, A-2-4	0	0-8	95-100	80-100	40-75	15-25	0-20	NP-5
	2-5	Sand, loamy sand	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	5-10	Sand, loamy sand	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	10-18	Sand, loamy sand, sandy loam.	SC-SM, SM, SP-SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	18-26	Sand, loamy sand, sandy loam.	SM, SC-SM, SP-SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	26-34	Sandy loam, loam	ML, CL, SC, SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	34-43	Sandy loam-------	ML, CL, SC, SM	A-2-4, A-1-b, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	43-80	Loamy sand, sandy loam.	SM, SP-SM	A-1-b, A-2-4	0	0-8	85-100	80-100	40-65	10-35	0-30	NP-5
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	85-100	40-70	5-15	0-14	NP
	3-6	Sand-------------	SM, SP-SM	A-1-b, A-3, A-2-4	0	0	95-100	85-100	40-75	5-30	0-14	NP
	6-25	Sand-------------	SM, SP-SM	A-1-b, A-3, A-2-4	0	0	95-100	85-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam.	SM, SP-SM	A-2-4, A-1, A-3, A-4	0	0	95-100	85-100	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	
364E:												
Mancelona-------	0-3	Sand-------------	SM, SP, SP-SM	A-1-b, A-2, A-3	0	0-15	90-100	80-100	35-70	0-15	0-14	NP
	3-6	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	6-20	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	20-29	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-2, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	29-35	Gravelly loamy sand, sandy clay loam, gravelly sandy loam.	SC, SP-SC, SC-SM	A-2, A-1, A-4, A-6	0	0-15	85-100	60-100	35-80	10-50	20-35	4-15
	35-80	Very gravelly sand, gravelly sand, sand.	GW, GP, SP, SW	A-1, A-2, A-3	0	0-15	40-90	35-70	20-60	0-15	0-14	NP
Millersburg-----	0-2	Loamy sand-------	SC-SM, SM	A-1-b, A-2-4	0	0-8	95-100	80-100	40-75	15-25	0-20	NP-5
	2-5	Sand, loamy sand	SC-SM, SP-SM, SM	A-1-b, A-3, A-2-4	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	5-10	Sand, loamy sand	SM, SC-SM, SP-SM	A-1-b, A-2-4, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	10-18	Sand, loamy sand, sandy loam.	SC-SM, SM, SP-SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	18-26	Sand, loamy sand, sandy loam.	SC-SM, SP-SM, SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	26-34	Sandy loam, loam	CL, ML, SM, SC	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	34-43	Sandy loam-------	ML, CL, SC, SM	A-2-4, A-1-b, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	43-80	Loamy sand, sandy loam.	SM, SP-SM	A-1-b, A-2-4	0	0-8	85-100	80-100	40-65	10-35	0-30	NP-5
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-3, A-2-4	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-1-b, A-3	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam.	SM, SP-SM	A-2-4, A-1, A-3, 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	Plasticity index
	In				Pct	Pct					Pct	
369:												
Deford----------	0-6	Muck------------	PT	A-8	0	0	---	---	---	---	---	---
	6-80	Sand------------	SP, SM, SP-SM	A-2-4, A-3	0	0-5	95-100	90-100	50-80	0-35	15-20	NP-4
371:												
Springport------	0-3	Silt loam--------	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	3-9	Silt loam, silty clay loam.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	9-13	Silty clay loam, silt loam.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	13-35	Silty clay, silty clay loam.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	35-80	Silty clay, silty clay loam.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
380:												
Access denied.												
384B:												
Iosco-----------	0-3	Sand------------	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	90-100	80-100	35-80	5-35	0-14	NP
	3-12	Sand------------	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-3	0	0	90-100	80-100	35-85	5-35	0-25	NP-7
	12-15	Sand------------	SC-SM, SP-SM, SM	A-2-4, A-1-b, A-3	0	0	90-100	80-100	35-85	5-35	0-25	NP-7
	15-18	Sand------------	SC-SM, SM, SP-SM	A-2-4, A-1-b, A-3	0	0	90-100	80-100	35-85	5-35	0-25	NP-7
	18-30	Sandy clay loam, loamy sand.	SC-SM, SM, SP-SM	A-1-b, A-3, A-2-4	0	0	90-100	80-100	35-85	5-35	0-25	NP-7
	30-42	Sandy clay loam, loam, clay loam, silty clay loam.	CL-ML, CL, SC, SC-SM	A-2, A-4, A-7, A-6	0	0	90-100	80-100	65-95	30-90	25-45	5-25
	42-80	Loam, sandy loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	0	90-100	80-100	70-95	50-90	25-45	5-25
385D:												
Lindquist-------	0-1	Sand------------	SM, SP, SP-SM	A-1-b, A-3, A-2-4	0	0-5	90-100	75-100	35-70	0-15	0-14	NP
	1-3	Sand------------	SM, SP-SM, SP	A-1-b, A-3, A-2-4	0	0-5	90-100	75-100	35-70	0-15	0-14	NP
	3-22	Sand------------	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0-5	90-100	75-100	35-70	0-15	0-14	NP
	22-80	Sand, loamy sand	SM, SP-SM	A-1-b, A-3, A-2-4	0	0-5	90-100	75-100	35-75	5-25	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	
386B:												
Mancelona-------	0-3	Sand------------	SP, SM, SP-SM	A-1-b, A-3, A-2	0	0-15	90-100	80-100	35-70	0-15	0-14	NP
	3-6	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	6-20	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-2, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	20-29	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-2, A-1-b, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	29-35	Gravelly loamy sand, sandy clay loam, gravelly sandy loam.	SC, SP-SC, SC-SM	A-2, A-1, A-4, A-6	0	0-15	85-100	60-100	35-80	10-50	20-35	4-15
	35-80	Very gravelly sand, gravelly sand, sand.	GP, GW, SW, SP	A-2, A-1, A-3	0	0-15	40-90	35-70	20-60	0-15	0-14	NP
Rubicon---------	0-4	Sand------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	4-9	Sand, loamy sand	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	9-22	Sand------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	22-47	Sand------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	47-80	Sand------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	90-100	30-70	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	Plas- ticity index
	In				Pct	Pct					Pct	
386D:												
Mancelona-------	0-3	Sand-------------	SM, SP-SM, SP	A-1-b, A-2, A-3	0	0-15	90-100	80-100	35-70	0-15	0-14	NP
	3-6	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	6-20	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	20-29	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-2, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	29-35	Gravelly loamy sand, sandy clay loam, gravelly sandy loam.	SC, SP-SC, SC-SM	A-2, A-1, A-4, A-6	0	0-15	85-100	60-100	35-80	10-50	20-35	4-15
	35-80	Very gravelly sand, gravelly sand, sand.	GW, GP, SP, SW	A-1, A-2, A-3	0	0-15	40-90	35-70	20-60	0-15	0-14	NP
Rubicon---------	0-4	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	4-9	Sand, loamy sand	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	9-22	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	22-47	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	47-80	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	90-100	30-70	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	
387E:												
Mancelona-------	0-3	Sand------------	SP, SM, SP-SM	A-1-b, A-3, A-2	0	0-15	90-100	80-100	35-70	0-15	0-14	NP
	3-6	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	6-20	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-2, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	20-29	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-2, A-1-b, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	29-35	Gravelly loamy sand, sandy clay loam, gravelly sandy loam.	SC, SC-SM, SP-SC	A-2, A-1, A-4, A-6	0	0-15	85-100	60-100	35-80	10-50	20-35	4-15
	35-80	Very gravelly sand, gravelly sand, sand.	GW, GP, SP, SW	A-2, A-1, A-3	0	0-15	40-90	35-70	20-60	0-15	0-14	NP
Rubicon---------	0-4	Sand------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	4-9	Sand, loamy sand	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	9-22	Sand------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	22-47	Sand------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	47-80	Sand------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	90-100	30-70	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	Plas- ticity index
	In				Pct	Pct					Pct	
387F:												
Mancelona-------	0-3	Sand-------------	SP, SM, SP-SM	A-1-b, A-2, A-3	0	0-15	90-100	80-100	35-70	0-15	0-14	NP
	3-6	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-3, A-2	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	6-20	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-2, A-1-b, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	20-29	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM	A-1-b, A-2, A-3	0	0-15	80-100	60-100	30-75	5-30	0-14	NP
	29-35	Gravelly loamy sand, sandy clay loam, gravelly sandy loam.	SC, SP-SC, SC-SM	A-2, A-4, A-1, A-6	0	0-15	85-100	60-100	35-80	10-50	20-35	4-15
	35-80	Very gravelly sand, gravelly sand, sand.	GW, GP, SP, SW	A-1, A-2, A-3	0	0-15	40-90	35-70	20-60	0-15	0-14	NP
Rubicon---------	0-4	Sand-------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	4-9	Sand, loamy sand	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	9-22	Sand-------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	22-47	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	90-100	35-70	0-15	0-14	NP
	47-80	Sand-------------	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	90-100	30-70	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	
388B:												
Millersburg-----	0-2	Loamy sand-------	SC-SM, SM	A-1-b, A-2-4	0	0-8	95-100	80-100	40-75	15-25	0-20	NP-5
	2-5	Sand, loamy sand	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	5-10	Sand, loamy sand	SC-SM, SM, SP-SM	A-1-b, A-3, A-2-4	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	10-18	Sand, loamy sand, sandy loam.	SC-SM, SM, SP-SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	18-26	Sand, loamy sand, sandy loam.	SC-SM, SM, SP-SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	26-34	Sandy loam, loam	ML, SC, CL, SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	34-43	Sandy loam-------	ML, SC, CL, SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	43-80	Loamy sand, sandy loam.	SM, SP-SM	A-1-b, A-2-4	0	0-8	85-100	80-100	40-65	10-35	0-30	NP-5
Klacking--------	0-4	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	90-100	80-100	35-75	0-15	0-14	NP
	4-23	Sand, loamy sand	SM, SP, SP-SM	A-2, A-1, A-3	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	23-30	Sand-------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	30-80	Sand, loamy sand, sandy loam.	SM, SC-SM, SP, SP-SM	A-1, A-4, A-2, A-3	0	0-5	90-100	80-100	35-70	0-40	0-25	NP-7
Graycalm--------	0-2	Sand-------------	SP, SM, SP-SM	A-1, A-2, A-3	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
	2-16	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	16-27	Sand-------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	27-80	Sand, loamy sand, sandy loam.	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	80-100	35-55	0-15	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	
388D:												
Millersburg-----	0-2	Loamy sand-------	SC-SM, SM	A-1-b, A-2-4	0	0-8	95-100	80-100	40-75	15-25	0-20	NP-5
	2-5	Sand, loamy sand	SM, SC-SM, SP-SM	A-2-4, A-1-b, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	5-10	Sand, loamy sand	SC-SM, SM, SP-SM	A-1-b, A-2-4, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	10-18	Sand, loamy sand, sandy loam.	SC-SM, SP-SM, SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	18-26	Sand, loamy sand, sandy loam.	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	26-34	Sandy loam, loam	ML, CL, SC, SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	34-43	Sandy loam-------	CL, ML, SM, SC	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	43-80	Loamy sand, sandy loam.	SM, SP-SM	A-1-b, A-2-4	0	0-8	85-100	80-100	40-65	10-35	0-30	NP-5
Klacking--------	0-4	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	90-100	80-100	35-75	0-15	0-14	NP
	4-23	Sand, loamy sand	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	23-30	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	30-80	Sand, loamy sand, sandy loam.	SM, SC-SM, SP, SP-SM	A-2, A-1, A-3, A-4	0	0-5	90-100	80-100	35-70	0-40	0-25	NP-7
Graycalm--------	0-2	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
	2-16	Sand-------------	SP, SM, SP-SM	A-1, A-3, A-2	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	16-27	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	27-80	Sand, loamy sand, sandy loam.	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	80-100	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	
388E:												
Millersburg-----	0-2	Loamy sand-------	SC-SM, SM	A-1-b, A-2-4	0	0-8	95-100	80-100	40-75	15-25	0-20	NP-5
	2-5	Sand, loamy sand	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	5-10	Sand, loamy sand	SM, SC-SM, SP-SM	A-1-b, A-3, A-2-4	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	10-18	Sand, loamy sand, sandy loam.	SC-SM, SM, SP-SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	18-26	Sand, loamy sand, sandy loam.	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	26-34	Sandy loam, loam	CL, SM, ML, SC	A-2-4, A-1-b, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	34-43	Sandy loam-------	ML, CL, SC, SM	A-2-4, A-1-b, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	43-80	Loamy sand, sandy loam.	SM, SP-SM	A-1-b, A-2-4	0	0-8	85-100	80-100	40-65	10-35	0-30	NP-5
Klacking--------	0-4	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	90-100	80-100	35-75	0-15	0-14	NP
	4-23	Sand, loamy sand	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	23-30	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	90-100	80-100	35-75	0-30	0-14	NP
	30-80	Sand, loamy sand, sandy loam.	SM, SP, SC-SM, SP-SM	A-1, A-4, A-2, A-3	0	0-5	90-100	80-100	35-70	0-40	0-25	NP-7
Graycalm--------	0-2	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
	2-16	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	16-27	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	27-80	Sand, loamy sand, sandy loam.	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	80-100	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	Plasticity index
	In				Pct	Pct					Pct	
389B:												
Horsehead-------	0-2	Gravelly sand----	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-30	70-100	70-100	25-65	0-15	0-14	NP
	2-7	Sand, gravelly sand.	GP-GM, GP, SP, SP-SM	A-1, A-2-4, A-3	0	0-30	35-100	30-100	10-70	0-15	0-14	NP
	7-18	Sand, gravelly and very gravelly sand, loamy sand.	GP, SM, GM, SP	A-1, A-2-4, A-3	0	0-30	35-100	30-100	10-60	0-30	15-25	NP-8
	18-37	Extremely gravelly loamy sand, very gravelly loamy sand, gravelly loamy sand.	GM, SP, GP, SM	A-1, A-2-4, A-3	0-7	0-30	30-100	30-75	10-60	0-30	15-25	NP-8
	37-80	Stratified extremely gravelly sand to sand.	GP-GM, GP, SP, SP-SM	A-1, A-3, A-2-4	0-7	0-30	30-100	30-100	10-70	0-15	0-14	NP
389D:												
Horsehead-------	0-2	Gravelly sand----	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-30	70-100	70-100	25-65	0-15	0-14	NP
	2-7	Sand, gravelly sand.	GP-GM, GP, SP, SP-SM	A-1, A-2-4, A-3	0	0-30	35-100	35-100	10-70	0-15	0-14	NP
	7-18	Sand, gravelly and very gravelly sand, loamy sand.	GM, SP, GP, SM	A-1, A-3, A-2-4	0	0-30	35-100	35-100	10-60	0-30	15-25	NP-8
	18-37	Extremely gravelly loamy sand, very gravelly loamy sand, gravelly loamy sand.	GP, GM, SM, SP	A-1, A-3, A-2-4	0-5	0-30	30-100	30-75	10-60	0-30	15-25	NP-8
	37-80	Stratified extremely gravelly sand to sand.	GP, GP-GM, SP-SM, SP	A-1, A-2-4, A-3	0-5	0-30	30-100	30-100	10-70	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	
389E:												
Horsehead-------	0-2	Gravelly sand----	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-30	70-100	70-100	25-65	0-15	0-14	NP
	2-7	Sand, gravelly sand.	GP, SP-SM, GP-GM, SP	A-1, A-2-4, A-3	0	0-30	35-100	35-100	10-70	0-15	0-14	NP
	7-18	Sand, gravelly and very gravelly sand, loamy sand.	GP, GM, SM, SP	A-1, A-3, A-2-4	0	0-30	35-100	35-100	10-60	0-30	15-25	NP-8
	18-37	Extremely gravelly loamy sand, very gravelly loamy sand, gravelly loamy sand.	GM, SP, GP, SM	A-1, A-3, A-2-4	0-7	0-30	30-100	30-75	10-60	0-30	15-25	NP-8
	37-80	Stratified extremely gravelly sand to sand.	GP-GM, GP, SP, SP-SM	A-1, A-2-4, A-3	0-7	0-30	30-100	30-100	10-70	0-15	0-14	NP
390B:												
Horsehead-------	0-2	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2-4	0	0-15	95-100	85-100	40-70	0-15	0-14	NP
	2-27	Gravelly sand, sand, loamy sand, very gravelly sand.	GP-GM, GP, SP, SP-SM	A-1, A-2-4, A-3	0	0-15	35-100	25-100	10-70	0-15	0-14	NP
	27-36	Very gravelly loamy sand, gravelly loamy sand, extremely gravelly loamy sand.	GP, SM, GM, SP	A-1, A-3, A-2-4	0-7	0-25	30-100	20-75	10-60	0-30	15-25	NP-8
	36-80	Stratified extremely gravelly sand to sand.	GP-GM, GP, SP, SP-SM	A-2-4, A-1, A-3	0-7	0-25	30-100	20-100	10-70	0-15	0-14	NP
Graycalm--------	0-2	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
	2-16	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	16-27	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	27-80	Sand, loamy sand, sandy loam.	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	80-100	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	Plasticity index
	In				Pct	Pct					Pct	
390D:												
Horsehead-------	0-2	Sand-------------	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-15	95-100	85-100	40-70	0-15	0-14	NP
	2-27	Gravelly sand, sand, loamy sand, very gravelly sand.	GP-GM, GP, SP, SP-SM	A-1, A-3, A-2-4	0	0-30	35-100	30-100	10-70	0-15	0-14	NP
	27-36	Very gravelly loamy sand, gravelly loamy sand, extremely gravelly loamy sand.	GP, GM, SM, SP	A-1, A-3, A-2-4	0-7	0-30	30-100	30-75	10-60	0-30	15-25	NP-8
	36-80	Stratified extremely gravelly sand to sand.	GP, SP-SM, GP-GM, SP	A-1, A-2-4, A-3	0-7	0-30	30-100	30-100	10-70	0-15	0-14	NP
Graycalm--------	0-2	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
	2-16	Sand-------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	16-27	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	27-80	Sand, loamy sand, sandy loam.	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
390E:												
Horsehead-------	0-2	Sand-------------	SM, SP, SP-SM	A-2-4, A-1, A-3	0	0-15	95-100	85-100	40-70	0-15	0-14	NP
	2-27	Gravelly sand, sand, loamy sand, very gravelly sand.	GP-GM, GP, SP, SP-SM	A-1, A-2-4, A-3	0	0-30	35-100	30-100	10-70	0-15	0-14	NP
	27-36	Very gravelly loamy sand, gravelly loamy sand, extremely gravelly loamy sand.	GP, GM, SM, SP	A-1, A-3, A-2-4	0-7	0-30	30-100	30-75	10-60	0-30	15-25	NP-8
	36-80	Stratified extremely gravelly sand to sand.	GP-GM, GP, SP, SP-SM	A-1, A-2-4, A-3	0-7	0-30	30-100	30-100	10-70	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	
390E:												
Graycalm--------	0-2	Sand-------------	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
	2-16	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	16-27	Sand-------------	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	27-80	Sand, loamy sand, sandy loam.	SM, SP-SM, SP	A-1, A-2, A-3	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
390F:												
Horsehead-------	0-2	Sand-------------	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-15	95-100	85-100	40-70	0-15	0-14	NP
	2-27	Gravelly sand, sand, loamy sand, very gravelly sand.	GP-GM, GP, SP, SP-SM	A-1, A-3, A-2-4	0	0-30	35-100	30-100	10-70	0-15	0-14	NP
	27-36	Very gravelly loamy sand, gravelly loamy sand, extremely gravelly loamy sand.	GP, GM, SM, SP	A-1, A-3, A-2-4	0-7	0-30	30-100	30-75	10-60	0-30	15-25	NP-8
	36-80	Stratified extremely gravelly sand to sand.	GP-GM, GP, SP, SP-SM	A-1, A-2-4, A-3	0-7	0-30	30-100	30-100	10-70	0-15	0-14	NP
Graycalm--------	0-2	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	80-100	35-55	0-15	0-14	NP
	2-16	Sand-------------	SM, SP, SP-SM	A-1, A-2, A-3	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	16-27	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2	0	0-5	95-100	80-100	30-75	0-30	0-14	NP
	27-80	Sand, loamy sand, sandy loam.	SM, SP-SM, SP	A-1, A-3, A-2	0	0-5	95-100	80-100	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	Plasticity index
	In				Pct	Pct					Pct	
391B:												
Horsehead-------	0-2	Sand-------------	SM, SP, SP-SM	A-1, A-3, A-2-4	0	0-15	95-100	85-100	40-70	0-15	0-14	NP
	2-27	Gravelly sand, sand, loamy sand, very gravelly sand.	GP-GM, GP, SP, SP-SM	A-1, A-3, A-2-4	0	0-30	35-100	30-100	10-70	0-15	0-14	NP
	27-36	Very gravelly loamy sand, gravelly loamy sand, extremely gravelly loamy sand.	GP, GM, SM, SP	A-1, A-2-4, A-3	0-7	0-30	30-100	30-75	10-60	0-30	15-25	NP-8
	36-80	Stratified extremely gravelly sand to sand.	GP-GM, GP, SP, SP-SM	A-1, A-3, A-2-4	0-7	0-30	30-100	30-100	10-70	0-15	0-14	NP
391D:												
Horsehead-------	0-2	Sand-------------	SM, SP, SP-SM	A-1, A-2-4, A-3	0	0-15	95-100	85-100	40-70	0-15	0-14	NP
	2-27	Gravelly sand, sand, loamy sand, very gravelly sand.	GP-GM, GP, SP, SP-SM	A-1, A-3, A-2-4	0	0-30	35-100	30-100	10-70	0-15	0-14	NP
	27-36	Very gravelly loamy sand, gravelly loamy sand, extremely gravelly loamy sand.	GP, GM, SM, SP	A-1, A-3, A-2-4	0-7	0-30	30-100	30-75	10-60	0-30	15-25	NP-8
	36-80	Stratified extremely gravelly sand to sand.	GP-GM, SP, GP, SP-SM	A-1, A-2-4, A-3	0-7	0-30	30-100	30-100	10-70	0-15	0-14	NP
392:												
Caffey----------	0-9	Mucky sand-------	SM	A-2-4, A-3	0	0-2	98-100	98-100	50-70	5-15	0-14	NP
	9-21	Sand, loamy sand, fine sand.	SM, SP-SM	A-3, A-2-4, A-4	0	0-2	98-100	98-100	50-90	5-45	0-14	NP
	21-80	Stratified very fine sandy loam to fine sand.	CL, CL-ML	A-4, A-6	0	0-2	98-100	98-100	65-100	50-90	20-40	4-20

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	
393B:												
Morganlake------	0-4	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
	4-8	Loamy sand-------	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-14	NP
	8-17	Sand, loamy sand	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-14	NP
	17-32	Sand, loamy sand, sandy clay loam, clay loam.	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-25	NP-15
	32-46	Clay loam, sandy clay loam, silty clay loam.	CL	A-6, A-7	0	0-8	95-100	90-100	65-95	55-75	25-45	10-20
	46-66	Sandy loam, loam, sandy clay loam, silty clay loam.	SC-SM, CL, SC	A-6, A-2, A-7	0	0-8	95-100	90-100	65-95	30-95	25-45	10-20
	66-80	Loam, silty clay loam, sandy clay loam, sandy loam.	SC, SC-SM, CL	A-2, A-7, A-6	0	0-8	95-100	90-100	65-95	30-95	25-45	10-20
393C:												
Morganlake------	0-4	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
	4-8	Loamy sand-------	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-14	NP
	8-17	Sand, loamy sand	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-14	NP
	17-32	Sand, loamy sand, sandy clay loam, clay loam.	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-25	NP-15
	32-46	Clay loam, sandy clay loam, silty clay loam.	CL	A-6, A-7	0	0-8	95-100	90-100	65-95	55-75	25-45	10-20
	46-66	Sandy loam, loam, sandy clay loam, silty clay loam.	SC-SM, SC, CL	A-2, A-6, A-7	0	0-8	95-100	90-100	65-95	30-95	25-45	10-20
	66-80	Loam, silty clay loam, sandy clay loam, sandy loam.	SC-SM, CL, SC	A-2, A-6, A-7	0	0-8	95-100	90-100	65-95	30-95	25-45	10-20
394B:												
Ocqueoc---------	0-4	Sand-------------	SM	A-2, A-3	0	0	98-100	92-100	50-80	5-15	0-20	NP-4
	4-7	Sand, loamy sand, loamy fine sand.	SC-SM, SM, SP-SM	A-2, A-4, A-3	0	0	98-100	92-100	50-80	5-50	0-25	NP-7
	7-23	Sand, loamy sand, loamy fine sand.	SC-SM, SP-SM, SM	A-2, A-4, A-3	0	0	98-100	92-100	50-80	5-50	0-25	NP-7
	23-28	Sand, loamy sand, loamy fine sand.	SC-SM, SM, SP-SM	A-2, A-4, A-3	0	0	98-100	92-100	50-80	5-50	0-25	NP-7
	28-80	Stratified fine sand to silt loam.	CL-ML, SC, CL, SC-SM	A-2, A-4, A-6	0	0	100	100	65-95	20-85	20-40	4-20

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	
399D:												
Menominee-------	0-4	Loamy sand-------	SM	A-2-4	0	0-7	95-100	85-100	50-75	15-30	0-14	NP
	4-6	Sand, loamy sand	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0-7	95-100	85-100	30-75	0-15	0-14	NP
	6-13	Sand, loamy sand	SP, SM, SP-SM	A-2-4, A-1-b, A-3	0	0-7	95-100	85-100	30-75	0-15	0-14	NP
	13-24	Sand, loamy sand	SP, SM, SP-SM	A-2-4, A-1-b, A-3	0	0-7	95-100	85-100	30-75	0-15	0-14	NP
	24-40	Sandy clay loam, clay loam, sandy loam.	CL, CL-ML	A-4, A-6	0	0-7	95-100	85-100	50-95	25-80	25-40	5-20
	40-80	Sandy clay loam, clay loam, loam, silty clay loam.	CL, CL-ML, SC-SM, SC	A-2, A-4, A-1, A-6	0	0-7	95-100	85-100	45-95	20-80	25-40	5-20
Bamfield--------	0-9	Fine sandy loam--	SC, SC-SM, SM	A-6, A-2-4, A-4	0	0-5	95-100	85-95	55-85	30-50	0-30	NP-11
	9-10	Fine sandy loam, sandy loam.	SC, SM, SC-SM	A-4, A-2	0	0-5	95-100	85-95	50-85	15-50	0-30	NP-11
	10-14	Loamy sand, sandy loam, fine sandy loam, sandy clay loam, clay loam.	SC-SM, SM, SC	A-2-4, A-4, A-6	0	0-5	95-100	85-95	45-90	15-50	0-35	NP-15
	14-23	Clay loam--------	CL	A-7, A-6	0	0-5	95-100	85-95	75-95	50-80	30-45	10-20
	23-29	Clay loam, loam--	CL	A-7, A-6	0	0-5	95-100	85-95	70-90	50-80	25-45	7-20
	29-61	Loam, clay loam, sandy loam, fine sandy loam, sandy clay loam.	CL	A-7, A-6	0	0-5	95-100	85-95	70-90	50-80	25-45	7-20
	60-80	Stratified sand to gravelly sand.	SM, SP-SM, SP	A-3, A-2-4, A-1-b	0	0-5	95-100	60-95	30-90	0-15	0-10	NP
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	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-1-b, A-3, A-2-4	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam.	SM, SP-SM	A-1, A-4, A-2-4, A-3	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	
400F:												
Menominee-------	0-4	Loamy sand-------	SM	A-2-4	0	0-7	95-100	85-100	50-75	15-30	0-14	NP
	4-6	Sand, loamy sand	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0-7	95-100	85-100	30-75	0-15	0-14	NP
	6-13	Sand, loamy sand	SP, SM, SP-SM	A-2-4, A-1-b, A-3	0	0-7	95-100	85-100	30-75	0-15	0-14	NP
	13-24	Sand, loamy sand	SP, SM, SP-SM	A-2-4, A-1-b, A-3	0	0-7	95-100	85-100	30-75	0-15	0-14	NP
	24-40	Sandy clay loam, clay loam, sandy loam.	CL, CL-ML	A-4, A-6	0	0-7	95-100	85-100	50-95	25-80	25-40	5-20
	40-80	Sandy clay loam, clay loam, loam, silty clay loam.	CL, CL-ML, SC-SM, SC	A-2, A-1, A-4, A-6	0	0-7	95-100	85-100	45-95	20-80	25-40	5-20
Bamfield--------	0-9	Fine sandy loam--	SC, SC-SM, SM	A-6, A-2-4, A-4	0	0-5	95-100	85-95	55-85	30-50	0-30	NP-11
	9-10	Fine sandy loam, sandy loam.	SC, SM, SC-SM	A-4, A-2	0	0-5	95-100	85-95	50-85	15-50	0-30	NP-11
	10-14	Loamy sand, sandy loam, fine sandy loam, sandy clay loam, clay loam.	SC-SM, SC, SM	A-4, A-2-4, A-6	0	0-5	95-100	85-95	45-90	15-50	0-35	NP-15
	14-23	Clay loam--------	CL	A-7, A-6	0	0-5	95-100	85-95	75-95	50-80	30-45	10-20
	23-29	Clay loam, loam--	CL	A-7, A-6	0	0-5	95-100	85-95	70-90	50-80	25-45	7-20
	29-61	Loam, clay loam, sandy loam, fine sandy loam, sandy clay loam.	CL	A-7, A-6	0	0-5	95-100	85-95	70-90	50-80	25-45	7-25
	60-80	Stratified sand to gravelly sand.	SM, SP, SP-SM	A-3, A-1-b, A-2-4	0	0-5	95-100	60-95	30-90	0-15	0-10	NP
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	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-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.	SM, SP-SM	A-2-4, A-3, 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	Plasticity index
	In				Pct	Pct					Pct	
420A:												
Otisco----------	0-5	Mucky sand-------	SM, SP-SM	A-2-4, A-3	0	0	95-100	90-100	50-80	5-35	15-20	NP-4
	5-10	Sand-------------	SC-SM, SP-SM, SM	A-2, A-1-b, A-3	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-3, A-2	0	0	95-100	90-100	45-75	5-30	0-20	NP-5
	25-38	Sand-------------	SC-SM, SP-SM, SM	A-1-b, A-2, A-3	0	0	95-100	90-100	45-75	5-30	0-20	NP-5
	38-45	Sand, loamy sand	CL, SC, SP-SM, SM	A-2, A-6, A-3, A-4	0	0	95-100	90-100	45-90	5-55	0-30	NP-15
	45-60	Loamy sand-------	SC-SM, SM, SP-SM	A-1-b, A-2, A-3	0	0	95-100	90-100	45-75	5-30	0-20	NP-5
	60-80	Sand-------------	SM, SC-SM, SP-SM	A-1-b, A-3, A-2	0	0	95-100	90-100	45-75	5-30	0-20	NP-5
421A:												
Richter---------	0-7	Loamy fine sand--	SM, SP-SM	A-2-4	0	0	98-100	97-100	45-80	10-35	0-20	NP-4
	7-11	Loamy fine sand, fine sandy loam.	SC-SM, SM	A-2, A-4, A-6	0	0	98-100	97-100	50-95	30-50	10-30	NP-16
	11-19	Loamy fine sand, fine sandy loam.	SC-SM, SM	A-4, A-2, A-6	0	0	98-100	97-100	50-95	30-50	10-30	NP-16
	19-25	Loamy fine sand, fine sandy loam, loam.	SC-SM, SM	A-4, A-6	0	0	98-100	97-100	50-95	30-50	10-30	NP-16
	25-29	Fine sandy loam, loamy fine sand, loam.	SC-SM, SM	A-2, A-4, A-6	0	0	98-100	97-100	50-95	30-50	10-30	NP-16
	29-80	Stratified very fine sand to silt loam.	CL-ML, SM	A-4	0	0	98-100	97-100	75-95	35-90	15-40	NP-10
Caffey----------	0-9	Mucky sand-------	SM, SP-SM	A-2-4, A-3	0	0-2	98-100	98-100	50-70	0-15	0-14	NP
	9-21	Sand, loamy sand, fine sand.	SM, SP-SM	A-2-4, A-4, A-3	0	0-2	98-100	98-100	50-90	5-45	0-14	NP
	21-80	Stratified very fine sandy loam to fine sand.	CL, CL-ML	A-4, A-6	0	0-2	98-100	98-100	65-100	50-90	20-40	4-20

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	
422B:												
Morganlake------	0-4	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
	4-8	Loamy sand, sand	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-14	NP
	8-17	Sand, loamy sand	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-14	NP
	17-32	Sand, loamy sand, sandy clay loam, clay loam.	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-25	NP-15
	32-46	Clay loam, sandy clay loam, silty clay loam.	CL	A-6, A-7	0	0-8	95-100	90-100	65-95	55-75	25-45	10-20
	46-66	Sandy loam, loam, sandy clay loam, silty clay loam.	SC-SM, CL, SC	A-2, A-7, A-6	0	0-8	95-100	90-100	65-95	30-95	25-45	10-20
	66-80	Loam, silty clay loam, sandy clay loam, sandy loam.	SC-SM, CL, SC	A-6, A-2, A-7	0	0-8	95-100	90-100	65-95	30-95	25-45	10-20
Iosco-----------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	90-100	80-100	35-80	5-35	0-14	NP
	3-12	Sand-------------	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-3	0	0	90-100	80-100	35-85	5-35	0-25	NP-7
	12-15	Sand-------------	SM, SC-SM, SP-SM	A-1-b, A-3, A-2-4	0	0	90-100	80-100	35-85	5-35	0-25	NP-7
	15-18	Sand-------------	SC-SM, SM, SP-SM	A-1-b, A-2-4, A-3	0	0	90-100	80-100	35-85	5-35	0-25	NP-7
	18-30	Sandy clay loam, loamy sand.	SM, SC-SM, SP-SM	A-1-b, A-3, A-2-4	0	0	90-100	80-100	35-85	5-35	0-25	NP-7
	30-42	Sandy clay loam, loam, clay loam, silty clay loam.	CL-ML, SC, CL, SC-SM	A-2, A-7, A-4, A-6	0	0	90-100	80-100	65-95	30-90	25-45	5-25
	42-80	Loam, sandy loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	0	90-100	80-100	70-95	50-90	25-45	5-25
Deford----------	0-6	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
	6-80	Sand-------------	SM, SP, SP-SM	A-2-4, A-3	0	0-5	95-100	90-100	50-80	0-35	15-20	NP-4

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	Percentage passing sieve number--: 10	Percentage passing sieve number--: 40	Percentage passing sieve number--: 200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
423B:												
Richter	0-7	Loamy fine sand	SM, SP-SM	A-2-4	0	0	98-100	97-100	45-80	10-35	0-20	NP-4
	7-11	Loamy fine sand, fine sandy loam.	SC-SM, SM	A-2, A-6, A-4	0	0	98-100	97-100	50-95	30-50	10-30	NP-16
	11-19	Loamy fine sand, fine sandy loam.	SC-SM, SM	A-4, A-2, A-6	0	0	98-100	97-100	50-95	30-50	10-30	NP-16
	19-25	Loamy fine sand, fine sandy loam, loam.	SC-SM, SM	A-2, A-4, A-6	0	0	98-100	97-100	50-95	30-50	10-30	NP-16
	25-29	Fine sandy loam, loamy fine sand, loam.	SC-SM, SM	A-2, A-6, A-4	0	0	98-100	97-100	50-95	30-50	10-30	NP-16
	29-80	Stratified very fine sand to silt loam.	CL-ML, SM	A-4	0	0	98-100	97-100	75-95	35-90	15-40	NP-10
Algonquin	0-5	Silt loam	CL	A-4, A-6	0	0	98-100	98-100	80-100	70-90	25-40	7-15
	5-10	Fine sandy loam	CL, CL-ML, SC-SM, SC	A-4, A-6	0	0	98-100	98-100	65-85	40-60	20-30	4-11
	10-17	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	17-24	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
	24-80	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	98-100	98-100	85-100	80-95	40-65	20-40
424B:												
Morganlake	0-4	Muck	PT	A-8	0	0	---	---	---	---	---	---
	4-8	Loamy sand, sand	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-14	NP
	8-17	Sand, loamy sand	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-14	NP
	17-32	Sand, loamy sand, sandy clay loam, clay loam.	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-25	NP-15
	32-46	Clay loam, sandy clay loam, silty clay loam.	CL	A-6, A-7	0	0-8	95-100	90-100	65-95	55-75	25-45	10-20
	46-66	Sandy loam, loam, sandy clay loam, silty clay loam.	SC-SM, CL, SC	A-2, A-7, A-6	0	0-8	95-100	90-100	65-95	30-95	25-45	10-20
	66-80	Loam, silty clay loam, sandy clay loam, sandy loam.	SC, SC-SM, CL	A-6, A-2, A-7	0	0-8	95-100	90-100	65-95	30-95	25-45	10-20

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	
424B:												
Ossineke--------	0-8	Fine sandy loam--	SC, SC-SM, SM	A-6, A-4, A-2-4	0	0-6	90-100	85-95	55-85	30-50	0-30	NP-11
	8-13	Fine sandy loam, sandy loam.	SC-SM, SC, SM	A-6, A-2-4, A-4	0	0-6	90-100	85-95	55-85	30-50	0-30	NP-11
	13-21	Sandy clay loam, clay loam, sandy loam.	SC, CL	A-7-6, A-4, A-6	0	0-6	90-100	85-95	65-95	35-80	20-45	9-28
	21-38	Sandy clay loam, clay loam.	SC, CL	A-4, A-7-6, A-6	0	0-6	90-100	85-95	65-95	35-80	20-45	9-28
	38-51	Sandy loam, loam, clay loam.	CL	A-7-6, A-6	0	0-6	90-100	85-95	70-95	50-80	25-45	10-20
	51-77	Sandy loam, loam, clay loam.	CL	A-7-6, A-6	0	0-6	90-100	85-95	70-95	50-80	25-45	10-20
	77-80	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM, SP	A-2-4, A-3, A-1-b	0	0-6	65-100	60-95	30-95	0-15	---	---
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	95-100	40-70	5-15	0-14	NP
	3-6	Sand-------------	SM, SP-SM	A-1-b, A-3, A-2-4	0	0	95-100	95-100	40-75	5-30	0-14	NP
	6-25	Sand-------------	SM, SP-SM	A-2-4, A-1-b, A-3	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam.	SM, SP-SM	A-2-4, A-1, A-3, A-4	0	0	95-100	95-100	40-75	5-40	0-14	NP
424C:												
Morganlake------	0-4	Muck-------------	PT	A-8	0	0	---	---	---	---	---	---
	4-8	Loamy sand, sand	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-14	NP
	8-17	Sand, loamy sand	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-14	NP
	17-32	Sand, loamy sand, sandy clay loam, clay loam.	SM, SP-SM	A-3	0	0-8	95-100	90-100	50-75	5-30	0-25	NP-15
	32-46	Clay loam, sandy clay loam, silty clay loam.	CL	A-6, A-7	0	0-8	95-100	90-100	65-95	55-75	25-45	10-20
	46-66	Sandy loam, loam, sandy clay loam, silty clay loam.	SC, SC-SM, CL	A-2, A-7, A-6	0	0-8	95-100	90-100	65-95	30-95	25-45	10-20
	66-80	Loam, silty clay loam, sandy clay loam, sandy loam.	SC-SM, SC, CL	A-2, A-6, A-7	0	0-8	95-100	90-100	65-95	30-95	25-45	10-20

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	
424C:												
Ossineke--------	0-8	Fine sandy loam--	SC, SC-SM, SM	A-6, A-2-4, A-4	0	0-6	90-100	85-95	55-85	30-50	0-30	NP-11
	8-13	Fine sandy loam, sandy loam.	SC, SM, SC-SM	A-6, A-4, A-2-4	0	0-6	90-100	85-95	55-85	30-50	0-30	NP-11
	13-21	Sandy clay loam, clay loam, sandy loam.	SC, CL	A-4, A-7-6, A-6	0	0-6	90-100	85-95	65-95	35-80	20-45	9-28
	21-38	Sandy clay loam, clay loam.	SC, CL	A-4, A-7-6, A-6	0	0-6	90-100	85-95	65-95	35-80	20-45	9-28
	38-51	Sandy loam, loam, clay loam.	CL	A-7-6, A-6	0	0-6	90-100	85-95	70-95	50-80	25-45	10-20
	51-77	Sandy loam, loam, clay loam.	CL	A-7-6, A-6	0	0-6	90-100	85-95	70-95	50-80	25-45	10-20
	77-80	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SM, SP-SM, SP	A-3, A-2-4, A-1-b	0	0-3	65-100	60-100	30-100	0-15	---	---
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-2-4, A-1-b, A-3	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-1-b, A-3, A-2-4	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam.	SM, SP-SM	A-2-4, A-1, A-3, A-4	0	0	95-100	95-100	40-75	5-40	0-14	NP
450B:												
Millersburg-----	0-2	Loamy sand-------	SC-SM, SM	A-2-4, A-1-b	0	0-8	95-100	80-100	40-75	15-25	0-20	NP-5
	2-5	Sand, loamy sand	SC-SM, SM, SP-SM	A-1-b, A-2-4, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	5-10	Sand, loamy sand	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	10-18	Sand, loamy sand, sandy loam.	SC-SM, SP-SM, SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	18-26	Sand, loamy sand, sandy loam.	SC-SM, SM, SP-SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	26-34	Sandy loam, loam	ML, CL, SC, SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	34-43	Sandy loam-------	ML, SC, CL, SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	43-80	Loamy sand, sandy loam.	SM, SP-SM	A-1-b, A-2-4	0	0-8	85-100	80-100	40-65	10-35	0-30	NP-5

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	Percentage passing sieve number--: 10	Percentage passing sieve number--: 40	Percentage passing sieve number--: 200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
450B:												
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	95-100	40-70	5-15	0-14	NP
	3-6	Sand-------------	SM, SP-SM	A-1-b, A-3, A-2-4	0	0	95-100	95-100	40-75	5-30	0-14	NP
	6-25	Sand-------------	SM, SP-SM	A-1-b, A-3, A-2-4	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam.	SM, SP-SM	A-2-4, A-1, A-3, A-4	0	0	95-100	95-100	40-75	5-40	0-14	NP
450D:												
Millersburg-----	0-2	Loamy sand-------	SC-SM, SM	A-1-b, A-2-4	0	0-8	95-100	80-100	40-75	15-25	0-20	NP-5
	2-5	Sand, loamy sand	SM, SC-SM, SP-SM	A-1-b, A-3, A-2-4	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	5-10	Sand, loamy sand	SC-SM, SM, SP-SM	A-1-b, A-2-4, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	10-18	Sand, loamy sand, sandy loam.	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	18-26	Sand, loamy sand, sandy loam.	SC-SM, SP-SM, SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	26-34	Sandy loam, loam	ML, CL, SC, SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	34-43	Sandy loam-------	CL, ML, SM, SC	A-2-4, A-1-b, A-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	43-80	Loamy sand, sandy loam.	SM, SP-SM	A-1-b, A-2-4	0	0-8	85-100	80-100	40-65	10-35	0-30	NP-5
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-3, A-2-4	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-1-b, A-3, A-2-4	0	0	95-100	95-100	40-75	5-30	0-14	NP
	25-80	Sand, loamy sand, sandy loam.	SM, SP-SM	A-1, A-4, A-2-4, A-3	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	Plasticity index
	In				Pct	Pct					Pct	
450E:												
Millersburg-----	0-2	Loamy sand-------	SC-SM, SM	A-1-b, A-2-4	0	0-8	95-100	80-100	40-75	15-25	0-20	NP-5
	2-5	Sand, loamy sand	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-3	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	5-10	Sand, loamy sand	SC-SM, SM, SP-SM	A-1-b, A-3, A-2-4	0	0-8	95-100	80-100	35-70	5-20	0-20	NP-5
	10-18	Sand, loamy sand, sandy loam.	SC-SM, SM, SP-SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	18-26	Sand, loamy sand, sandy loam.	SC-SM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-8	95-100	80-100	35-65	5-40	0-20	NP-5
	26-34	Sandy loam, loam	CL, ML, SM, SC	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	34-43	Sandy loam-------	ML, CL, SC, SM	A-1-b, A-4, A-2-4	0	0-8	95-100	80-100	45-90	20-60	0-30	NP-10
	43-80	Loamy sand, sandy loam.	SM, SP-SM	A-1-b, A-2-4	0	0-8	85-100	80-100	40-65	10-35	0-30	NP-5
Blue Lake-------	0-3	Sand-------------	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	95-100	40-70	5-15	0-14	NP
	3-6	Sand-------------	SM, SP-SM	A-1-b, A-3, A-2-4	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.	SM, SP-SM	A-2-4, A-1, A-3, A-4	0	0	95-100	95-100	40-75	5-40	0-14	NP
451B:												
Annalake--------	0-9	Loamy fine sand--	ML, SC-SM, CL-ML, SM	A-2-4, A-4	0	0	95-100	92-100	50-95	25-60	0-26	NP-8
	9-11	Fine sand--------	SM	A-2-4	0	0	95-100	92-100	50-90	15-35	0-14	NP
	11-16	Loamy fine sand--	SM	A-2-4	0	0	95-100	92-100	50-95	15-35	0-14	NP
	16-30	Sandy loam, loam, loamy sand.	SM, SC, CL, ML	A-2, A-4	0	0	95-100	92-100	60-90	20-70	15-30	NP-8
	30-37	Sandy loam, very fine sandy loam, loam.	CL, ML, SM, SC	A-2-4, A-4	0	0	95-100	92-100	50-95	25-80	18-28	3-9
	37-57	Sandy loam-------	CL-ML, SM, ML, SC-SM	A-2-4, A-4	0	0	95-100	92-100	50-95	25-80	0-26	NP-8
	57-80	Stratified fine sand to silt loam.	ML, SC-SM, CL-ML, SM	A-2-4, A-4	0	0	95-100	92-100	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	
451C:												
Annalake--------	0-9	Loamy fine sand--	ML, CL-ML, SC-SM, SM	A-2-4, A-4	0	0	95-100	92-100	50-95	25-60	0-26	NP-8
	9-11	Fine sand--------	SM	A-2-4	0	0	95-100	92-100	50-90	15-35	0-14	NP
	11-16	Loamy fine sand--	SM	A-2-4	0	0	95-100	92-100	50-95	15-35	0-14	NP
	16-30	Sandy loam, loam, loamy sand.	SC, SM, ML, CL	A-2, A-4	0	0	95-100	92-100	60-90	20-70	15-30	NP-8
	30-37	Sandy loam, very fine sandy loam, loam.	CL, ML, SM, SC	A-2-4, A-4	0	0	95-100	92-100	50-95	25-80	18-28	3-9
	37-57	Sandy loam-------	ML, CL-ML, SC-SM, SM	A-2-4, A-4	0	0	95-100	92-100	50-95	25-80	0-26	NP-8
	57-80	Stratified fine sand to silt loam.	ML, CL-ML, SC-SM, SM	A-2-4, A-4	0	0	95-100	92-100	50-95	25-80	0-26	NP-8
452D:												
Bamfield--------	0-9	Fine sandy loam--	SC, SC-SM, SM	A-2-4, A-6, A-4	0	0-5	95-100	85-95	55-85	30-50	0-30	NP-11
	9-10	Fine sandy loam, sandy loam.	SC, SC-SM, SM	A-4, A-2	0	0-5	95-100	85-95	50-85	15-50	0-30	NP-11
	10-14	Loamy sand, sandy loam, fine sandy loam, sandy clay loam, clay loam.	SC-SM, SC, SM	A-2-4, A-4, A-6	0	0-5	95-100	85-95	45-90	15-50	0-35	NP-15
	14-23	Clay loam--------	CL	A-7, A-6	0	0-5	95-100	85-95	75-95	50-80	30-45	10-20
	23-29	Clay loam, loam--	CL	A-7, A-6	0	0-5	95-100	85-95	70-90	50-80	25-45	7-20
	29-61	Loam, clay loam, sandy loam, fine sandy loam, sandy clay loam.	CL	A-7, A-6	0	0-5	95-100	85-95	70-90	50-80	25-45	7-20
	60-80	Stratified sand to gravelly sand.	SM, SP, SP-SM	A-3, A-1-b, A-2-4	0	0-5	95-100	60-95	30-90	0-15	0-10	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	
452E:												
Bamfield--------	0-9	Fine sandy loam--	SC, SC-SM, SM	A-6, A-2-4, A-4	0	0-5	95-100	85-95	55-85	30-50	0-30	NP-11
	9-10	Fine sandy loam, sandy loam.	SC-SM, SC, SM	A-4, A-2	0	0-5	95-100	85-95	50-85	15-50	0-30	NP-11
	10-14	Loamy sand, sandy loam, fine sandy loam, sandy clay loam, clay loam.	SC-SM, SC, SM	A-4, A-2-4, A-6	0	0-5	95-100	85-95	45-90	15-50	0-35	NP-15
	14-23	Clay loam--------	CL	A-7, A-6	0	0-5	95-100	85-95	75-95	50-80	30-45	10-20
	23-29	Clay loam, loam--	CL	A-7, A-6	0	0-5	95-100	85-95	70-90	50-80	25-45	7-20
	29-61	Loam, clay loam, sandy loam, fine sandy loam, sandy clay loam.	CL	A-7, A-6	0	0-5	95-100	85-95	70-90	50-80	25-45	7-20
	60-80	Stratified sand to gravelly sand.	SM, SP, SP-SM	A-3, A-1-b, A-2-4	0	0-5	95-100	60-95	30-90	0-15	0-10	NP
453B:												
Ossineke--------	0-8	Fine sandy loam--	SC, SC-SM, SM	A-6, A-4, A-2-4	0	0-6	90-100	85-95	55-85	30-50	0-30	NP-11
	8-13	Fine sandy loam, sandy loam.	SC, SM, SC-SM	A-6, A-2-4, A-4	0	0-6	90-100	85-95	55-85	30-50	0-30	NP-11
	13-21	Sandy clay loam, clay loam, sandy loam.	SC, CL	A-7-6, A-4, A-6	0	0-6	90-100	85-95	65-95	35-80	20-45	9-28
	21-38	Sandy clay loam, clay loam.	SC, CL	A-4, A-7-6, A-6	0	0-6	90-100	85-95	65-95	35-80	20-45	9-28
	38-51	Sandy loam, loam, clay loam.	CL	A-7-6, A-6	0	0-6	90-100	85-95	70-95	50-80	25-45	10-20
	51-77	Sandy loam, loam, clay loam.	CL	A-7-6, A-6	0	0-6	90-100	85-95	70-95	50-80	25-45	10-20
	77-80	Sand, loamy sand, gravelly loamy sand, gravelly sand.	SP-SM, SM, SP	A-2-4, A-3, A-1-b	0	0-6	65-100	60-100	30-100	0-15	---	---

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	Organic matter	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	Pct					
13:												
Tawas-----------	0-10	---	0.30-0.55	0.20-5.95	0.35-0.45	---	40-60	---	---	2	2	134
	10-22	---	0.30-0.55	0.20-5.95	0.24-0.45	---	40-60	---	---			
	22-80	0-10	1.40-1.65	5.95-19.98	0.03-0.10	0.0-2.9	---	.15	.15			
Lupton----------	0-8	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	70-90	---	---	3	2	134
	8-80	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	70-90	---	---			
14:												
Dawson----------	0-4	0-0	0.15-0.30	5.95-19.98	0.55-0.65	---	65-85	---	---	2	7	38
	4-8	0-0	0.15-0.40	0.20-5.95	0.35-0.45	---	65-85	---	---			
	8-28	0-0	0.15-0.40	0.20-5.95	0.35-0.45	---	65-85	---	---			
	28-80	0-10	1.55-1.75	5.95-19.98	0.03-0.10	0.0-2.9	0.0-0.5	.10	.15			
Loxley----------	0-5	0-0	0.30-0.40	5.95-19.98	0.35-0.65	---	70-90	---	---	3	7	38
	5-80	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	70-90	---	---			
16B:												
Graycalm--------	0-2	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	2-16	0-15	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	16-27	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	0.0-0.5	.10	.15			
	27-80	0-10	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
17B:												
Croswell--------	0-2	0-0	0.30-0.40	5.95-19.98	0.35-0.65	---	70-90	---	---	5	1	220
	2-5	0-10	1.30-1.55	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.10	.15			
	5-11	0-10	1.40-1.60	5.95-19.98	0.06-0.10	0.0-2.9	0.6-1.0	.10	.15			
	11-17	0-10	1.40-1.60	5.95-19.98	0.06-0.09	0.0-2.9	0.0-0.5	.10	.15			
	17-33	0-10	1.50-1.65	5.95-19.98	0.05-0.07	0.0-2.9	0.0-0.5	.10	.15			
	33-80	0-10	1.50-1.65	5.95-19.98	0.05-0.07	0.0-2.9	0.0-0.5	.10	.15			
18A:												
Au Gres---------	0-2	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	70-90	---	---	5	1	220
	2-8	0-8	1.30-1.55	5.95-19.98	0.07-0.10	0.0-2.9	0.5-2.0	.10	.15			
	8-18	0-8	1.50-1.70	5.95-19.98	0.06-0.09	0.0-2.9	2.0-5.0	.10	.15			
	18-35	0-8	1.50-1.70	5.95-19.98	0.05-0.07	0.0-2.9	0.5-3.0	.10	.15			
	35-80	0-8	1.50-1.70	5.95-19.98	0.05-0.07	0.0-2.9	0.0-0.5	.10	.15			
24A:												
Kinross---------	0-4	---	0.30-0.40	5.95-19.98	0.35-0.65	---	70-90	---	---	5	2	134
	4-11	0-10	1.40-1.70	5.95-19.98	0.04-0.09	0.0-2.9	1.0-4.0	.15	.15			
	11-13	0-10	1.40-1.70	5.95-19.98	0.04-0.09	0.0-2.9	1.0-4.0	.15	.15			
	13-21	0-10	1.40-1.70	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.15	.15			
	21-30	0-10	1.40-1.70	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.15	.15			
	30-80	0-10	1.40-1.70	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.15	.15			
Au Gres---------	0-2	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	70-90	---	---	5	1	220
	2-8	0-8	1.30-1.55	5.95-19.98	0.07-0.10	0.0-2.9	0.5-2.0	.10	.15			
	8-18	0-8	1.50-1.70	5.95-19.98	0.06-0.09	0.0-2.9	2.0-5.0	.10	.15			
	18-35	0-8	1.50-1.70	5.95-19.98	0.05-0.07	0.0-2.9	0.5-3.0	.10	.15			
	35-80	0-8	1.50-1.70	5.95-19.98	0.05-0.07	0.0-2.9	0.0-0.5	.10	.15			
32B:												
Kellogg---------	0-3	0-10	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	2.0-4.0	.15	.15	5	1	220
	3-10	2-12	1.35-1.60	5.95-19.98	0.06-0.10	0.0-2.9	0.6-1.0	.15	.15			
	10-30	2-12	1.35-1.60	5.95-19.98	0.06-0.10	0.0-2.9	0.5-3.0	.15	.15			
	30-39	2-12	1.35-1.60	5.95-19.98	0.06-0.10	0.0-2.9	0.5-3.0	.15	.15			
	39-46	35-60	1.60-1.70	0.06-0.20	0.08-0.15	6.0-8.9	0.0-0.5	.32	.32			
	46-80	35-60	1.60-1.70	0.06-0.20	0.08-0.15	6.0-8.9	0.0-0.5	.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	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	in/hr	In/in	Pct	Pct					
32C:												
Kellogg---------	0-3	0-10	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	2.0-4.0	.15	.15	5	1	220
	3-10	2-12	1.35-1.60	5.95-19.98	0.06-0.10	0.0-2.9	0.6-1.0	.15	.15			
	10-30	2-12	1.35-1.60	5.95-19.98	0.06-0.10	0.0-2.9	0.5-3.0	.15	.15			
	30-39	2-12	1.35-1.60	5.95-19.98	0.06-0.10	0.0-2.9	0.5-3.0	.15	.15			
	39-46	35-60	1.60-1.70	0.06-0.20	0.08-0.15	6.0-8.9	0.0-0.5	.32	.32			
	46-80	35-60	1.60-1.70	0.06-0.20	0.08-0.15	6.0-8.9	0.0-0.5	.32	.32			
37B:												
Richter---------	0-7	0-10	1.20-1.50	1.98-5.95	0.10-0.12	0.0-2.9	2.0-10	.17	.17	5	2	134
	7-11	10-22	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	0.0-0.5	.20	.20			
	11-19	10-22	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	0.5-3.0	.20	.20			
	19-25	10-22	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	0.0-0.5	.20	.20			
	25-29	10-22	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	0.0-0.5	.20	.20			
	29-80	2-25	1.60-1.70	0.57-1.98	0.05-0.25	0.0-2.9	0.0-0.5	.20	.20			
41B:												
McGinn----------	0-1	0-0	0.15-0.30	5.95-19.98	0.55-0.65	---	65-85	---	---	5	2	134
	1-2	5-15	1.25-1.40	1.98-5.95	0.11-0.14	0.0-2.9	0.5-2.0	.17	.17			
	2-4	5-15	1.30-1.65	1.98-5.95	0.10-0.12	0.0-2.9	0.0-0.5	.17	.17			
	4-16	5-15	1.30-1.65	1.98-5.95	0.09-0.11	0.0-2.9	0.0-0.5	.17	.17			
	16-21	5-15	1.30-1.65	1.98-5.95	0.10-0.13	0.0-2.9	0.0-0.5	.17	.17			
	21-25	5-15	1.30-1.65	1.98-5.95	0.10-0.13	0.0-2.9	0.0-0.5	.17	.17			
	25-35	15-20	1.50-1.75	0.57-1.98	0.12-0.14	0.0-2.9	0.0-0.5	.28	.28			
	35-80	5-15	1.65-1.80	0.57-1.98	0.11-0.13	0.0-2.9	0.0-0.5	.28	.28			
41C:												
McGinn----------	0-1	0-0	0.15-0.30	5.95-19.98	0.55-0.65	---	65-85	---	---	5	2	134
	1-2	5-15	1.25-1.40	1.98-5.95	0.11-0.14	0.0-2.9	0.5-2.0	.17	.17			
	2-4	5-15	1.30-1.65	1.98-5.95	0.10-0.12	0.0-2.9	0.0-0.5	.17	.17			
	4-16	5-15	1.30-1.65	1.98-5.95	0.09-0.11	0.0-2.9	0.0-0.5	.17	.17			
	16-21	5-15	1.30-1.65	1.98-5.95	0.10-0.13	0.0-2.9	0.0-0.5	.17	.17			
	21-25	5-15	1.30-1.65	1.98-5.95	0.10-0.13	0.0-2.9	0.0-0.5	.17	.17			
	25-35	15-20	1.50-1.75	0.57-1.98	0.12-0.14	0.0-2.9	0.0-0.5	.28	.28			
	35-80	5-15	1.65-1.80	0.57-1.98	0.11-0.13	0.0-2.9	0.0-0.5	.28	.28			
44B:												
Ossineke--------	0-10	5-20	1.30-1.60	0.57-1.98	0.14-0.18	0.0-2.9	1.0-3.0	.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	0.0-0.5	.17	.24			
	15-22	10-27	1.60-1.80	0.57-1.98	0.14-0.19	0.0-2.9	0.0-0.5	.24	.24			
	22-35	10-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	0.0-0.5	.37	.37			
	35-41	20-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	0.0-0.5	.28	.37			
	41-80	11-27	1.80-2.00	0.06-0.20	0.03-0.04	3.0-5.9	0.0-0.5	.28	.37			
44C:												
Ossineke--------	0-10	5-20	1.30-1.60	0.57-1.98	0.14-0.18	0.0-2.9	1.0-3.0	.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	0.0-0.5	.17	.24			
	15-22	10-27	1.60-1.80	0.57-1.98	0.14-0.19	0.0-2.9	0.0-0.5	.24	.24			
	22-35	10-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	0.0-0.5	.37	.37			
	35-41	20-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	0.0-0.5	.28	.37			
	41-80	11-27	1.80-2.00	0.06-0.20	0.03-0.04	3.0-5.9	0.0-0.5	.28	.37			
47D:												
Graycalm--------	0-2	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	2-16	0-15	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	16-27	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	0.0-0.5	.10	.15			
	27-80	0-10	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
47F:												
Graycalm--------	0-2	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	2-16	0-15	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	16-27	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	0.0-0.5	.10	.15			
	27-80	0-10	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.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	Organic matter	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	Pct					
53B:												
Negwegon--------	0-5	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	1.0-3.0	.37	.37	5	5	56
	5-8	18-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	8-13	18-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	13-34	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	34-80	18-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
53C:												
Negwegon--------	0-5	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	1.0-3.0	.37	.37	5	5	56
	5-8	18-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	8-13	18-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	13-34	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	34-80	18-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
54A:												
Algonquin-------	0-5	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	2.0-3.0	.37	.37	5	6	48
	5-10	12-18	1.20-1.55	0.57-1.98	0.15-0.17	0.0-2.9	0.0-0.5	.24	.24			
	10-17	35-60	1.40-1.60	0.06-0.20	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	17-24	35-60	1.40-1.60	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	24-80	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
59B:												
Algonquin-------	0-5	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	2.0-3.0	.37	.37	5	6	48
	5-10	12-18	1.20-1.55	0.57-1.98	0.15-0.17	0.0-2.9	0.0-0.5	.24	.24			
	10-17	35-60	1.40-1.60	0.06-0.20	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	17-24	35-60	1.40-1.60	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	24-80	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
Springport------	0-3	18-35	1.10-1.35	0.20-0.57	0.17-0.19	6.0-8.9	2.0-5.0	.32	.32	5	4	86
	3-9	18-60	1.40-1.65	0.06-0.20	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	9-13	35-60	1.40-1.65	0.06-0.20	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	13-35	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	35-80	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
62A:												
Allendale-------	0-10	0-12	1.25-1.40	5.95-19.98	0.09-0.12	0.0-2.9	2.0-4.0	.17	.17	4	2	134
	10-18	0-15	1.35-1.45	5.95-19.98	0.06-0.10	0.0-2.9	0.5-1.0	.17	.17			
	18-25	0-15	1.35-1.45	5.95-19.98	0.06-0.10	0.0-2.9	0.5-1.0	.17	.17			
	25-45	40-60	1.45-1.70	0.00-0.06	0.08-0.12	6.0-8.9	0.0-0.5	.32	.32			
	45-80	40-60	1.45-1.70	0.00-0.06	0.08-0.12	6.0-8.9	0.0-0.5	.32	.32			
72:												
Dorval----------	0-18	0-0	0.13-0.42	0.57-5.95	0.20-0.25	---	50-95	---	---	2	2	134
	18-80	35-60	1.40-1.65	0.00-0.06	0.10-0.20	6.0-8.9	0.0-8.0	.28	.28			
75B:												
Rubicon---------	0-4	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	4-9	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	9-22	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	22-47	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	47-80	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
75D:												
Rubicon---------	0-4	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	4-9	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	9-22	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	22-47	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	47-80	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.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	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	in/hr	In/in	Pct	Pct					
75E:												
Rubicon---------	0-4	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	4-9	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	9-22	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	22-47	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	47-80	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
75F:												
Rubicon---------	0-4	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	4-9	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	9-22	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	22-47	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	47-80	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
78:												
Pits, borrow.												
81B:												
Grayling--------	0-5	0-10	1.30-1.65	5.95-19.98	0.07-0.09	0.0-2.9	1.0-6.0	.15	.15	5	1	220
	5-17	0-10	1.30-1.65	5.95-19.98	0.06-0.08	0.0-2.9	0.3-0.5	.15	.15			
	17-80	0-10	1.45-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.15	.15			
81D:												
Grayling--------	0-5	0-10	1.30-1.65	5.95-19.98	0.07-0.09	0.0-2.9	1.0-6.0	.15	.15	5	1	220
	5-17	0-10	1.30-1.65	5.95-19.98	0.06-0.08	0.0-2.9	0.3-0.5	.15	.15			
	17-80	0-10	1.45-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.15	.15			
81E:												
Grayling--------	0-5	0-10	1.30-1.65	5.95-19.98	0.07-0.09	0.0-2.9	1.0-6.0	.15	.15	5	1	220
	5-17	0-10	1.30-1.65	5.95-19.98	0.06-0.08	0.0-2.9	0.3-0.5	.15	.15			
	17-80	0-10	1.45-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.15	.15			
82B:												
Udorthents------	---	---	---	---	---	---	---	---	---	5	3	86
83B:												
Udipsamments----	---	---	---	---	---	---	---	---	---	5	1	220
86:												
Histosols-------	0-51	---	---	0.20-5.95	---	---	50-70	---	---	3	2	134
	51-80	---	---	---	---	---	---	---	---			
Aquents.												
87:												
Ausable---------	0-10	0-0	0.20-0.30	0.57-5.95	0.35-0.45	---	70-90	---	---	3	2	134
	10-80	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	5.0-10	.10	.15			
90B:												
Chinwhisker-----	0-2	0-5	1.30-1.55	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	2-7	0-10	1.30-1.55	5.95-19.98	0.06-0.08	0.0-2.9	0.6-1.0	.10	.15			
	7-18	0-10	1.30-1.55	5.95-19.98	0.06-0.08	0.0-2.9	0.0-0.5	.10	.15			
	18-27	0-5	1.30-1.55	5.95-19.98	0.05-0.07	0.0-2.9	0.0-0.5	.10	.15			
	27-80	3-10	1.50-1.65	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
94F:												
Klacking--------	0-4	2-12	1.35-1.65	5.95-19.98	0.08-0.11	0.0-2.9	1.0-2.0	.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	0.0-0.5	.10	.15			
	12-25	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	25-33	0-15	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	33-64	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.15	.17			
	64-80	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.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	Organic matter	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	Pct					
94F:												
McGinn----------	0-1	0-0	0.15-0.30	5.95-19.98	0.55-0.65	---	65-85	---	---	5	2	134
	1-2	5-15	1.25-1.40	1.98-5.95	0.11-0.14	0.0-2.9	0.5-2.0	.17	.17			
	2-4	5-15	1.30-1.65	1.98-5.95	0.10-0.12	0.0-2.9	0.0-0.5	.17	.17			
	4-16	5-15	1.30-1.65	1.98-5.95	0.09-0.11	0.0-2.9	0.0-0.5	.17	.17			
	16-21	5-15	1.30-1.65	1.98-5.95	0.10-0.13	0.0-2.9	0.0-0.5	.17	.17			
	21-25	5-15	1.30-1.65	1.98-5.95	0.10-0.13	0.0-2.9	0.0-0.5	.17	.17			
	25-35	15-20	1.50-1.75	0.57-1.98	0.12-0.14	0.0-2.9	0.0-0.5	.28	.28			
	35-80	5-15	1.65-1.80	0.57-1.98	0.11-0.13	0.0-2.9	0.0-0.5	.28	.28			
95D:												
Menominee-------	0-4	2-15	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	0.5-3.0	.17	.17	5	2	134
	4-6	5-15	1.45-1.70	5.95-19.98	0.04-0.10	0.0-2.9	0.0-0.5	.15	.17			
	6-13	5-15	1.45-1.70	5.95-19.98	0.04-0.10	0.0-2.9	0.5-3.0	.15	.17			
	13-24	5-15	1.45-1.70	5.95-19.98	0.04-0.10	0.0-2.9	0.0-0.5	.15	.17			
	24-40	18-35	1.45-1.70	0.57-1.98	0.14-0.18	3.0-5.9	0.0-0.5	.32	.32			
	40-80	12-35	1.45-1.75	0.20-0.57	0.13-0.18	3.0-5.9	0.0-0.5	.32	.37			
97:												
Colonville------	0-19	10-15	1.35-1.45	1.98-5.95	0.20-0.22	0.0-2.9	2.0-4.0	.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	0.0-1.0	.15	.15			
	35-80	0-18	1.40-1.65	1.98-5.95	0.02-0.12	0.0-2.9	0.0-1.0	.15	.15			
116B:												
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.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	0.0-0.5	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	20-29	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	0.0-0.5	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	0.0-0.5	.10	.15			
116C:												
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.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	0.0-0.5	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	20-29	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	0.0-0.5	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	0.0-0.5	.10	.15			
116D:												
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.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	0.0-0.5	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	20-29	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	0.0-0.5	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	0.0-0.5	.10	.15			
116E:												
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.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	0.0-0.5	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	20-29	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	0.0-0.5	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	0.0-0.5	.10	.15			
116F:												
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.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	0.0-0.5	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	20-29	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	0.0-0.5	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	0.0-0.5	.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	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	in/hr	In/in	Pct	Pct					
123D:												
Klacking--------	0-4	0-10	1.35-1.65	5.95-19.98	0.05-0.09	0.0-2.9	1.0-2.0	.10	.15	5	1	220
	4-23	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	23-30	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	30-80	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.15	.17			
125B:												
Melita----------	0-4	0-10	1.35-1.60	5.95-19.98	0.06-0.08	0.0-2.9	3.0-4.0	.15	.15	5	1	220
	4-8	0-15	1.35-1.60	5.95-19.98	0.04-0.10	0.0-2.9	0.5-1.0	.17	.17			
	8-16	0-15	1.35-1.60	5.95-19.98	0.04-0.10	0.0-2.9	0.5-1.0	.17	.17			
	16-43	0-15	1.35-1.60	5.95-19.98	0.04-0.10	0.0-2.9	0.5-1.0	.17	.17			
	43-47	18-35	1.45-1.70	0.20-0.57	0.14-0.19	0.0-2.9	0.0-0.5	.32	.32			
	47-80	18-35	1.45-1.70	0.20-0.57	0.13-0.18	0.0-2.9	0.0-0.5	.32	.32			
147B:												
Lindquist-------	0-1	0-5	1.30-1.55	5.95-19.98	0.07-0.10	0.0-2.9	2.0-4.0	.10	.15	5	1	220
	1-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.1-1.0	.10	.15			
	3-22	0-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	0.1-1.0	.10	.15			
	22-80	2-12	1.55-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
147E:												
Lindquist-------	0-1	0-5	1.30-1.55	5.95-19.98	0.07-0.10	0.0-2.9	2.0-4.0	.10	.15	5	1	220
	1-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.1-1.0	.10	.15			
	3-22	0-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	0.1-1.0	.10	.15			
	22-80	2-12	1.55-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
307B:												
Klacking--------	0-4	0-10	1.35-1.65	5.95-19.98	0.05-0.09	0.0-2.9	1.0-2.0	.10	.15	5	1	220
	4-23	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	23-30	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	30-80	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.15	.17			
307E:												
Klacking--------	0-4	0-10	1.35-1.65	5.95-19.98	0.05-0.09	0.0-2.9	1.0-2.0	.10	.15	5	1	220
	4-23	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	23-30	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	30-80	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.15	.17			
307F:												
Klacking--------	0-4	0-10	1.35-1.65	5.95-19.98	0.05-0.09	0.0-2.9	1.0-2.0	.10	.15	5	1	220
	4-23	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	23-30	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	30-80	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.15	.17			
350B:												
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.17			
350D:												
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.17			
350E:												
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.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	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	in/hr	In/in	Pct	Pct					
351A:												
Allendale-------	0-10	0-12	1.25-1.40	5.95-19.98	0.09-0.12	0.0-2.9	2.0-4.0	.17	.17	4	2	134
	10-18	0-15	1.35-1.45	5.95-19.98	0.06-0.10	0.0-2.9	0.5-1.0	.17	.17			
	18-25	0-15	1.35-1.45	5.95-19.98	0.06-0.10	0.0-2.9	0.5-1.0	.17	.17			
	25-45	40-60	1.45-1.70	0.00-0.06	0.08-0.12	6.0-8.9	0.0-0.5	.32	.32			
	45-80	40-60	1.45-1.70	0.00-0.06	0.08-0.12	6.0-8.9	0.0-0.5	.32	.32			
Wakeley---------	0-3	---	0.30-0.40	5.95-19.98	0.35-0.45	---	40-60	---	---	4	2	134
	3-7	0-15	1.45-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	7-41	0-15	1.45-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	41-80	35-60	1.50-1.70	0.06-0.20	0.08-0.12	6.0-8.9	0.0-0.5	.32	.32			
Dorval----------	0-18	0-0	0.13-0.42	0.57-5.95	0.20-0.25	---	50-95	---	---	2	2	134
	18-80	35-60	1.40-1.65	0.00-0.06	0.10-0.20	6.0-8.9	0.0-8.0	.28	.28			
352B:												
Deford----------	0-6	---	0.30-0.50	0.20-5.95	0.35-0.45	---	40-60	---	---	5	2	134
	6-80	0-12	1.40-1.60	5.95-19.98	0.05-0.07	0.0-2.9	0.0-0.5	.17	.17			
Au Gres---------	0-2	0-0	0.10-0.35	0.20-5.95	0.35-0.45	---	70-90	---	---	5	1	220
	2-8	0-8	1.30-1.55	5.95-19.98	0.07-0.10	0.0-2.9	0.5-2.0	.10	.15			
	8-18	0-8	1.50-1.70	5.95-19.98	0.06-0.09	0.0-2.9	2.0-5.0	.10	.15			
	18-35	0-8	1.50-1.70	5.95-19.98	0.05-0.07	0.0-2.9	0.5-3.0	.10	.15			
	35-80	0-8	1.50-1.70	5.95-19.98	0.05-0.07	0.0-2.9	0.0-0.5	.10	.15			
Croswell--------	0-2	0-0	0.30-0.40	5.95-19.98	0.35-0.65	---	70-90	---	---	5	1	220
	2-5	0-10	1.30-1.55	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.10	.15			
	5-11	0-10	1.40-1.60	5.95-19.98	0.06-0.10	0.0-2.9	0.6-1.0	.10	.15			
	11-17	0-10	1.40-1.60	5.95-19.98	0.06-0.09	0.0-2.9	0.0-0.5	.10	.15			
	17-33	0-10	1.50-1.65	5.95-19.98	0.05-0.07	0.0-2.9	0.0-0.5	.10	.15			
	33-80	0-10	1.50-1.65	5.95-19.98	0.05-0.07	0.0-2.9	0.0-0.5	.10	.15			
353B:												
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.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	0.0-0.5	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	20-29	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	0.0-0.5	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	0.0-0.5	.10	.15			
Ossineke--------	0-10	5-20	1.30-1.60	0.57-1.98	0.14-0.18	0.0-2.9	1.0-3.0	.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	0.0-0.5	.17	.24			
	15-22	10-27	1.60-1.80	0.57-1.98	0.14-0.19	0.0-2.9	0.0-0.5	.24	.24			
	22-35	10-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	0.0-0.5	.37	.37			
	35-41	20-35	1.60-1.80	0.20-0.57	0.14-0.19	3.0-5.9	0.0-0.5	.28	.37			
	41-80	11-27	1.80-2.00	0.06-0.20	0.03-0.04	3.0-5.9	0.0-0.5	.28	.37			
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.17			
354F:												
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.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	0.0-0.5	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	20-29	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	0.0-0.5	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	0.0-0.5	.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	Organic matter	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	Pct					
354F:												
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.17			
359C:												
Algonquin-------	0-5	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	2.0-3.0	.37	.37	5	6	48
	5-10	12-18	1.20-1.55	0.57-1.98	0.15-0.17	0.0-2.9	0.0-0.5	.24	.24			
	10-17	35-60	1.40-1.60	0.06-0.20	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	17-24	35-60	1.40-1.60	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	24-80	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
Negwegon--------	0-5	12-27	1.40-1.60	0.57-1.98	0.22-0.24	0.0-2.9	1.0-3.0	.37	.37	5	5	56
	5-8	18-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	8-13	18-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	13-34	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	34-80	18-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
Dorval----------	0-18	0-0	0.13-0.42	0.57-5.95	0.20-0.25	---	50-95	---	---	2	2	134
	18-80	35-60	1.40-1.65	0.00-0.06	0.10-0.20	6.0-8.9	0.0-8.0	.28	.28			
360:												
Wakeley---------	0-3	---	0.30-0.40	5.95-19.98	0.35-0.45	---	40-60	---	---	4	2	134
	3-7	0-15	1.45-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	7-41	0-15	1.45-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	41-80	35-60	1.50-1.70	0.06-0.20	0.08-0.12	6.0-8.9	0.0-0.5	.32	.32			
361B:												
Allendale-------	0-10	0-12	1.25-1.40	5.95-19.98	0.09-0.12	0.0-2.9	2.0-4.0	.17	.17	4	2	134
	10-18	0-15	1.35-1.45	5.95-19.98	0.06-0.10	0.0-2.9	0.5-1.0	.17	.17			
	18-25	0-15	1.35-1.45	5.95-19.98	0.06-0.10	0.0-2.9	0.5-1.0	.17	.17			
	25-45	40-60	1.45-1.70	0.00-0.06	0.08-0.12	6.0-8.9	0.0-0.5	.32	.32			
	45-80	40-60	1.45-1.70	0.00-0.06	0.08-0.12	6.0-8.9	0.0-0.5	.32	.32			
Dorval----------	0-18	0-0	0.13-0.42	0.57-5.95	0.20-0.25	---	50-95	---	---	2	2	134
	18-80	35-60	1.40-1.65	0.00-0.06	0.10-0.20	6.0-8.9	0.0-8.0	.28	.28			
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.17			
362B:												
Millersburg-----	0-2	3-12	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	3.0-7.0	.17	.17	5	2	134
	2-5	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	5-10	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	10-18	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	18-26	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	26-34	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	34-43	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	43-80	3-12	1.55-1.80	0.57-1.98	0.06-0.13	0.0-2.9	0.0-0.5	.17	.17			
362D:												
Millersburg-----	0-2	3-12	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	3.0-7.0	.17	.17	5	2	134
	2-5	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	5-10	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	10-18	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	18-26	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	26-34	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	34-43	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	43-80	3-12	1.55-1.80	0.57-1.98	0.06-0.13	0.0-2.9	0.0-0.5	.17	.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	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	in/hr	In/in	Pct	Pct					
362E:												
Millersburg-----	0-2	3-12	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	3.0-7.0	.17	.17	5	2	134
	2-5	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	5-10	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	10-18	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	18-26	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	26-34	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	34-43	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	43-80	3-12	1.55-1.80	0.57-1.98	0.06-0.13	0.0-2.9	0.0-0.5	.17	.17			
363D:												
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.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	0.0-0.5	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	20-29	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	0.0-0.5	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	0.0-0.5	.10	.15			
Millersburg-----	0-2	3-12	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	3.0-7.0	.17	.17	5	2	134
	2-5	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	5-10	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	10-18	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	18-26	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	26-34	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	34-43	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	43-80	3-12	1.55-1.80	0.57-1.98	0.06-0.13	0.0-2.9	0.0-0.5	.17	.17			
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.17			
364E:												
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.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	0.0-0.5	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	20-29	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	0.0-0.5	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	0.0-0.5	.10	.15			
Millersburg-----	0-2	3-12	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	3.0-7.0	.17	.17	5	2	134
	2-5	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	5-10	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	10-18	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	18-26	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	26-34	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	34-43	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	43-80	3-12	1.55-1.80	0.57-1.98	0.06-0.13	0.0-2.9	0.0-0.5	.17	.17			
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.17			
369:												
Deford----------	0-6	---	0.30-0.50	0.20-5.95	0.35-0.45	---	40-60	---	---	5	2	134
	6-80	0-12	1.40-1.60	5.95-19.98	0.05-0.07	0.0-2.9	0.0-0.5	.17	.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	Organic matter	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	Pct					
371:												
Springport------	0-3	18-35	1.10-1.35	0.20-0.57	0.17-0.19	6.0-8.9	2.0-5.0	.32	.32	5	6	48
	3-9	18-60	1.40-1.65	0.06-0.20	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	9-13	18-60	1.40-1.65	0.06-0.20	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	13-35	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	35-80	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
380:												
Access denied.												
384B:												
Iosco-----------	0-3	0-10	1.25-1.40	5.95-19.98	0.07-0.09	0.0-2.9	2.0-5.0	.15	.15	5	1	220
	3-12	0-10	1.35-1.60	5.95-19.98	0.06-0.11	0.0-2.9	2.0-4.0	.17	.17			
	12-15	0-10	1.35-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-3.0	.17	.17			
	15-18	0-10	1.35-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.0-1.0	.17	.17			
	18-30	5-25	1.35-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.0-1.0	.17	.17			
	30-42	18-35	1.50-1.70	0.20-0.57	0.16-0.20	3.0-5.9	0.0-0.5	.37	.37			
	42-80	15-35	1.50-1.70	0.20-0.57	0.17-0.20	3.0-5.9	0.0-0.5	.37	.37			
385D:												
Lindquist-------	0-1	0-5	1.30-1.55	5.95-19.98	0.07-0.10	0.0-2.9	2.0-4.0	.10	.15	5	1	220
	1-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.1-1.0	.10	.15			
	3-22	0-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	0.1-1.0	.10	.15			
	22-80	2-12	1.55-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
386B:												
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.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	0.0-0.5	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	20-29	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	0.0-0.5	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	0.0-0.5	.10	.15			
Rubicon---------	0-4	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	4-9	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	9-22	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	22-47	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	47-80	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
386D:												
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.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	0.0-0.5	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	20-29	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	0.0-0.5	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	0.0-0.5	.10	.15			
Rubicon---------	0-4	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	4-9	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	9-22	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	22-47	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	47-80	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
387E:												
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.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	0.0-0.5	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	20-29	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	0.0-0.5	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	0.0-0.5	.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	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	in/hr	In/in	Pct	Pct					
387E:												
Rubicon---------	0-4	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	4-9	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	9-22	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	22-47	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	47-80	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
387F:												
Mancelona-------	0-3	0-5	1.35-1.65	5.95-19.98	0.06-0.09	0.0-2.9	0.5-2.0	.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	0.0-0.5	.17	.24			
	6-20	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	20-29	2-15	1.30-1.65	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.17	.24			
	29-35	10-25	1.30-1.65	1.98-5.95	0.06-0.16	0.0-2.9	0.0-0.5	.17	.24			
	35-80	0-10	1.45-1.65	19.98-19.98	0.02-0.04	0.0-2.9	0.0-0.5	.10	.15			
Rubicon---------	0-4	0-5	1.25-1.45	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	4-9	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	9-22	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	22-47	0-10	1.30-1.60	5.95-19.98	0.04-0.08	0.0-2.9	0.6-1.0	.10	.15			
	47-80	0-5	1.40-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
388B:												
Millersburg-----	0-2	3-12	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	3.0-7.0	.17	.17	5	2	134
	2-5	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	5-10	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	10-18	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	18-26	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	26-34	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	34-43	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	43-80	3-12	1.55-1.80	0.57-1.98	0.06-0.13	0.0-2.9	0.0-0.5	.17	.17			
Klacking--------	0-4	0-10	1.35-1.65	5.95-19.98	0.05-0.09	0.0-2.9	1.0-2.0	.10	.15	5	1	220
	4-23	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	23-30	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	30-80	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.15	.17			
Graycalm--------	0-2	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	2-16	0-15	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	16-27	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	0.0-0.5	.10	.15			
	27-80	0-10	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
388D:												
Millersburg-----	0-2	3-12	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	3.0-7.0	.17	.17	5	2	134
	2-5	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	5-10	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	10-18	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	18-26	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	26-34	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	34-43	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	43-80	3-12	1.55-1.80	0.57-1.98	0.06-0.13	0.0-2.9	0.0-0.5	.17	.17			
Klacking--------	0-4	0-10	1.35-1.65	5.95-19.98	0.05-0.09	0.0-2.9	1.0-2.0	.10	.15	5	1	220
	4-23	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	23-30	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	30-80	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.15	.17			
Graycalm--------	0-2	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	2-16	0-15	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	16-27	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	0.0-0.5	.10	.15			
	27-80	0-10	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.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	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	in/hr	In/in	Pct	Pct					
388E:												
Millersburg-----	0-2	3-12	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	3.0-7.0	.17	.17	5	2	134
	2-5	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	5-10	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	10-18	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	18-26	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	26-34	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	34-43	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	43-80	3-12	1.55-1.80	0.57-1.98	0.06-0.13	0.0-2.9	0.0-0.5	.17	.17			
Klacking--------	0-4	0-10	1.35-1.65	5.95-19.98	0.05-0.09	0.0-2.9	1.0-2.0	.10	.15	5	1	220
	4-23	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	23-30	0-10	1.35-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.0-0.5	.10	.15			
	30-80	2-15	1.55-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.15	.17			
Graycalm--------	0-2	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	2-16	0-15	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	16-27	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	0.0-0.5	.10	.15			
	27-80	0-10	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
389B:												
Horsehead-------	0-2	0-8	1.30-1.55	5.95-19.98	0.05-0.08	0.0-2.9	0.5-1.0	.10	.15	2	8	0
	2-7	0-8	1.30-1.60	19.98-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
	7-18	5-15	1.30-1.65	5.95-19.98	0.05-0.09	0.0-2.9	0.0-0.5	.10	.15			
	18-37	5-15	1.30-1.65	5.95-19.98	0.05-0.09	0.0-2.9	0.0-0.5	.10	.15			
	37-80	0-8	1.50-1.60	19.98-19.98	0.03-0.07	0.0-2.9	0.0-0.5	.10	.15			
389D:												
Horsehead-------	0-2	0-8	1.30-1.55	5.95-19.98	0.05-0.08	0.0-2.9	0.5-1.0	.10	.15	2	8	0
	2-7	0-8	1.30-1.60	19.98-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
	7-18	5-15	1.30-1.65	5.95-19.98	0.05-0.09	0.0-2.9	0.0-0.5	.10	.15			
	18-37	5-15	1.30-1.65	5.95-19.98	0.05-0.09	0.0-2.9	0.0-0.5	.10	.15			
	37-80	0-8	1.50-1.60	19.98-19.98	0.03-0.07	0.0-2.9	0.0-0.5	.10	.15			
389E:												
Horsehead-------	0-2	0-8	1.30-1.55	5.95-19.98	0.05-0.08	0.0-2.9	0.5-1.0	.10	.15	2	8	0
	2-7	0-8	1.30-1.60	19.98-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
	7-18	5-15	1.30-1.65	5.95-19.98	0.05-0.09	0.0-2.9	0.0-0.5	.10	.15			
	18-37	5-15	1.30-1.65	5.95-19.98	0.05-0.09	0.0-2.9	0.0-0.5	.10	.15			
	37-80	0-8	1.50-1.60	19.98-19.98	0.03-0.07	0.0-2.9	0.0-0.5	.10	.15			
390B:												
Horsehead-------	0-2	0-8	1.30-1.55	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	4	1	220
	2-27	0-8	1.30-1.55	19.98-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
	27-36	5-15	1.30-1.65	5.95-19.98	0.05-0.09	0.0-2.9	0.0-0.5	.10	.15			
	36-80	0-8	1.50-1.60	19.98-19.98	0.03-0.07	0.0-2.9	0.0-0.5	.10	.15			
Graycalm--------	0-2	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	2-16	0-15	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	16-27	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	0.0-0.5	.10	.15			
	27-80	0-10	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
390D:												
Horsehead-------	0-2	0-8	1.30-1.55	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	4	1	220
	2-27	0-8	1.30-1.55	19.98-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
	27-36	5-15	1.30-1.65	5.95-19.98	0.05-0.09	0.0-2.9	0.0-0.5	.10	.15			
	36-80	0-8	1.50-1.60	19.98-19.98	0.03-0.07	0.0-2.9	0.0-0.5	.10	.15			
Graycalm--------	0-2	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	2-16	0-15	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	16-27	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	0.0-0.5	.10	.15			
	27-80	0-10	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.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	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	in/hr	In/in	Pct	Pct					
390E:												
Horsehead-------	0-2	0-8	1.30-1.55	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	4	1	220
	2-27	0-8	1.30-1.55	19.98-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
	27-36	5-15	1.30-1.65	5.95-19.98	0.05-0.09	0.0-2.9	0.0-0.5	.10	.15			
	36-80	0-8	1.50-1.60	19.98-19.98	0.03-0.07	0.0-2.9	0.0-0.5	.10	.15			
Graycalm--------	0-2	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	2-16	0-15	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	16-27	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	0.0-0.5	.10	.15			
	27-80	0-10	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
390F:												
Horsehead-------	0-2	0-8	1.30-1.55	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	4	1	220
	2-27	0-8	1.30-1.55	19.98-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
	27-36	5-15	1.30-1.65	5.95-19.98	0.05-0.09	0.0-2.9	0.0-0.5	.10	.15			
	36-80	0-8	1.50-1.60	19.98-19.98	0.03-0.07	0.0-2.9	0.0-0.5	.10	.15			
Graycalm--------	0-2	0-10	1.30-1.55	5.95-19.98	0.04-0.10	0.0-2.9	0.5-2.0	.10	.15	5	1	220
	2-16	0-15	1.25-1.60	5.95-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.10	.15			
	16-27	0-10	1.50-1.65	5.95-19.98	0.04-0.09	0.0-2.9	0.0-0.5	.10	.15			
	27-80	0-10	1.50-1.65	5.95-19.98	0.04-0.06	0.0-2.9	0.0-0.5	.10	.15			
391B:												
Horsehead-------	0-2	0-8	1.30-1.55	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	4	1	220
	2-27	0-8	1.30-1.55	19.98-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
	27-36	5-15	1.30-1.65	5.95-19.98	0.05-0.09	0.0-2.9	0.0-0.5	.10	.15			
	36-80	0-8	1.50-1.60	19.98-19.98	0.03-0.07	0.0-2.9	0.0-0.5	.10	.15			
391D:												
Horsehead-------	0-2	0-8	1.30-1.55	5.95-19.98	0.05-0.09	0.0-2.9	0.5-2.0	.10	.15	4	1	220
	2-27	0-8	1.30-1.55	19.98-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
	27-36	5-15	1.30-1.65	5.95-19.98	0.05-0.09	0.0-2.9	0.0-0.5	.10	.15			
	36-80	0-8	1.50-1.60	19.98-19.98	0.03-0.07	0.0-2.9	0.0-0.5	.10	.15			
392:												
Caffey----------	0-9	2-10	1.10-1.30	1.98-5.95	0.10-0.15	0.0-2.9	10-20	.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	0.0-0.5	.17	.17			
	21-80	8-27	1.50-1.80	0.20-0.57	0.10-0.20	0.0-2.9	0.0-0.5	.43	.43			
393B:												
Morganlake------	0-4	---	0.30-0.40	5.95-19.98	0.35-0.65	---	70-90	---	---	5	1	220
	4-8	1-10	1.30-1.55	5.95-19.98	0.07-0.12	0.0-2.9	0.5-1.0	.15	.15			
	8-17	1-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	0.1-1.0	.15	.15			
	17-32	1-27	1.40-1.65	0.57-19.98	0.06-0.16	0.0-2.9	0.1-1.0	.15	.15			
	32-46	27-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
	46-66	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
	66-80	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
393C:												
Morganlake------	0-4	---	0.30-0.40	5.95-19.98	0.35-0.65	---	70-90	---	---	5	1	220
	4-8	1-10	1.30-1.55	5.95-19.98	0.07-0.12	0.0-2.9	0.5-1.0	.15	.15			
	8-17	1-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	0.1-1.0	.15	.15			
	17-32	1-27	1.40-1.65	0.57-19.98	0.06-0.16	0.0-2.9	0.1-1.0	.15	.15			
	32-46	27-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
	46-66	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
	66-80	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
394B:												
Ocqueoc---------	0-4	0-10	1.30-1.60	5.95-19.98	0.07-0.09	0.0-2.9	1.0-3.0	.15	.15	4	1	220
	4-7	0-15	1.30-1.60	5.95-19.98	0.06-0.12	0.0-2.9	0.6-1.0	.15	.15			
	7-23	0-15	1.30-1.60	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.15	.15			
	23-28	0-15	1.30-1.60	5.95-19.98	0.06-0.12	0.0-2.9	0.0-0.5	.15	.15			
	28-80	8-27	1.50-1.80	0.20-0.57	0.05-0.21	0.0-2.9	0.0-0.5	.37	.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	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	in/hr	In/in	Pct	Pct					
399D:												
Menominee-------	0-4	2-15	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	0.5-3.0	.17	.17	5	2	134
	4-6	5-15	1.45-1.70	5.95-19.98	0.04-0.10	0.0-2.9	0.0-0.5	.15	.17			
	6-13	5-15	1.45-1.70	5.95-19.98	0.04-0.10	0.0-2.9	0.5-3.0	.15	.17			
	13-24	5-15	1.45-1.70	5.95-19.98	0.04-0.10	0.0-2.9	0.0-0.5	.15	.17			
	24-40	18-35	1.45-1.70	0.57-1.98	0.14-0.18	3.0-5.9	0.0-0.5	.32	.32			
	40-80	12-35	1.45-1.75	0.20-0.57	0.13-0.18	3.0-5.9	0.0-0.5	.32	.37			
Bamfield--------	0-9	5-20	1.30-1.60	1.98-5.95	0.14-0.18	0.0-2.9	1.0-3.0	.20	.24	4	3	86
	9-10	5-20	1.35-1.70	1.98-5.95	0.11-0.17	0.0-2.9	0.0-0.5	.20	.24			
	10-14	5-35	1.35-1.80	0.20-1.98	0.11-0.19	0.0-2.9	0.0-0.5	.20	.24			
	14-23	28-35	1.37-1.65	0.20-0.57	0.13-0.19	3.0-5.9	0.0-0.5	.32	.37			
	23-29	18-35	1.70-2.00	0.06-0.20	0.03-0.04	3.0-5.9	0.0-0.5	.32	.37			
	29-61	18-35	1.70-2.00	0.06-0.20	0.03-0.04	3.0-5.9	0.0-0.5	.32	.37			
	60-80	0-5	1.55-1.65	5.95-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.17			
400F:												
Menominee-------	0-4	2-15	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	0.5-3.0	.17	.17	5	2	134
	4-6	5-15	1.45-1.70	5.95-19.98	0.04-0.10	0.0-2.9	0.0-0.5	.15	.17			
	6-13	5-15	1.45-1.70	5.95-19.98	0.04-0.10	0.0-2.9	0.5-3.0	.15	.17			
	13-24	5-15	1.45-1.70	5.95-19.98	0.04-0.10	0.0-2.9	0.0-0.5	.15	.17			
	24-40	18-35	1.45-1.70	0.57-1.98	0.14-0.18	3.0-5.9	0.0-0.5	.32	.32			
	40-80	12-35	1.45-1.75	0.20-0.57	0.13-0.18	3.0-5.9	0.0-0.5	.32	.37			
Bamfield--------	0-9	5-20	1.30-1.60	1.98-5.95	0.14-0.18	0.0-2.9	1.0-3.0	.20	.24	4	3	86
	9-10	5-20	1.35-1.70	1.98-5.95	0.11-0.17	0.0-2.9	0.0-0.5	.20	.24			
	10-14	5-35	1.35-1.80	0.20-1.98	0.11-0.19	0.0-2.9	0.0-0.5	.20	.24			
	14-23	28-35	1.37-1.65	0.20-0.57	0.13-0.19	3.0-5.9	0.0-0.5	.32	.37			
	23-29	18-35	1.70-2.00	0.06-0.20	0.03-0.04	3.0-5.9	0.0-0.5	.32	.37			
	29-61	18-35	1.70-2.00	0.06-0.20	0.03-0.04	3.0-5.9	0.0-0.5	.32	.37			
	60-80	0-5	1.55-1.65	5.95-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.17			
420A:												
Otisco----------	0-5	0-15	1.35-1.50	5.95-19.98	0.10-0.20	0.0-2.9	10-15	.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	0.0-0.5	.17	.17			
	10-25	2-12	1.25-1.40	1.98-19.98	0.06-0.11	0.0-2.9	0.0-0.5	.17	.17			
	25-38	2-12	1.25-1.40	1.98-19.98	0.06-0.11	0.0-2.9	0.0-0.5	.17	.17			
	38-45	5-15	1.35-1.45	1.98-5.95	0.05-0.17	0.0-2.9	0.0-0.5	.17	.17			
	45-60	5-15	1.25-1.50	1.98-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.17	.17			
	60-80	0-12	1.25-1.50	1.98-19.98	0.05-0.10	0.0-2.9	0.0-0.5	.17	.17			
421A:												
Richter---------	0-7	0-10	1.20-1.50	1.98-5.95	0.10-0.12	0.0-2.9	2.0-10	.17	.17	5	2	134
	7-11	10-22	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	0.0-0.5	.20	.20			
	11-19	10-22	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	0.5-3.0	.20	.20			
	19-25	10-22	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	0.0-0.5	.20	.20			
	25-29	10-22	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	0.0-0.5	.20	.20			
	29-80	2-25	1.60-1.70	0.57-1.98	0.05-0.25	0.0-2.9	0.0-0.5	.20	.20			
Caffey----------	0-9	2-10	1.10-1.30	1.98-5.95	0.10-0.15	0.0-2.9	10-20	.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	0.0-0.5	.17	.17			
	21-80	8-27	1.50-1.80	0.20-0.57	0.10-0.20	0.0-2.9	0.0-0.5	.43	.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	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	in/hr	In/in	Pct	Pct					
422B:												
Morganlake------	0-4	---	0.30-0.40	5.95-19.98	0.35-0.65	---	70-90	---	---	5	1	220
	4-8	1-10	1.30-1.55	5.95-19.98	0.07-0.12	0.0-2.9	0.5-1.0	.15	.15			
	8-17	1-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	0.1-1.0	.15	.15			
	17-32	1-27	1.40-1.65	0.57-19.98	0.06-0.16	0.0-2.9	0.1-1.0	.15	.15			
	32-46	27-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
	46-66	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
	66-80	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
Iosco-----------	0-3	0-10	1.25-1.40	5.95-19.98	0.07-0.09	0.0-2.9	2.0-5.0	.15	.15	5	1	220
	3-12	0-10	1.35-1.60	5.95-19.98	0.06-0.11	0.0-2.9	2.0-4.0	.17	.17			
	12-15	0-10	1.35-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-3.0	.17	.17			
	15-18	0-10	1.35-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.0-1.0	.17	.17			
	18-30	5-25	1.35-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.0-1.0	.17	.17			
	30-42	18-35	1.50-1.70	0.20-0.57	0.16-0.20	3.0-5.9	0.0-0.5	.37	.37			
	42-80	15-35	1.50-1.70	0.20-0.57	0.17-0.20	3.0-5.9	0.0-0.5	.37	.37			
Deford----------	0-6	---	0.30-0.50	0.20-5.95	0.35-0.45	---	40-60	---	---	5	2	134
	6-80	0-12	1.40-1.60	5.95-19.98	0.05-0.07	0.0-2.9	0.0-0.5	.17	.17			
423B:												
Richter---------	0-7	0-10	1.20-1.50	1.98-5.95	0.10-0.12	0.0-2.9	2.0-10	.17	.17	5	2	134
	7-11	10-22	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	0.0-0.5	.20	.20			
	11-19	10-22	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	0.5-3.0	.20	.20			
	19-25	10-22	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	0.0-0.5	.20	.20			
	25-29	10-22	1.35-1.60	0.57-1.98	0.10-0.18	0.0-2.9	0.0-0.5	.20	.20			
	29-80	2-25	1.60-1.70	0.57-1.98	0.05-0.25	0.0-2.9	0.0-0.5	.20	.20			
Algonquin-------	0-5	15-27	1.20-1.55	0.57-1.98	0.22-0.24	0.0-2.9	2.0-3.0	.37	.37	5	6	48
	5-10	12-18	1.20-1.55	0.57-1.98	0.15-0.17	0.0-2.9	0.0-0.5	.24	.24			
	10-17	35-60	1.40-1.60	0.06-0.20	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	17-24	35-60	1.40-1.60	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
	24-80	35-60	1.40-1.70	0.00-0.06	0.11-0.20	6.0-8.9	0.0-0.5	.32	.32			
424B:												
Morganlake------	0-4	---	0.30-0.40	5.95-19.98	0.35-0.65	---	70-90	---	---	5	1	220
	4-8	1-10	1.30-1.55	5.95-19.98	0.07-0.12	0.0-2.9	0.5-1.0	.15	.15			
	8-17	1-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	0.1-1.0	.15	.15			
	17-32	1-27	1.40-1.65	0.57-19.98	0.06-0.16	0.0-2.9	0.1-1.0	.15	.15			
	32-46	27-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
	46-66	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
	66-80	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
Ossineke--------	0-8	5-20	1.30-1.60	0.57-1.98	0.14-0.18	0.0-2.9	1.0-3.0	.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	0.0-0.5	.17	.24			
	13-21	11-27	1.55-1.70	0.57-1.98	0.14-0.19	0.0-2.9	0.0-0.5	.24	.24			
	21-38	18-35	1.55-1.70	0.57-1.98	0.14-0.19	3.0-5.9	0.0-0.5	.37	.37			
	38-51	18-35	1.60-1.80	0.57-1.98	0.14-0.19	3.0-5.9	0.0-0.5	.28	.37			
	51-77	18-35	1.60-1.80	0.57-1.98	0.14-0.19	3.0-5.9	0.0-0.5	.28	.37			
	77-80	0-5	1.55-1.65	5.95-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.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	Organic matter	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	Pct					
424C:												
Morganlake------	0-4	---	0.30-0.40	5.95-19.98	0.35-0.65	---	70-90	---	---	5	1	220
	4-8	1-10	1.30-1.55	5.95-19.98	0.07-0.12	0.0-2.9	0.5-1.0	.15	.15			
	8-17	1-10	1.40-1.65	5.95-19.98	0.06-0.08	0.0-2.9	0.1-1.0	.15	.15			
	17-32	1-27	1.40-1.65	0.57-19.98	0.06-0.16	0.0-2.9	0.1-1.0	.15	.15			
	32-46	27-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
	46-66	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
	66-80	15-35	1.45-1.70	0.20-0.57	0.14-0.16	3.0-5.9	0.0-0.5	.37	.43			
Ossineke--------	0-8	5-20	1.30-1.60	0.57-1.98	0.14-0.18	0.0-2.9	1.0-3.0	.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	0.0-0.5	.17	.24			
	13-21	11-27	1.55-1.70	0.57-1.98	0.14-0.19	0.0-2.9	0.0-0.5	.24	.24			
	21-38	18-35	1.55-1.70	0.57-1.98	0.14-0.19	3.0-5.9	0.0-0.5	.37	.37			
	38-51	18-35	1.60-1.80	0.57-1.98	0.14-0.19	3.0-5.9	0.0-0.5	.28	.37			
	51-77	18-35	1.60-1.80	0.57-1.98	0.14-0.19	3.0-5.9	0.0-0.5	.28	.37			
	77-80	0-5	1.55-1.65	5.95-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.17			
450B:												
Millersburg-----	0-2	3-12	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	3.0-7.0	.17	.17	5	2	134
	2-5	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	5-10	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	10-18	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	18-26	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	26-34	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	34-43	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	43-80	3-12	1.55-1.80	0.57-1.98	0.06-0.13	0.0-2.9	0.0-0.5	.17	.17			
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.17			
450D:												
Millersburg-----	0-2	3-12	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	3.0-7.0	.17	.17	5	2	134
	2-5	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	5-10	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	10-18	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	18-26	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	26-34	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	34-43	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	43-80	3-12	1.55-1.80	0.57-1.98	0.06-0.13	0.0-2.9	0.0-0.5	.17	.17			
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.17			
450E:												
Millersburg-----	0-2	3-12	1.35-1.65	1.98-5.95	0.10-0.12	0.0-2.9	3.0-7.0	.17	.17	5	2	134
	2-5	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	5-10	2-12	1.30-1.70	1.98-5.95	0.05-0.11	0.0-2.9	0.0-0.5	.17	.17			
	10-18	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	18-26	2-18	1.30-1.70	1.98-5.95	0.07-0.13	0.0-2.9	0.0-0.5	.24	.24			
	26-34	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	34-43	8-18	1.35-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	43-80	3-12	1.55-1.80	0.57-1.98	0.06-0.13	0.0-2.9	0.0-0.5	.17	.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	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	in/hr	In/in	Pct	Pct					
450E:												
Blue Lake-------	0-3	0-5	1.35-1.60	5.95-19.98	0.07-0.09	0.0-2.9	0.5-2.0	.15	.15	5	1	220
	3-6	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	6-25	5-12	1.30-1.60	5.95-19.98	0.06-0.11	0.0-2.9	0.5-2.0	.17	.17			
	25-80	8-15	1.30-1.60	1.98-5.95	0.06-0.12	0.0-2.9	0.0-0.5	.17	.17			
451B:												
Annalake--------	0-9	5-15	1.25-1.55	0.57-1.98	0.08-0.18	0.0-2.9	1.0-3.0	.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	0.5-1.0	.15	.15			
	11-16	0-10	1.40-1.70	5.95-19.98	0.10-0.14	0.0-2.9	1.0-2.0	.24	.24			
	16-30	5-15	1.40-1.70	0.57-1.98	0.10-0.14	0.0-2.9	0.0-0.5	.28	.28			
	30-37	8-18	1.40-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	37-57	5-15	1.45-1.70	0.57-1.98	0.10-0.15	0.0-2.9	0.0-0.5	.24	.24			
	57-80	5-15	1.45-1.70	0.57-1.98	0.10-0.15	0.0-2.9	0.0-0.5	.24	.24			
451C:												
Annalake--------	0-9	5-15	1.25-1.55	0.57-1.98	0.08-0.18	0.0-2.9	1.0-3.0	.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	0.5-1.0	.15	.15			
	11-16	0-10	1.40-1.70	5.95-19.98	0.10-0.14	0.0-2.9	1.0-2.0	.24	.24			
	16-30	5-15	1.40-1.70	0.57-1.98	0.10-0.14	0.0-2.9	0.0-0.5	.28	.28			
	30-37	8-18	1.40-1.70	0.57-1.98	0.10-0.19	0.0-2.9	0.0-0.5	.24	.24			
	37-57	5-15	1.45-1.70	0.57-1.98	0.10-0.15	0.0-2.9	0.0-0.5	.24	.24			
	57-80	5-15	1.45-1.70	0.57-1.98	0.10-0.15	0.0-2.9	0.0-0.5	.24	.24			
452D:												
Bamfield--------	0-9	5-20	1.30-1.60	1.98-5.95	0.14-0.18	0.0-2.9	1.0-3.0	.20	.24	4	3	86
	9-10	5-20	1.35-1.70	1.98-5.95	0.11-0.17	0.0-2.9	0.0-0.5	.20	.24			
	10-14	5-35	1.35-1.80	0.20-1.98	0.11-0.19	0.0-2.9	0.0-0.5	.20	.24			
	14-23	28-35	1.37-1.65	0.20-0.57	0.13-0.19	3.0-5.9	0.0-0.5	.32	.37			
	23-29	18-35	1.70-2.00	0.06-0.20	0.03-0.04	3.0-5.9	0.0-0.5	.32	.37			
	29-61	18-35	1.70-2.00	0.06-0.20	0.03-0.04	3.0-5.9	0.0-0.5	.32	.37			
	60-80	0-5	1.55-1.65	5.95-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
452E:												
Bamfield--------	0-9	5-20	1.30-1.60	1.98-5.95	0.14-0.18	0.0-2.9	1.0-3.0	.20	.24	4	3	86
	9-10	5-20	1.35-1.70	1.98-5.95	0.11-0.17	0.0-2.9	0.0-0.5	.20	.24			
	10-14	5-35	1.35-1.80	0.20-1.98	0.11-0.19	0.0-2.9	0.0-0.5	.20	.24			
	14-23	28-35	1.37-1.65	0.20-0.57	0.13-0.19	3.0-5.9	0.0-0.5	.32	.37			
	23-29	18-35	1.70-2.00	0.06-0.20	0.03-0.04	3.0-5.9	0.0-0.5	.32	.37			
	29-61	18-35	1.70-2.00	0.06-0.20	0.03-0.04	3.0-5.9	0.0-0.5	.32	.37			
	60-80	0-5	1.55-1.65	5.95-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
453B:												
Ossineke--------	0-8	5-20	1.30-1.60	0.57-1.98	0.14-0.18	0.0-2.9	1.0-3.0	.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	0.0-0.5	.17	.24			
	13-21	11-27	1.55-1.70	0.57-1.98	0.14-0.19	0.0-2.9	0.0-0.5	.24	.24			
	21-38	18-35	1.55-1.70	0.57-1.98	0.14-0.19	3.0-5.9	0.0-0.5	.37	.37			
	38-51	18-35	1.60-1.80	0.57-1.98	0.14-0.19	3.0-5.9	0.0-0.5	.28	.37			
	51-77	18-35	1.60-1.80	0.57-1.98	0.14-0.19	3.0-5.9	0.0-0.5	.28	.37			
	77-80	0-5	1.55-1.65	5.95-19.98	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			

Table 20.--Chemical Properties of the Soils

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
13:						
Tawas-----------	0-10	---	80-120	---	4.5-7.8	0
	10-22	---	80-120	---	4.5-7.8	0
	22-80	0-10	1.0-3.0	---	5.6-8.4	0
Lupton----------	0-8	0-0	140-180	---	5.6-7.8	0
	8-80	0-0	140-180	---	5.6-7.8	0
14:						
Dawson----------	0-4	0-0	---	80-120	3.6-4.4	0
	4-8	0-0	---	150-230	3.6-4.4	0
	8-28	0-0	---	150-230	3.6-4.4	0
	28-80	0-10	1.0-2.0	---	4.5-6.5	0
Loxley----------	0-5	0-0	---	50-100	2.0-4.4	0
	5-80	0-0	---	50-120	2.0-4.4	0
16B:						
Graycalm--------	0-2	0-10	4.0-10	---	4.5-6.5	0
	2-16	0-15	2.0-4.0	---	4.5-7.3	---
	16-27	0-10	1.0-5.0	---	4.5-7.3	---
	27-80	0-10	0.0-2.0	---	5.6-8.4	---
17B:						
Croswell--------	0-2	0-0	---	50-100	2.0-4.4	0
	2-5	0-10	---	1.0-5.0	3.6-6.5	0
	5-11	0-10	1.0-4.0	---	4.5-7.3	0
	11-17	0-10	1.0-3.0	---	4.5-7.3	0
	17-33	0-10	1.0-2.0	---	5.1-8.4	0
	33-80	0-10	1.0-2.0	---	5.1-8.4	0
18A:						
Au Gres---------	0-2	0-0	140-180	---	5.6-7.8	0
	2-8	0-8	5.0-10	---	3.6-7.3	0
	8-18	0-8	2.0-5.0	---	4.5-7.3	0
	18-35	0-8	1.0-2.0	---	5.1-7.3	0
	35-80	0-8	1.0-2.0	---	5.1-7.3	0
24A:						
Kinross---------	0-4	---	---	80-100	3.6-5.0	0
	4-11	0-10	---	1.0-10	3.6-6.0	0
	11-13	0-10	---	1.0-10	3.6-6.0	0
	13-21	0-10	1.0-2.0	---	4.5-6.5	0
	21-30	0-10	1.0-2.0	---	4.5-6.5	0
	30-80	0-10	1.0-2.0	---	4.5-6.5	0
Au Gres---------	0-2	0-0	140-180	---	5.6-7.8	0
	2-8	0-8	5.0-10	---	3.6-7.3	0
	8-18	0-8	2.0-5.0	---	4.5-7.3	0
	18-35	0-8	1.0-2.0	---	5.1-7.3	0
	35-80	0-8	1.0-2.0	---	5.1-7.3	0
32B:						
Kellogg---------	0-3	0-10	---	4.0-15	4.5-6.0	0
	3-10	2-12	---	1.0-5.0	4.5-6.0	0
	10-30	2-12	---	1.0-5.0	4.5-6.0	0
	30-39	2-12	---	1.0-5.0	4.5-6.0	0
	39-46	35-60	10-25	---	7.4-8.4	0-5
	46-80	35-60	10-25	---	7.4-8.4	5-25

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
32C:						
Kellogg	0-3	0-10	---	4.0-15	4.5-6.0	0
	3-10	2-12	---	1.0-5.0	4.5-6.0	0
	10-30	2-12	---	1.0-5.0	4.5-6.0	0
	30-39	2-12	---	1.0-5.0	4.5-6.0	0
	39-46	35-60	10-25	---	7.4-8.4	0-5
	46-80	35-60	10-25	---	7.4-8.4	5-25
37B:						
Richter	0-7	0-10	5.0-10	---	5.6-7.3	0
	7-11	10-22	5.0-15	---	5.6-7.3	0
	11-19	10-22	5.0-15	---	5.6-7.3	0
	19-25	10-22	5.0-15	---	5.6-7.3	0
	25-29	10-22	5.0-15	---	5.6-7.3	0
	29-80	2-25	1.0-10	---	7.4-8.4	0-20
41B:						
McGinn	0-1	0-0	---	80-120	3.6-4.4	0
	1-2	5-15	---	5.0-10	5.1-5.5	0
	2-4	5-15	---	1.0-3.0	4.5-5.5	0
	4-16	5-15	---	1.0-3.0	5.1-5.5	0
	16-21	5-15	1.0-10	---	5.1-6.0	0
	21-25	5-15	1.0-10	---	5.1-6.0	0
	25-35	15-20	3.0-10	---	5.6-6.5	0
	35-80	5-15	1.0-5.0	---	7.4-8.4	10-30
41C:						
McGinn	0-1	0-0	---	80-120	3.6-4.4	0
	1-2	5-15	---	5.0-10	5.1-5.5	0
	2-4	5-15	---	1.0-3.0	4.5-5.5	0
	4-16	5-15	---	1.0-3.0	5.1-5.5	0
	16-21	5-15	1.0-10	---	5.1-6.0	0
	21-25	5-15	1.0-10	---	5.1-6.0	0
	25-35	15-20	3.0-10	---	5.6-6.5	0
	35-80	5-15	1.0-5.0	---	7.4-8.4	10-30
44B:						
Ossineke	0-10	5-20	---	3.0-14	4.5-6.0	0
	10-15	5-20	1.0-8.0	---	5.1-6.0	0
	15-22	10-27	2.0-11	---	5.1-6.0	0
	22-35	10-35	3.0-14	---	5.6-6.5	0
	35-41	20-35	3.0-14	---	6.6-8.4	0-10
	41-80	11-27	2.0-14	---	7.4-8.4	10-30
44C:						
Ossineke	0-10	5-20	---	3.0-14	4.5-6.0	0
	10-15	5-20	1.0-8.0	---	5.1-6.0	0
	15-22	10-27	2.0-11	---	5.1-6.0	0
	22-35	10-35	3.0-14	---	5.6-6.5	0
	35-41	20-35	3.0-14	---	6.6-8.4	0-10
	41-80	11-27	2.0-14	---	7.4-8.4	10-30
47D:						
Graycalm	0-2	0-10	4.0-10	---	4.5-6.5	0
	2-16	0-15	2.0-4.0	---	4.5-7.3	---
	16-27	0-10	1.0-5.0	---	4.5-7.3	---
	27-80	0-10	0.0-2.0	---	5.6-8.4	---

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
47F:						
Graycalm--------	0-2	0-10	4.0-10	---	4.5-6.5	0
	2-16	0-15	2.0-4.0	---	4.5-7.3	---
	16-27	0-10	1.0-5.0	---	4.5-7.3	---
	27-80	0-10	0.0-2.0	---	5.6-8.4	---
53B:						
Negwegon--------	0-5	12-27	10-25	---	6.1-7.8	0
	5-8	18-60	10-20	---	6.1-7.8	0
	8-13	18-60	10-20	---	6.1-7.8	0
	13-34	35-60	10-20	---	6.1-7.8	0
	34-80	18-60	10-20	---	7.9-8.4	20-30
53C:						
Negwegon--------	0-5	12-27	10-25	---	6.1-7.8	0
	5-8	18-60	10-20	---	6.1-7.8	0
	8-13	18-60	10-20	---	6.1-7.8	0
	13-34	35-60	10-20	---	6.1-7.8	0
	34-80	18-60	10-20	---	7.9-8.4	20-30
54A:						
Algonquin-------	0-5	15-27	10-25	---	6.6-7.3	0
	5-10	12-18	5.0-10	---	6.6-7.3	0
	10-17	35-60	10-20	---	7.4-8.4	0
	17-24	35-60	10-20	---	7.9-8.4	10-20
	24-80	35-60	10-20	---	7.9-8.4	20-30
59B:						
Algonquin-------	0-5	15-27	10-25	---	6.6-7.3	0
	5-10	12-18	5.0-10	---	6.6-7.3	0
	10-17	35-60	10-20	---	7.4-8.4	0
	17-24	35-60	10-20	---	7.9-8.4	10-20
	24-80	35-60	10-20	---	7.9-8.4	20-30
Springport------	0-3	18-35	15-35	---	6.6-7.3	0
	3-9	18-60	10-20	---	7.4-8.4	0
	9-13	35-60	10-20	---	7.4-8.4	0
	13-35	35-60	10-20	---	7.4-8.4	10-20
	35-80	35-60	10-20	---	7.4-8.4	20-30
62A:						
Allendale-------	0-10	0-12	4.0-20	---	4.5-7.3	0
	10-18	0-15	1.0-5.0	---	4.5-7.3	0
	18-25	0-15	1.0-5.0	---	4.5-7.3	0
	25-45	40-60	8.0-25	---	6.1-8.4	0-10
	45-80	40-60	8.0-25	---	6.1-8.4	0-10
72:						
Dorval----------	0-18	0-0	100-160	---	5.1-7.8	0
	18-80	35-60	18-30	---	6.1-8.4	0-10
75B:						
Rubicon---------	0-4	0-5	---	1.0-6.0	4.5-6.0	0
	4-9	0-10	---	1.0-4.0	4.5-6.0	0
	9-22	0-10	---	1.0-4.0	4.5-6.0	0
	22-47	0-10	---	1.0-4.0	4.5-6.0	0
	47-80	0-5	1.0-2.0	---	4.5-6.5	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
75D:						
Rubicon---------	0-4	0-5	---	1.0-6.0	4.5-6.0	0
	4-9	0-10	---	1.0-4.0	4.5-6.0	0
	9-22	0-10	---	1.0-4.0	4.5-6.0	0
	22-47	0-10	---	1.0-4.0	4.5-6.0	0
	47-80	0-5	1.0-2.0	---	4.5-6.5	0
75E:						
Rubicon---------	0-4	0-5	---	1.0-6.0	4.5-6.0	0
	4-9	0-10	---	1.0-4.0	4.5-6.0	0
	9-22	0-10	---	1.0-4.0	4.5-6.0	0
	22-47	0-10	---	1.0-4.0	4.5-6.0	0
	47-80	0-5	1.0-2.0	---	4.5-6.5	0
75F:						
Rubicon---------	0-4	0-5	---	1.0-6.0	4.5-6.0	0
	4-9	0-10	---	1.0-4.0	4.5-6.0	0
	9-22	0-10	---	1.0-4.0	4.5-6.0	0
	22-47	0-10	---	1.0-4.0	4.5-6.0	0
	47-80	0-5	1.0-2.0	---	4.5-6.5	0
78:						
Pits, borrow.						
81B:						
Grayling--------	0-5	0-10	---	2.0-14	3.5-5.5	0
	5-17	0-10	---	1.0-4.0	3.5-5.5	0
	17-80	0-10	1.0-2.0	---	4.5-6.5	0
81D:						
Grayling--------	0-5	0-10	---	2.0-14	3.5-5.5	0
	5-17	0-10	---	1.0-4.0	3.5-5.5	0
	17-80	0-10	1.0-2.0	---	4.5-6.5	0
81E:						
Grayling--------	0-5	0-10	---	2.0-14	3.5-5.5	0
	5-17	0-10	---	1.0-4.0	3.5-5.5	0
	17-80	0-10	1.0-2.0	---	4.5-6.5	0
82B:						
Udorthents.						
83B:						
Udipsamments.						
86:						
Histosols.						
Aquents.						
87:						
Ausable---------	0-10	0-0	140-180	---	6.1-7.3	0
	10-80	0-10	5.0-25	---	6.1-7.8	0
90B:						
Chinwhisker-----	0-2	0-5	4.0-10	---	4.5-6.5	0
	2-7	0-10	---	2.0-3.0	4.5-6.0	0
	7-18	0-10	1.0-2.0	---	4.5-6.5	0
	18-27	0-5	1.0-2.0	---	4.5-7.3	0
	27-80	3-10	2.0-4.0	---	5.6-8.4	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
94F:						
Klacking--------	0-4	2-12	---	2.0-14	4.5-6.0	0
	4-12	0-10	2.0-6.0	---	4.5-7.3	0
	12-25	0-10	2.0-6.0	---	4.5-7.3	0
	25-33	0-15	2.0-6.0	---	4.5-7.3	0
	33-64	2-15	2.0-6.0	---	4.5-7.3	0
	64-80	0-10	2.0-6.0	---	4.5-7.3	0
McGinn----------	0-1	0-0	---	80-120	3.6-4.4	0
	1-2	5-15	---	5.0-10	5.1-5.5	0
	2-4	5-15	---	1.0-3.0	4.5-5.5	0
	4-16	5-15	---	1.0-3.0	5.1-5.5	0
	16-21	5-15	1.0-10	---	5.1-6.0	0
	21-25	5-15	1.0-10	---	5.1-6.0	0
	25-35	15-20	3.0-10	---	5.6-6.5	0
	35-80	5-15	1.0-5.0	---	7.4-8.4	10-30
95D:						
Menominee-------	0-4	2-15	2.0-10	---	4.5-6.5	---
	4-6	5-15	1.0-6.0	---	4.5-7.8	---
	6-13	5-15	1.0-6.0	---	4.5-7.8	---
	13-24	5-15	1.0-6.0	---	4.5-7.8	---
	24-40	18-35	5.0-20	---	5.1-7.8	1-10
	40-80	12-35	5.0-25	---	6.1-8.4	20-30
97:						
Colonville------	0-19	10-15	5.0-15	---	6.6-8.4	0
	19-35	0-18	1.0-10	---	7.9-8.4	0
	35-80	0-18	1.0-10	---	7.9-8.4	0
116B:						
Mancelona-------	0-3	0-5	2.0-10	---	5.1-7.3	0
	3-6	2-15	1.0-10	---	5.6-7.8	0
	6-20	2-15	1.0-10	---	5.6-7.8	0
	20-29	2-15	1.0-10	---	5.6-7.8	0
	29-35	10-25	4.0-15	---	6.1-7.8	---
	35-80	0-10	1.0-4.0	---	7.4-8.4	10-25
116C:						
Mancelona-------	0-3	0-5	2.0-10	---	5.1-7.3	0
	3-6	2-15	1.0-10	---	5.6-7.8	0
	6-20	2-15	1.0-10	---	5.6-7.8	0
	20-29	2-15	1.0-10	---	5.6-7.8	0
	29-35	10-25	4.0-15	---	6.1-7.8	---
	35-80	0-10	1.0-4.0	---	7.4-8.4	10-25
116D:						
Mancelona-------	0-3	0-5	2.0-10	---	5.1-7.3	0
	3-6	2-15	1.0-10	---	5.6-7.8	0
	6-20	2-15	1.0-10	---	5.6-7.8	0
	20-29	2-15	1.0-10	---	5.6-7.8	0
	29-35	10-25	4.0-15	---	6.1-7.8	---
	35-80	0-10	1.0-4.0	---	7.4-8.4	10-25
116E:						
Mancelona-------	0-3	0-5	2.0-10	---	5.1-7.3	0
	3-6	2-15	1.0-10	---	5.6-7.8	0
	6-20	2-15	1.0-10	---	5.6-7.8	0
	20-29	2-15	1.0-10	---	5.6-7.8	0
	29-35	10-25	4.0-15	---	6.1-7.8	---
	35-80	0-10	1.0-4.0	---	7.4-8.4	10-25

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
116F:						
Mancelona-------	0-3	0-5	2.0-10	---	5.1-7.3	0
	3-6	2-15	1.0-10	---	5.6-7.8	0
	6-20	2-15	1.0-10	---	5.6-7.8	0
	20-29	2-15	1.0-10	---	5.6-7.8	0
	29-35	10-25	4.0-15	---	6.1-7.8	---
	35-80	0-10	1.0-4.0	---	7.4-8.4	10-25
123D:						
Klacking--------	0-4	0-10	---	2.0-10	4.5-6.0	0
	4-23	0-10	2.0-6.0	---	4.5-7.3	0
	23-30	0-10	2.0-6.0	---	4.5-7.3	0
	30-80	2-15	2.0-6.0	---	4.5-7.3	0
125B:						
Melita----------	0-4	0-10	2.0-5.0	---	5.1-7.3	0
	4-8	0-15	1.0-6.0	---	5.1-7.3	0
	8-16	0-15	1.0-6.0	---	5.1-7.3	0
	16-43	0-15	1.0-6.0	---	5.1-7.3	0
	43-47	18-35	5.0-15	---	6.1-7.8	3-6
	47-80	18-35	8.0-20	---	7.4-8.4	15-30
147B:						
Lindquist-------	0-1	0-5	---	5.0-10	4.5-5.5	0
	1-3	0-5	---	1.0-2.0	4.5-5.5	0
	3-22	0-10	---	1.0-4.0	4.5-6.0	0
	22-80	2-12	1.0-4.0	---	5.6-7.3	0
147E:						
Lindquist-------	0-1	0-5	---	5.0-10	4.5-5.5	0
	1-3	0-5	---	1.0-2.0	4.5-5.5	0
	3-22	0-10	---	1.0-4.0	4.5-6.0	0
	22-80	2-12	1.0-4.0	---	5.6-7.3	0
307B:						
Klacking--------	0-4	0-10	---	2.0-10	4.5-6.0	0
	4-23	0-10	2.0-6.0	---	4.5-7.3	0
	23-30	0-10	2.0-6.0	---	4.5-7.3	0
	30-80	2-15	2.0-6.0	---	4.5-7.3	0
307E:						
Klacking--------	0-4	0-10	---	2.0-10	4.5-6.0	0
	4-23	0-10	2.0-6.0	---	4.5-7.3	0
	23-30	0-10	2.0-6.0	---	4.5-7.3	0
	30-80	2-15	2.0-6.0	---	4.5-7.3	0
307F:						
Klacking--------	0-4	0-10	---	2.0-10	4.5-6.0	0
	4-23	0-10	2.0-6.0	---	4.5-7.3	0
	23-30	0-10	2.0-6.0	---	4.5-7.3	0
	30-80	2-15	2.0-6.0	---	4.5-7.3	0
350B:						
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
350D:						
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0
350E:						
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0
351A:						
Allendale-------	0-10	0-12	4.0-20	---	4.5-7.3	0
	10-18	0-15	1.0-5.0	---	4.5-7.3	0
	18-25	0-15	1.0-5.0	---	4.5-7.3	0
	25-45	40-60	8.0-25	---	6.1-8.4	0-10
	45-80	40-60	8.0-25	---	6.1-8.4	0-10
Wakeley---------	0-3	---	80-120	---	5.6-7.8	0
	3-7	0-15	1.0-10	---	5.6-7.8	0
	7-41	0-15	1.0-10	---	5.6-7.8	0
	41-80	35-60	5.0-25	---	7.4-8.4	10-30
Dorval----------	0-18	0-0	100-160	---	5.1-7.8	0
	18-80	35-60	18-30	---	6.1-8.4	0-10
352B:						
Deford----------	0-6	---	80-120	---	5.6-7.8	---
	6-80	0-12	1.0-5.0	---	5.6-8.4	---
Au Gres---------	0-2	0-0	140-180	---	5.6-7.8	0
	2-8	0-8	5.0-10	---	3.6-7.3	0
	8-18	0-8	2.0-5.0	---	4.5-7.3	0
	18-35	0-8	1.0-2.0	---	5.1-7.3	0
	35-80	0-8	1.0-2.0	---	5.1-7.3	0
Croswell--------	0-2	0-0	---	50-100	2.0-4.4	0
	2-5	0-10	---	1.0-5.0	3.6-6.5	0
	5-11	0-10	1.0-4.0	---	4.5-7.3	0
	11-17	0-10	1.0-3.0	---	4.5-7.3	0
	17-33	0-10	1.0-2.0	---	5.1-8.4	0
	33-80	0-10	1.0-2.0	---	5.1-8.4	0
353B:						
Mancelona-------	0-3	0-5	2.0-10	---	5.1-7.3	0
	3-6	2-15	1.0-10	---	5.6-7.8	0
	6-20	2-15	1.0-10	---	5.6-7.8	0
	20-29	2-15	1.0-10	---	5.6-7.8	0
	29-35	10-25	4.0-15	---	6.1-7.8	---
	35-80	0-10	1.0-4.0	---	7.4-8.4	10-25
Ossineke--------	0-10	5-20	---	3.0-14	4.5-6.0	0
	10-15	5-20	1.0-8.0	---	5.1-6.0	0
	15-22	10-27	2.0-11	---	5.1-6.0	0
	22-35	10-35	3.0-14	---	5.6-6.5	0
	35-41	20-35	3.0-14	---	6.6-8.4	0-10
	41-80	11-27	2.0-14	---	7.4-8.4	10-30

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
353B:						
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0
354F:						
Mancelona-------	0-3	0-5	2.0-10	---	5.1-7.3	0
	3-6	2-15	1.0-10	---	5.6-7.8	0
	6-20	2-15	1.0-10	---	5.6-7.8	0
	20-29	2-15	1.0-10	---	5.6-7.8	0
	29-35	10-25	4.0-15	---	6.1-7.8	---
	35-80	0-10	1.0-4.0	---	7.4-8.4	10-25
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0
359C:						
Algonquin-------	0-5	15-27	10-25	---	6.6-7.3	0
	5-10	12-18	5.0-10	---	6.6-7.3	0
	10-17	35-60	10-20	---	7.4-8.4	0
	17-24	35-60	10-20	---	7.9-8.4	10-20
	24-80	35-60	10-20	---	7.9-8.4	20-30
Negwegon--------	0-5	12-27	10-25	---	6.1-7.8	0
	5-8	18-60	10-20	---	6.1-7.8	0
	8-13	18-60	10-20	---	6.1-7.8	0
	13-34	35-60	10-20	---	6.1-7.8	0
	34-80	18-60	10-20	---	7.9-8.4	20-30
Dorval----------	0-18	0-0	100-160	---	5.1-7.8	0
	18-80	35-60	18-30	---	6.1-8.4	0-10
360:						
Wakeley---------	0-3	---	80-120	---	5.6-7.8	0
	3-7	0-15	1.0-10	---	5.6-7.8	0
	7-41	0-15	1.0-10	---	5.6-7.8	0
	41-80	35-60	5.0-25	---	7.4-8.4	10-30
361B:						
Allendale-------	0-10	0-12	4.0-20	---	4.5-7.3	0
	10-18	0-15	1.0-5.0	---	4.5-7.3	0
	18-25	0-15	1.0-5.0	---	4.5-7.3	0
	25-45	40-60	8.0-25	---	6.1-8.4	0-10
	45-80	40-60	8.0-25	---	6.1-8.4	0-10
Dorval----------	0-18	0-0	100-160	---	5.1-7.8	0
	18-80	35-60	18-30	---	6.1-8.4	0-10
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
362B:						
Millersburg-----	0-2	3-12	---	5.0-20	3.6-6.5	0
	2-5	2-12	1.0-5.0	---	4.5-7.3	0
	5-10	2-12	1.0-5.0	---	4.5-7.3	0
	10-18	2-18	1.0-5.0	---	4.5-7.3	0
	18-26	2-18	1.0-5.0	---	4.5-7.3	0
	26-34	8-18	2.0-5.0	---	6.1-7.8	0-10
	34-43	8-18	2.0-5.0	---	6.1-7.8	0-10
	43-80	3-12	2.0-5.0	---	7.4-8.4	10-30
362D:						
Millersburg-----	0-2	3-12	---	5.0-20	3.6-6.5	0
	2-5	2-12	1.0-5.0	---	4.5-7.3	0
	5-10	2-12	1.0-5.0	---	4.5-7.3	0
	10-18	2-18	1.0-5.0	---	4.5-7.3	0
	18-26	2-18	1.0-5.0	---	4.5-7.3	0
	26-34	8-18	2.0-5.0	---	6.1-7.8	0-10
	34-43	8-18	2.0-5.0	---	6.1-7.8	0-10
	43-80	3-12	2.0-5.0	---	7.4-8.4	10-30
362E:						
Millersburg-----	0-2	3-12	---	5.0-20	3.6-6.5	0
	2-5	2-12	1.0-5.0	---	4.5-7.3	0
	5-10	2-12	1.0-5.0	---	4.5-7.3	0
	10-18	2-18	1.0-5.0	---	4.5-7.3	0
	18-26	2-18	1.0-5.0	---	4.5-7.3	0
	26-34	8-18	2.0-5.0	---	6.1-7.8	0-10
	34-43	8-18	2.0-5.0	---	6.1-7.8	0-10
	43-80	3-12	2.0-5.0	---	7.4-8.4	10-30
363D:						
Mancelona-------	0-3	0-5	2.0-10	---	5.1-7.3	0
	3-6	2-15	1.0-10	---	5.6-7.8	0
	6-20	2-15	1.0-10	---	5.6-7.8	0
	20-29	2-15	1.0-10	---	5.6-7.8	0
	29-35	10-25	4.0-15	---	6.1-7.8	---
	35-80	0-10	1.0-4.0	---	7.4-8.4	10-25
Millersburg-----	0-2	3-12	---	5.0-20	3.6-6.5	0
	2-5	2-12	1.0-5.0	---	4.5-7.3	0
	5-10	2-12	1.0-5.0	---	4.5-7.3	0
	10-18	2-18	1.0-5.0	---	4.5-7.3	0
	18-26	2-18	1.0-5.0	---	4.5-7.3	0
	26-34	8-18	2.0-5.0	---	6.1-7.8	0-10
	34-43	8-18	2.0-5.0	---	6.1-7.8	0-10
	43-80	3-12	2.0-5.0	---	7.4-8.4	10-30
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0
364E:						
Mancelona-------	0-3	0-5	2.0-10	---	5.1-7.3	0
	3-6	2-15	1.0-10	---	5.6-7.8	0
	6-20	2-15	1.0-10	---	5.6-7.8	0
	20-29	2-15	1.0-10	---	5.6-7.8	0
	29-35	10-25	4.0-15	---	6.1-7.8	---
	35-80	0-10	1.0-4.0	---	7.4-8.4	10-25

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
364E:						
Millersburg-----	0-2	3-12	---	5.0-20	3.6-6.5	0
	2-5	2-12	1.0-5.0	---	4.5-7.3	0
	5-10	2-12	1.0-5.0	---	4.5-7.3	0
	10-18	2-18	1.0-5.0	---	4.5-7.3	0
	18-26	2-18	1.0-5.0	---	4.5-7.3	0
	26-34	8-18	2.0-5.0	---	6.1-7.8	0-10
	34-43	8-18	2.0-5.0	---	6.1-7.8	0-10
	43-80	3-12	2.0-5.0	---	7.4-8.4	10-30
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0
369:						
Deford----------	0-6	---	80-120	---	5.6-7.8	---
	6-80	0-12	1.0-5.0	---	5.6-8.4	---
371:						
Springport------	0-3	18-35	15-35	---	6.6-7.3	0
	3-9	18-60	10-20	---	7.4-8.4	0
	9-13	18-60	10-20	---	7.4-8.4	0
	13-35	35-60	10-20	---	7.4-8.4	10-20
	35-80	35-60	10-20	---	7.4-8.4	20-30
380:						
Access denied.						
384B:						
Iosco-----------	0-3	0-10	2.0-6.0	---	5.1-7.3	0
	3-12	0-10	2.0-10	---	5.1-6.5	0
	12-15	0-10	2.0-10	---	5.1-6.5	0
	15-18	0-10	2.0-10	---	5.1-6.5	0
	18-30	5-25	2.0-10	---	5.1-6.5	0
	30-42	18-35	4.0-10	---	6.1-7.8	3-6
	42-80	15-35	8.0-20	---	6.6-8.4	15-30
385D:						
Lindquist-------	0-1	0-5	---	5.0-10	4.5-5.5	0
	1-3	0-5	---	1.0-2.0	4.5-5.5	0
	3-22	0-10	---	1.0-4.0	4.5-6.0	0
	22-80	2-12	1.0-4.0	---	5.6-7.3	0
386B:						
Mancelona-------	0-3	0-5	2.0-10	---	5.1-7.3	0
	3-6	2-15	1.0-10	---	5.6-7.8	0
	6-20	2-15	1.0-10	---	5.6-7.8	0
	20-29	2-15	1.0-10	---	5.6-7.8	0
	29-35	10-25	4.0-15	---	6.1-7.8	---
	35-80	0-10	1.0-4.0	---	7.4-8.4	10-25
Rubicon---------	0-4	0-5	---	1.0-6.0	4.5-6.0	0
	4-9	0-10	---	1.0-4.0	4.5-6.0	0
	9-22	0-10	---	1.0-4.0	4.5-6.0	0
	22-47	0-10	---	1.0-4.0	4.5-6.0	0
	47-80	0-5	1.0-2.0	---	4.5-6.5	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
386D:						
Mancelona-------	0-3	0-5	2.0-10	---	5.1-7.3	0
	3-6	2-15	1.0-10	---	5.6-7.8	0
	6-20	2-15	1.0-10	---	5.6-7.8	0
	20-29	2-15	1.0-10	---	5.6-7.8	0
	29-35	10-25	4.0-15	---	6.1-7.8	---
	35-80	0-10	1.0-4.0	---	7.4-8.4	10-25
Rubicon---------	0-4	0-5	---	1.0-6.0	4.5-6.0	0
	4-9	0-10	---	1.0-4.0	4.5-6.0	0
	9-22	0-10	---	1.0-4.0	4.5-6.0	0
	22-47	0-10	---	1.0-4.0	4.5-6.0	0
	47-80	0-5	1.0-2.0	---	4.5-6.5	0
387E:						
Mancelona-------	0-3	0-5	2.0-10	---	5.1-7.3	0
	3-6	2-15	1.0-10	---	5.6-7.8	0
	6-20	2-15	1.0-10	---	5.6-7.8	0
	20-29	2-15	1.0-10	---	5.6-7.8	0
	29-35	10-25	4.0-15	---	6.1-7.8	---
	35-80	0-10	1.0-4.0	---	7.4-8.4	10-25
Rubicon---------	0-4	0-5	---	1.0-6.0	4.5-6.0	0
	4-9	0-10	---	1.0-4.0	4.5-6.0	0
	9-22	0-10	---	1.0-4.0	4.5-6.0	0
	22-47	0-10	---	1.0-4.0	4.5-6.0	0
	47-80	0-5	1.0-2.0	---	4.5-6.5	0
387F:						
Mancelona-------	0-3	0-5	2.0-10	---	5.1-7.3	0
	3-6	2-15	1.0-10	---	5.6-7.8	0
	6-20	2-15	1.0-10	---	5.6-7.8	0
	20-29	2-15	1.0-10	---	5.6-7.8	0
	29-35	10-25	4.0-15	---	6.1-7.8	---
	35-80	0-10	1.0-4.0	---	7.4-8.4	10-25
Rubicon---------	0-4	0-5	---	1.0-6.0	4.5-6.0	0
	4-9	0-10	---	1.0-4.0	4.5-6.0	0
	9-22	0-10	---	1.0-4.0	4.5-6.0	0
	22-47	0-10	---	1.0-4.0	4.5-6.0	0
	47-80	0-5	1.0-2.0	---	4.5-6.5	0
388B:						
Millersburg-----	0-2	3-12	---	5.0-20	3.6-6.5	0
	2-5	2-12	1.0-5.0	---	4.5-7.3	0
	5-10	2-12	1.0-5.0	---	4.5-7.3	0
	10-18	2-18	1.0-5.0	---	4.5-7.3	0
	18-26	2-18	1.0-5.0	---	4.5-7.3	0
	26-34	8-18	2.0-5.0	---	6.1-7.8	0-10
	34-43	8-18	2.0-5.0	---	6.1-7.8	0-10
	43-80	3-12	2.0-5.0	---	7.4-8.4	10-30
Klacking--------	0-4	0-10	---	2.0-10	4.5-6.0	0
	4-23	0-10	2.0-6.0	---	4.5-7.3	0
	23-30	0-10	2.0-6.0	---	4.5-7.3	0
	30-80	2-15	2.0-6.0	---	4.5-7.3	0
Graycalm--------	0-2	0-10	4.0-10	---	4.5-6.5	0
	2-16	0-15	2.0-4.0	---	4.5-7.3	---
	16-27	0-10	1.0-5.0	---	4.5-7.3	---
	27-80	0-10	0.0-2.0	---	5.6-8.4	---

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
388D:						
Millersburg-----	0-2	3-12	---	5.0-20	3.6-6.5	0
	2-5	2-12	1.0-5.0	---	4.5-7.3	0
	5-10	2-12	1.0-5.0	---	4.5-7.3	0
	10-18	2-18	1.0-5.0	---	4.5-7.3	0
	18-26	2-18	1.0-5.0	---	4.5-7.3	0
	26-34	8-18	2.0-5.0	---	6.1-7.8	0-10
	34-43	8-18	2.0-5.0	---	6.1-7.8	0-10
	43-80	3-12	2.0-5.0	---	7.4-8.4	10-30
Klacking--------	0-4	0-10	---	2.0-10	4.5-6.0	0
	4-23	0-10	2.0-6.0	---	4.5-7.3	0
	23-30	0-10	2.0-6.0	---	4.5-7.3	0
	30-80	2-15	2.0-6.0	---	4.5-7.3	0
Graycalm--------	0-2	0-10	4.0-10	---	4.5-6.5	0
	2-16	0-15	2.0-4.0	---	4.5-7.3	---
	16-27	0-10	1.0-5.0	---	4.5-7.3	---
	27-80	0-10	0.0-2.0	---	5.6-8.4	---
388E:						
Millersburg-----	0-2	3-12	---	5.0-20	3.6-6.5	0
	2-5	2-12	1.0-5.0	---	4.5-7.3	0
	5-10	2-12	1.0-5.0	---	4.5-7.3	0
	10-18	2-18	1.0-5.0	---	4.5-7.3	0
	18-26	2-18	1.0-5.0	---	4.5-7.3	0
	26-34	8-18	2.0-5.0	---	6.1-7.8	0-10
	34-43	8-18	2.0-5.0	---	6.1-7.8	0-10
	43-80	3-12	2.0-5.0	---	7.4-8.4	10-30
Klacking--------	0-4	0-10	---	2.0-10	4.5-6.0	0
	4-23	0-10	2.0-6.0	---	4.5-7.3	0
	23-30	0-10	2.0-6.0	---	4.5-7.3	0
	30-80	2-15	2.0-6.0	---	4.5-7.3	0
Graycalm--------	0-2	0-10	4.0-10	---	4.5-6.5	0
	2-16	0-15	2.0-4.0	---	4.5-7.3	---
	16-27	0-10	1.0-5.0	---	4.5-7.3	---
	27-80	0-10	0.0-2.0	---	5.6-8.4	---
389B:						
Horsehead-------	0-2	0-8	2.0-6.0	---	5.1-6.0	0
	2-7	0-8	2.0-5.0	---	5.1-6.0	0
	7-18	5-15	2.0-8.0	---	5.5-7.0	0
	18-37	5-15	2.0-8.0	---	5.5-7.0	0
	37-80	0-8	2.0-5.0	---	7.4-8.4	10-25
389D:						
Horsehead-------	0-2	0-8	2.0-6.0	---	5.1-6.0	0
	2-7	0-8	2.0-5.0	---	5.1-6.0	0
	7-18	5-15	2.0-8.0	---	5.5-7.0	0
	18-37	5-15	2.0-8.0	---	5.5-7.0	0
	37-80	0-8	2.0-5.0	---	7.4-8.4	10-25
389E:						
Horsehead-------	0-2	0-8	2.0-6.0	---	5.1-6.0	0
	2-7	0-8	2.0-5.0	---	5.1-6.0	0
	7-18	5-15	2.0-8.0	---	5.5-7.0	0
	18-37	5-15	2.0-8.0	---	5.5-7.0	0
	37-80	0-8	2.0-5.0	---	7.4-8.4	10-25

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
390B:						
Horsehead-------	0-2	0-8	2.0-6.0	---	5.1-6.0	0
	2-27	0-8	2.0-5.0	---	5.1-6.0	0
	27-36	5-15	2.0-8.0	---	5.5-7.0	0
	36-80	0-8	2.0-5.0	---	7.0-8.0	10-25
Graycalm--------	0-2	0-10	4.0-10	---	4.5-6.5	0
	2-16	0-15	2.0-4.0	---	4.5-7.3	---
	16-27	0-10	1.0-5.0	---	4.5-7.3	---
	27-80	0-10	0.0-2.0	---	5.6-8.4	---
390D:						
Horsehead-------	0-2	0-8	2.0-6.0	---	5.1-6.0	0
	2-27	0-8	2.0-5.0	---	5.1-6.0	0
	27-36	5-15	2.0-8.0	---	5.5-7.0	0
	36-80	0-8	2.0-5.0	---	7.0-8.0	10-25
Graycalm--------	0-2	0-10	4.0-10	---	4.5-6.5	0
	2-16	0-15	2.0-4.0	---	4.5-7.3	---
	16-27	0-10	1.0-5.0	---	4.5-7.3	---
	27-80	0-10	0.0-2.0	---	5.6-8.4	---
390E:						
Horsehead-------	0-2	0-8	2.0-6.0	---	5.1-6.0	0
	2-27	0-8	2.0-5.0	---	5.1-6.0	0
	27-36	5-15	2.0-8.0	---	5.5-7.0	0
	36-80	0-8	2.0-5.0	---	7.0-8.0	10-25
Graycalm--------	0-2	0-10	4.0-10	---	4.5-6.5	0
	2-16	0-15	2.0-4.0	---	4.5-7.3	---
	16-27	0-10	1.0-5.0	---	4.5-7.3	---
	27-80	0-10	0.0-2.0	---	5.6-8.4	---
390F:						
Horsehead-------	0-2	0-8	2.0-6.0	---	5.1-6.0	0
	2-27	0-8	2.0-5.0	---	5.1-6.0	0
	27-36	5-15	2.0-8.0	---	5.5-7.0	0
	36-80	0-8	2.0-5.0	---	7.0-8.0	10-25
Graycalm--------	0-2	0-10	4.0-10	---	4.5-6.5	0
	2-16	0-15	2.0-4.0	---	4.5-7.3	---
	16-27	0-10	1.0-5.0	---	4.5-7.3	---
	27-80	0-10	0.0-2.0	---	5.6-8.4	---
391B:						
Horsehead-------	0-2	0-8	2.0-6.0	---	5.1-6.0	0
	2-27	0-8	2.0-5.0	---	5.1-6.0	0
	27-36	5-15	2.0-8.0	---	5.5-7.0	0
	36-80	0-8	2.0-5.0	---	7.0-8.0	10-25
391D:						
Horsehead-------	0-2	0-8	2.0-6.0	---	5.1-6.0	0
	2-27	0-8	2.0-5.0	---	5.1-6.0	0
	27-36	5-15	2.0-8.0	---	5.5-7.0	0
	36-80	0-8	2.0-5.0	---	7.0-8.0	10-25
392:						
Caffey----------	0-9	2-10	20-45	---	6.6-7.3	0
	9-21	2-10	1.0-5.0	---	6.6-8.4	0-20
	21-80	8-27	2.0-10	---	7.4-8.4	15-30

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
393B:						
Morganlake------	0-4	---	---	80-100	3.6-5.0	0
	4-8	1-10	---	2.0-7.0	3.5-7.3	0
	8-17	1-10	---	1.0-7.0	3.5-6.0	0
	17-32	1-27	---	1.0-7.0	3.5-6.0	0
	32-46	27-35	5.0-14	---	5.6-7.8	0
	46-66	15-35	5.0-14	---	7.4-8.4	10-30
	66-80	15-35	5.0-14	---	7.4-8.4	10-30
393C:						
Morganlake------	0-4	---	---	80-100	3.6-5.0	0
	4-8	1-10	---	2.0-7.0	3.5-7.3	0
	8-17	1-10	---	1.0-7.0	3.5-6.0	0
	17-32	1-27	---	1.0-7.0	3.5-6.0	0
	32-46	27-35	5.0-14	---	5.6-7.8	0
	46-66	15-35	5.0-14	---	7.4-8.4	10-30
	66-80	15-35	5.0-14	---	7.4-8.4	10-30
394B:						
Ocqueoc---------	0-4	0-10	---	3.0-14	4.5-6.0	0
	4-7	0-15	---	4.0-15	4.5-6.0	0
	7-23	0-15	3.0-14	---	4.5-6.5	0
	23-28	0-15	3.0-14	---	4.5-6.5	0
	28-80	8-27	6.0-22	---	5.6-7.8	0
399D:						
Menominee-------	0-4	2-15	2.0-10	---	4.5-6.5	---
	4-6	5-15	1.0-6.0	---	4.5-7.8	---
	6-13	5-15	1.0-6.0	---	4.5-7.8	---
	13-24	5-15	1.0-6.0	---	4.5-7.8	---
	24-40	18-35	5.0-20	---	5.1-7.8	1-10
	40-80	12-35	5.0-25	---	6.1-8.4	20-30
Bamfield--------	0-9	5-20	5.0-15	---	4.5-5.0	0
	9-10	5-20	2.0-10	---	5.1-5.5	0
	10-14	5-35	2.0-10	---	5.1-5.5	0
	14-23	28-35	5.0-15	---	5.6-8.4	0-10
	23-29	18-35	5.0-15	---	7.9-8.4	10-30
	29-61	18-35	5.0-15	---	7.9-8.4	10-30
	60-80	0-5	1.0-2.0	---	7.9-8.4	5-25
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0
400F:						
Menominee-------	0-4	2-15	2.0-10	---	4.5-6.5	---
	4-6	5-15	1.0-6.0	---	4.5-7.8	---
	6-13	5-15	1.0-6.0	---	4.5-7.8	---
	13-24	5-15	1.0-6.0	---	4.5-7.8	---
	24-40	18-35	5.0-20	---	5.1-7.8	1-10
	40-80	12-35	5.0-25	---	6.1-8.4	20-30
Bamfield--------	0-9	5-20	5.0-15	---	4.5-5.0	0
	9-10	5-20	2.0-10	---	5.1-5.5	0
	10-14	5-35	2.0-10	---	5.1-5.5	0
	14-23	28-35	5.0-15	---	5.6-8.4	0-10
	23-29	18-35	5.0-15	---	7.9-8.4	10-30
	29-61	18-35	5.0-15	---	7.9-8.4	10-30
	60-80	0-5	1.0-2.0	---	7.9-8.4	5-25

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
400F:						
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0
420A:						
Otisco----------	0-5	0-15	20-30	---	5.6-7.8	0
	5-10	2-12	1.0-5.0	---	5.1-6.5	0
	10-25	2-12	1.0-5.0	---	5.1-6.5	0
	25-38	2-12	1.0-5.0	---	5.1-6.5	0
	38-45	5-15	1.0-10	---	5.6-7.8	0
	45-60	5-15	1.0-5.0	---	5.6-7.8	0
	60-80	0-12	1.0-5.0	---	5.6-7.8	5-15
421A:						
Richter---------	0-7	0-10	5.0-10	---	5.6-7.3	0
	7-11	10-22	5.0-15	---	5.6-7.3	0
	11-19	10-22	5.0-15	---	5.6-7.3	0
	19-25	10-22	5.0-15	---	5.6-7.3	0
	25-29	10-22	5.0-15	---	5.6-7.3	0
	29-80	2-25	1.0-10	---	7.4-8.4	0-20
Caffey----------	0-9	2-10	20-45	---	6.6-7.3	0
	9-21	2-10	1.0-5.0	---	6.6-8.4	0-20
	21-80	8-27	2.0-10	---	7.4-8.4	15-30
422B:						
Morganlake------	0-4	---	---	80-100	3.6-5.0	0
	4-8	1-10	---	2.0-7.0	3.5-7.3	0
	8-17	1-10	---	1.0-7.0	3.5-6.0	0
	17-32	1-27	---	1.0-7.0	3.5-6.0	0
	32-46	27-35	5.0-14	---	5.6-7.8	0
	46-66	15-35	5.0-14	---	7.4-8.4	10-30
	66-80	15-35	5.0-14	---	7.4-8.4	10-30
Iosco-----------	0-3	0-10	2.0-6.0	---	5.1-7.3	0
	3-12	0-10	2.0-10	---	5.1-6.5	0
	12-15	0-10	2.0-10	---	5.1-6.5	0
	15-18	0-10	2.0-10	---	5.1-6.5	0
	18-30	5-25	2.0-10	---	5.1-6.5	0
	30-42	18-35	4.0-10	---	6.1-7.8	3-6
	42-80	15-35	8.0-20	---	6.6-8.4	15-30
Deford----------	0-6	---	80-120	---	5.6-7.8	---
	6-80	0-12	1.0-5.0	---	5.6-8.4	---
423B:						
Richter---------	0-7	0-10	5.0-10	---	5.6-7.3	0
	7-11	10-22	5.0-15	---	5.6-7.3	0
	11-19	10-22	5.0-15	---	5.6-7.3	0
	19-25	10-22	5.0-15	---	5.6-7.3	0
	25-29	10-22	5.0-15	---	5.6-7.3	0
	29-80	2-25	1.0-10	---	7.4-8.4	0-20
Algonquin-------	0-5	15-27	10-25	---	6.6-7.3	0
	5-10	12-18	5.0-10	---	6.6-7.3	0
	10-17	35-60	10-20	---	7.4-8.4	0
	17-24	35-60	10-20	---	7.9-8.4	10-20
	24-80	35-60	10-20	---	7.9-8.4	20-30

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
424B:						
Morganlake------	0-4	---	---	80-100	3.6-5.0	0
	4-8	1-10	---	2.0-7.0	3.5-7.3	0
	8-17	1-10	---	1.0-7.0	3.5-6.0	0
	17-32	1-27	---	1.0-7.0	3.5-6.0	0
	32-46	27-35	5.0-14	---	5.6-7.8	0
	46-66	15-35	5.0-14	---	7.4-8.4	10-30
	66-80	15-35	5.0-14	---	7.4-8.4	10-30
Ossineke--------	0-8	5-20	3.0-14	---	4.5-6.0	0
	8-13	5-20	1.0-8.0	---	5.1-6.0	0
	13-21	11-27	2.0-11	---	5.1-6.0	0
	21-38	18-35	3.0-14	---	5.6-6.5	0
	38-51	18-35	3.0-14	---	6.6-8.4	10-30
	51-77	18-35	3.0-14	---	6.6-8.4	10-30
	77-80	0-5	1.0-2.0	---	7.4-8.4	5-25
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0
424C:						
Morganlake------	0-4	---	---	80-100	3.6-5.0	0
	4-8	1-10	---	2.0-7.0	3.5-7.3	0
	8-17	1-10	---	1.0-7.0	3.5-6.0	0
	17-32	1-27	---	1.0-7.0	3.5-6.0	0
	32-46	27-35	5.0-14	---	5.6-7.8	0
	46-66	15-35	5.0-14	---	7.4-8.4	10-30
	66-80	15-35	5.0-14	---	7.4-8.4	10-30
Ossineke--------	0-8	5-20	3.0-14	---	4.5-6.0	0
	8-13	5-20	1.0-8.0	---	5.1-6.0	0
	13-21	11-27	2.0-11	---	5.1-6.0	0
	21-38	18-35	3.0-14	---	5.6-6.5	0
	38-51	18-35	3.0-14	---	6.6-8.4	10-30
	51-77	18-35	3.0-14	---	6.6-8.4	10-30
	77-80	0-5	1.0-2.0	---	7.4-8.4	5-25
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0
450B:						
Millersburg-----	0-2	3-12	---	5.0-20	3.6-6.5	0
	2-5	2-12	1.0-5.0	---	4.5-7.3	0
	5-10	2-12	1.0-5.0	---	4.5-7.3	0
	10-18	2-18	1.0-5.0	---	4.5-7.3	0
	18-26	2-18	1.0-5.0	---	4.5-7.3	0
	26-34	8-18	2.0-5.0	---	6.1-7.8	0-10
	34-43	8-18	2.0-5.0	---	6.1-7.8	0-10
	43-80	3-12	2.0-5.0	---	7.4-8.4	10-30
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
450D:						
Millersburg-----	0-2	3-12	---	5.0-20	3.6-6.5	0
	2-5	2-12	1.0-5.0	---	4.5-7.3	0
	5-10	2-12	1.0-5.0	---	4.5-7.3	0
	10-18	2-18	1.0-5.0	---	4.5-7.3	0
	18-26	2-18	1.0-5.0	---	4.5-7.3	0
	26-34	8-18	2.0-5.0	---	6.1-7.8	0-10
	34-43	8-18	2.0-5.0	---	6.1-7.8	0-10
	43-80	3-12	2.0-5.0	---	7.4-8.4	10-30
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0
450E:						
Millersburg-----	0-2	3-12	---	5.0-20	3.6-6.5	0
	2-5	2-12	1.0-5.0	---	4.5-7.3	0
	5-10	2-12	1.0-5.0	---	4.5-7.3	0
	10-18	2-18	1.0-5.0	---	4.5-7.3	0
	18-26	2-18	1.0-5.0	---	4.5-7.3	0
	26-34	8-18	2.0-5.0	---	6.1-7.8	0-10
	34-43	8-18	2.0-5.0	---	6.1-7.8	0-10
	43-80	3-12	2.0-5.0	---	7.4-8.4	10-30
Blue Lake-------	0-3	0-5	1.0-5.0	---	5.1-6.5	0
	3-6	5-12	2.0-6.0	---	5.1-6.5	0
	6-25	5-12	2.0-6.0	---	5.1-6.5	0
	25-80	8-15	1.0-8.0	---	5.1-6.5	0
451B:						
Annalake--------	0-9	5-15	3.0-20	---	4.5-7.8	0
	9-11	0-10	1.0-15	---	4.5-7.8	0
	11-16	0-10	---	3.0-15	4.5-6.0	0
	16-30	5-15	1.0-15	---	4.5-7.3	0
	30-37	8-18	2.0-15	---	4.5-7.3	0
	37-57	5-15	1.0-15	---	5.1-8.4	0-10
	57-80	5-15	1.0-15	---	5.1-8.4	0-10
451C:						
Annalake--------	0-9	5-15	3.0-20	---	4.5-7.8	0
	9-11	0-10	1.0-15	---	4.5-7.8	0
	11-16	0-10	---	3.0-15	4.5-6.0	0
	16-30	5-15	1.0-15	---	4.5-7.3	0
	30-37	8-18	2.0-15	---	4.5-7.3	0
	37-57	5-15	1.0-15	---	5.1-8.4	0-10
	57-80	5-15	1.0-15	---	5.1-8.4	0-10
452D:						
Bamfield--------	0-9	5-20	5.0-15	---	4.5-5.0	0
	9-10	5-20	2.0-10	---	5.1-5.5	0
	10-14	5-35	2.0-10	---	5.1-5.5	0
	14-23	28-35	5.0-15	---	5.6-8.4	0-10
	23-29	18-35	5.0-15	---	7.9-8.4	10-30
	29-61	18-35	5.0-15	---	7.9-8.4	10-30
	60-80	0-5	1.0-2.0	---	7.9-8.4	5-25

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	meq/100g	pH	Pct
452E:						
Bamfield--------	0-9	5-20	5.0-15	---	4.5-5.0	0
	9-10	5-20	2.0-10	---	5.1-5.5	0
	10-14	5-35	2.0-10	---	5.1-5.5	0
	14-23	28-35	5.0-15	---	5.6-8.4	0-10
	23-29	18-35	5.0-15	---	7.9-8.4	10-30
	29-61	18-35	5.0-15	---	7.9-8.4	10-30
	60-80	0-5	1.0-2.0	---	7.9-8.4	5-25
453B:						
Ossineke--------	0-8	5-20	3.0-14	---	4.5-6.0	0
	8-13	5-20	1.0-8.0	---	5.1-6.0	0
	13-21	11-27	2.0-11	---	5.1-6.0	0
	21-38	18-35	3.0-14	---	5.6-6.5	0
	38-51	18-35	3.0-14	---	6.6-8.4	10-30
	51-77	18-35	3.0-14	---	6.6-8.4	10-30
	77-80	0-5	1.0-2.0	---	7.4-8.4	5-25

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	Subsidence		Potential for frost action	Risk of corrosion	
	Initial	Total		Uncoated steel	Concrete
	In	In			
13:					
Tawas	4-15	25-30	High	High	Moderate.
Lupton	6-18	50-55	High	High	Low.
14:					
Dawson	---	30-36	High	High	High.
Loxley	6-18	50-55	High	High	High.
16B:					
Graycalm	---	---	Low	Low	Moderate.
17B:					
Croswell	---	---	Low	Low	Moderate.
18A:					
Au Gres	---	---	Moderate	Low	Moderate.
24A:					
Kinross	---	---	Moderate	High	Moderate.
Au Gres	---	---	Moderate	Low	Moderate.
32B:					
Kellogg	---	---	Low	High	Low.
32C:					
Kellogg	---	---	Low	High	Low.
37B:					
Richter	---	---	High	High	Moderate.
41B:					
McGinn	---	---	Moderate	Low	Moderate.
41C:					
McGinn	---	---	Moderate	Low	Moderate.
44B:					
Ossineke	---	---	Moderate	Moderate	Moderate.
44C:					
Ossineke	---	---	Moderate	Moderate	Moderate.
47D:					
Graycalm	---	---	Low	Low	Moderate.
47F:					
Graycalm	---	---	Low	Low	Moderate.
53B:					
Negwegon	---	---	Moderate	High	Low.
53C:					
Negwegon	---	---	Moderate	High	Low.

Table 21.--Soil Features--Continued

Map symbol and soil name	Subsidence		Potential for frost action	Risk of corrosion	
	Initial	Total		Uncoated steel	Concrete
	In	In			
54A:					
Algonquin	---	---	High	High	Low.
59B:					
Algonquin	---	---	High	High	Low.
Springport	---	---	High	High	Low.
62A:					
Allendale	---	---	Moderate	High	Moderate.
72:					
Dorval	4-12	25-30	High	High	Moderate.
75B:					
Rubicon	---	---	Low	Low	High.
75D:					
Rubicon	---	---	Low	Low	High.
75E:					
Rubicon	---	---	Low	Low	High.
75F:					
Rubicon	---	---	Low	Low	High.
78:					
Pits, borrow.					
81B:					
Grayling	---	---	Low	Low	Moderate.
81D:					
Grayling	---	---	Low	Low	Moderate.
81E:					
Grayling	---	---	Low	Low	Moderate.
82B:					
Udorthents.					
83B:					
Udipsamments	---	---	Low	Low	Moderate.
86:					
Histosols	---	---	High	---	---
Aquents	---	---	High	---	---
87:					
Ausable	---	---	Moderate	High	Low.
90B:					
Chinwhisker	---	---	Low	Low	Moderate.
94F:					
Klacking	---	---	Low	Low	Moderate.
McGinn	---	---	Moderate	Low	Moderate.
95D:					
Menominee	---	---	Low	Low	Moderate.

Table 21.--Soil Features--Continued

Map symbol and soil name	Subsidence		Potential for frost action	Risk of corrosion	
	Initial	Total		Uncoated steel	Concrete
	In	In			
97:					
Colonville	---	---	High	Low	Low.
116B:					
Mancelona	---	---	Low	Low	Low.
116C:					
Mancelona	---	---	Low	Low	Low.
116D:					
Mancelona	---	---	Low	Low	Low.
116E:					
Mancelona	---	---	Low	Low	Low.
116F:					
Mancelona	---	---	Low	Low	Low.
123D:					
Klacking	---	---	Low	Low	Moderate.
125B:					
Melita	---	---	Low	Low	Moderate.
147B:					
Lindquist	---	---	Low	Low	Moderate.
147E:					
Lindquist	---	---	Low	Low	Moderate.
307B:					
Klacking	---	---	Low	Low	Moderate.
307E:					
Klacking	---	---	Low	Low	Moderate.
307F:					
Klacking	---	---	Low	Low	Moderate.
350B:					
Blue Lake	---	---	Low	Low	Moderate.
350D:					
Blue Lake	---	---	Low	Low	Moderate.
350E:					
Blue Lake	---	---	Low	Low	Moderate.
351A:					
Allendale	---	---	Moderate	High	Moderate.
Wakeley	---	---	Moderate	High	Moderate.
Dorval	4-12	25-30	High	High	Moderate.
352B:					
Deford	---	---	Moderate	Low	Moderate.
Au Gres	---	---	Moderate	Low	Moderate.
Croswell	---	---	Low	Low	Moderate.

Table 21.--Soil Features--Continued

Map symbol and soil name	Subsidence Initial	Subsidence Total	Potential for frost action	Risk of corrosion Uncoated steel	Risk of corrosion Concrete
	In	In			
353B:					
Mancelona	---	---	Low	Low	Low.
Ossineke	---	---	Moderate	Moderate	Moderate.
Blue Lake	---	---	Low	Low	Moderate.
354F:					
Mancelona	---	---	Low	Low	Low.
Blue Lake	---	---	Low	Low	Moderate.
359C:					
Algonquin	---	---	High	High	Low.
Negwegon	---	---	Moderate	High	Low.
Dorval	4-12	25-30	High	High	Moderate.
360:					
Wakeley	---	---	Moderate	High	Moderate.
361B:					
Allendale	---	---	Moderate	High	Moderate.
Dorval	4-12	25-30	High	High	Moderate.
Blue Lake	---	---	Low	Low	Moderate.
362B:					
Millersburg	---	---	Moderate	Low	Moderate.
362D:					
Millersburg	---	---	Moderate	Low	Moderate.
362E:					
Millersburg	---	---	Moderate	Low	Moderate.
363D:					
Mancelona	---	---	Low	Low	Low.
Millersburg	---	---	Moderate	Low	Moderate.
Blue Lake	---	---	Low	Low	Moderate.
364E:					
Mancelona	---	---	Low	Low	Low.
Millersburg	---	---	Moderate	Low	Moderate.
Blue Lake	---	---	Low	Low	Moderate.
369:					
Deford	---	---	Moderate	Low	Moderate.
371:					
Springport	---	---	High	High	Low.
380:					
Access denied.					

Table 21.--Soil Features--Continued

Map symbol and soil name	Subsidence		Potential for frost action	Risk of corrosion	
	Initial	Total		Uncoated steel	Concrete
	In	In			
384B:					
Iosco	---	---	Moderate	High	Low.
385D:					
Lindquist	---	---	Low	Low	Moderate.
386B:					
Mancelona	---	---	Low	Low	Low.
Rubicon	---	---	Low	Low	High.
386D:					
Mancelona	---	---	Low	Low	Low.
Rubicon	---	---	Low	Low	High.
387E:					
Mancelona	---	---	Low	Low	Low.
Rubicon	---	---	Low	Low	High.
387F:					
Mancelona	---	---	Low	Low	Low.
Rubicon	---	---	Low	Low	High.
388B:					
Millersburg	---	---	Moderate	Low	Moderate.
Klacking	---	---	Low	Low	Moderate.
Graycalm	---	---	Low	Low	Moderate.
388D:					
Millersburg	---	---	Moderate	Low	Moderate.
Klacking	---	---	Low	Low	Moderate.
Graycalm	---	---	Low	Low	Moderate.
388E:					
Millersburg	---	---	Moderate	Low	Moderate.
Klacking	---	---	Low	Low	Moderate.
Graycalm	---	---	Low	Low	Moderate.
389B:					
Horsehead	---	---	Low	Low	Moderate.
389D:					
Horsehead	---	---	Low	Low	Moderate.
389E:					
Horsehead	---	---	Low	Low	Moderate.
390B:					
Horsehead	---	---	Low	Low	Moderate.
Graycalm	---	---	Low	Low	Moderate.

Table 21.--Soil Features--Continued

Map symbol and soil name	Subsidence		Potential for frost action	Risk of corrosion	
	Initial	Total		Uncoated steel	Concrete
	In	In			
390D:					
Horsehead	---	---	Low	Low	Moderate.
Graycalm	---	---	Low	Low	Moderate.
390E:					
Horsehead	---	---	Low	Low	Moderate.
Graycalm	---	---	Low	Low	Moderate.
390F:					
Horsehead	---	---	Low	Low	Moderate.
Graycalm	---	---	Low	Low	Moderate.
391B:					
Horsehead	---	---	Low	Low	Moderate.
391D:					
Horsehead	---	---	Low	Low	Moderate.
392:					
Caffey	---	---	Moderate	High	Low.
393B:					
Morganlake	---	---	Low	Low	Moderate.
393C:					
Morganlake	---	---	Low	Low	Moderate.
394B:					
Ocqueoc	---	---	Low	Low	Moderate.
399D:					
Menominee	---	---	Low	Low	Moderate.
Bamfield	---	---	Moderate	Moderate	Moderate.
Blue Lake	---	---	Low	Low	Moderate.
400F:					
Menominee	---	---	Low	Low	Moderate.
Bamfield	---	---	Moderate	Moderate	Moderate.
Blue Lake	---	---	Low	Low	Moderate.
420A:					
Otisco	---	---	Moderate	Low	Moderate.
421A:					
Richter	---	---	High	High	Moderate.
Caffey	---	---	Moderate	High	Low.
422B:					
Morganlake	---	---	Low	Low	Moderate.
Iosco	---	---	Moderate	High	Low.
Deford	---	---	Moderate	Low	Moderate.

Table 21.--Soil Features--Continued

Map symbol and soil name	Subsidence		Potential for frost action	Risk of corrosion	
	Initial	Total		Uncoated steel	Concrete
	In	In			
423B:					
Richter------------	---	---	High--------	High--------	Moderate.
Algonquin----------	---	---	High--------	High--------	Low.
424B:					
Morganlake---------	---	---	Low---------	Low---------	Moderate.
Ossineke-----------	---	---	Moderate----	Moderate----	Moderate.
Blue Lake----------	---	---	Low---------	Low---------	Moderate.
424C:					
Morganlake---------	---	---	Low---------	Low---------	Moderate.
Ossineke-----------	---	---	Moderate----	Moderate----	Moderate.
Blue Lake----------	---	---	Low---------	Low---------	Moderate.
450B:					
Millersburg--------	---	---	Moderate----	Low---------	Moderate.
Blue Lake----------	---	---	Low---------	Low---------	Moderate.
450D:					
Millersburg--------	---	---	Moderate----	Low---------	Moderate.
Blue Lake----------	---	---	Low---------	Low---------	Moderate.
450E:					
Millersburg--------	---	---	Moderate----	Low---------	Moderate.
Blue Lake----------	---	---	Low---------	Low---------	Moderate.
451B:					
Annalake-----------	---	---	Moderate----	Moderate----	Low.
451C:					
Annalake-----------	---	---	Moderate----	Moderate----	Low.
452D:					
Bamfield-----------	---	---	Moderate----	Moderate----	Moderate.
452E:					
Bamfield-----------	---	---	Moderate----	Moderate----	Moderate.
453B:					
Ossineke-----------	---	---	Moderate----	Moderate----	Moderate.

Table 22.--Soil Moisture Status by Depth

(Depths of layers are in feet)

Map symbol and soil name	Hydro- logic group	January	February	March	April	May	June	July	August	September	October	November	December
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 ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
17B:													
Croswell------	A	0.0-3.5: Moist 3.5-6.5: Wet ---	0.0-3.5: Moist 3.5-6.5: 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: 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 ---	0.0-3.0: 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 22.--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
24A:													
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 ---	0.0-0.5: 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 ---
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 ---
32B:													
Kellogg-------	A	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 --- ---
32C:													
Kellogg-------	A	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 --- ---
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 ---
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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
44B: Ossineke------	B	0.0-6.5: Moist --- ---	0.0-6.5: 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	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist	0.0-6.5: Moist --- ---	0.0-1.0: Dry 1.0-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-6.5: 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	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist
44C: Ossineke------	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-1.5: Moist 1.5-3.0: 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	0.0-6.5: 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 1.5-3.0: 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
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 2.0-6.5: Moist	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
47F: 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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
53B: Negwegon------	C	0.0-6.5: Moist --- ---	0.0-6.5: 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	0.0-1.5: Moist 1.5-3.0: 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 ---	0.0-6.5: Moist --- ---	0.0-6.5: 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	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist
53C: Negwegon------	C	0.0-6.5: Moist --- ---	0.0-6.5: 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	0.0-1.5: Moist 1.5-3.0: 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 ---	0.0-6.5: Moist --- ---	0.0-6.5: 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	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: Moist

Table 22.--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
54A:													
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 --- ---	0.0-0.5: Moist 0.5-1.5: 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
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	0.0-0.5: Moist 0.5-1.5: Wet 1.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-0.5: Dry 0.5-6.5: Moist ---	0.0-6.5: Moist --- ---	0.0-0.5: Moist 0.5-1.5: 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 ---	0.0-1.5: 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	0.0-1.5: 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 1.0-3.0: 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
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 ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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
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	0.0-3.0: Dry 3.0-6.5: 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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
75F:													
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
78:													
Pits, borrow.													
81B:													
Grayling------	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
81D:													
Grayling------	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
81E:													
Grayling------	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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 ---	0.0-0.5: 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 ---
90B:													
Chinwhisker---	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: 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 ---	0.0-3.0: 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 ---
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
95D:													
Menominee-----	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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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	0.0-1.5: 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 ---
116B: 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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
116D: 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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
116E: 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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
116F: 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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
123D: 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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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
125B:													
Melita--------	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
147B:													
Lindquist-----	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
147E:													
Lindquist-----	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
307B:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
307E:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
307F:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
350B:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
350D:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
351A:													
Allendale-----	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	0.0-2.5: 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	0.0-1.5: Moist 1.5-2.5: Wet 2.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-6.5: 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 2.5-6.0: Moist ---	0.0-2.5: Wet 2.5-6.0: 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 ---
352B:													
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 ---
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 ---
Croswell------	A	0.0-3.5: Moist 3.5-6.5: Wet ---	0.0-3.5: Moist 3.5-6.5: 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: 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 ---	0.0-3.0: 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 22.--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
353B:													
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
Ossineke------	B	0.0-6.5: Moist --- ---	0.0-6.5: Moist --- ---	0.0-1.5: Moist 1.5-3.0: 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	0.0-6.5: 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 1.5-3.0: 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
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
354F:													
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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 --- ---	0.0-0.5: Moist 0.5-1.5: 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 --- ---	0.0-1.5: 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	0.0-1.0: Dry 1.0-6.5: 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 1.5-3.0: 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

Table 22.--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 ---
360:													
Wakeley-------	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 ---	0.0-0.5: Moist 0.5-2.5: Wet 2.5-6.5: Moist	0.0-1.5: Moist 1.5-2.5: Wet 2.5-6.5: Moist	0.0-6.5: Moist --- ---	0.0-6.5: 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 2.5-6.0: Moist ---	0.0-2.5: Wet 2.5-6.0: Moist ---
361B:													
Allendale-----	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
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
362B:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
363D:													
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
364E:													
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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 ---

Table 22.--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
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 ---	0.0-1.5: 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	0.0-1.5: 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 ---
380: Access denied.													
384B:													
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 0.5-3.0: 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	0.0-1.0: 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	0.0-1.0: Moist 1.0-6.5: Wet
385D:													
Lindquist-----	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
386B:													
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
386D:													
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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
387E:													
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
387F:													
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
388B:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
388D:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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
388D:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
388E:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
389B:													
Horsehead-----	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
389D:													
Horsehead-----	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
389E:													
Horsehead-----	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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
390B:													
Horsehead-----	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
390D:													
Horsehead-----	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
390E:													
Horsehead-----	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
390F:													
Horsehead-----	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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
391B:													
Horsehead-----	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
391D:													
Horsehead-----	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	0.0-3.0: Dry 3.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
392:													
Caffey--------	C	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-0.5: Moist 0.5-6.5: Wet	0.0-1.5: Moist 1.5-6.5: Wet	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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	0.0-1.5: 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	0.0-6.5: 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	0.0-1.5: 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	0.0-6.5: 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 --- ---
394B:													
Ocqueoc-------	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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
399D:													
Menominee-----	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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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
399D:													
Bamfield------	C	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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
400F:													
Menominee-----	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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
Bamfield------	C	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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
420A:													
Otisco--------	A	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 ---
421A:													
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 ---
Caffey--------	C	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	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---	0.0-6.5: Wet ---

Table 22.--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
422B:													
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	0.0-1.5: 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	0.0-6.5: 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 --- ---
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 0.5-3.0: 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	0.0-1.0: 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	0.0-1.0: Moist 1.0-6.5: 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 ---
423B:													
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 ---
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 --- ---	0.0-0.5: Moist 0.5-1.5: 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
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	0.0-1.5: 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	0.0-6.5: 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 1.5-3.0: 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: Dry 0.5-6.5: 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 1.5-3.0: 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

Table 22.--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:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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	0.0-1.5: 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	0.0-6.5: 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 1.5-3.0: 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: Dry 0.5-6.5: 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 1.5-3.0: Wet 3.0-6.5: Moist	0.0-1.5: Moist 1.5-3.0: Wet 3.0-6.5: 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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
450B:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
450D:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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
450E:													
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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: 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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
451B:													
Annalake------	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	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: 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 2.5-3.5: 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 --- ---
451C:													
Annalake------	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	0.0-2.5: Moist 2.5-3.5: Wet 3.5-6.5: 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 2.5-3.5: 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 --- ---
452D:													
Bamfield------	C	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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---
452E:													
Bamfield------	C	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 ---	0.0-0.5: Dry 0.5-6.5: Moist	0.0-1.0: Dry 1.0-6.5: Moist	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---	0.0-6.5: Moist ---

Table 22.--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
453B:													
Ossineke------	B	0.0-6.5: Moist	0.0-6.5: Moist	0.0-1.5: Moist	0.0-1.5: Moist	0.0-1.5: Moist	0.0-6.5: Moist	0.0-1.0: Dry	0.0-6.5: Moist	0.0-6.5: Moist	0.0-1.5: Moist	0.0-1.5: Moist	0.0-1.5: Moist
		---	---	1.5-3.0: Wet	1.5-3.0: Wet	1.5-3.0: Wet	---	1.0-6.5: Moist	---	---	1.5-3.0: Wet	1.5-3.0: Wet	1.5-3.0: Wet
		---	---	3.0-6.5: Moist	3.0-6.5: Moist	3.0-6.5: Moist	---	---	---	---	3.0-6.5: Moist	3.0-6.5: Moist	3.0-6.5: Moist

Table 23.--Water Features

(Depths of layers are in feet. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. 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	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
13:										
Tawas-----------	A/D									
		January	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		February	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		March	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		April	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		June	0.0	>6.0	Apparent	---	---	---	---	---
		July	0.5	>6.0	Apparent	---	---	---	---	---
		August	0.5	>6.0	Apparent	---	---	---	---	---
		September	0.0	>6.0	Apparent	---	---	---	---	---
		October	0.0	>6.0	Apparent	---	---	---	---	---
		November	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		December	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
Lupton----------	A/D									
		January	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		February	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		March	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		April	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		June	0.0	>6.0	Apparent	---	---	---	---	---
		July	0.5	>6.0	Apparent	---	---	---	---	---
		August	0.5	>6.0	Apparent	---	---	---	---	---
		September	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		October	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		November	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		December	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
14:										
Dawson----------	A/D									
		January	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		February	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		March	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		April	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		June	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		July	0.5	>6.0	Apparent	---	---	---	---	---
		August	0.5	>6.0	Apparent	---	---	---	---	---
		September	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		October	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		November	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		December	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
Loxley----------	A/D									
		January	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		February	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		March	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		April	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		June	0.0	>6.0	Apparent	---	---	---	---	---
		July	0.5	>6.0	Apparent	---	---	---	---	---
		August	0.5	>6.0	Apparent	---	---	---	---	---
		September	0.0	>6.0	Apparent	---	---	---	---	---
		October	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		November	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		December	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---

Table 23.--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
16B:										
Graycalm--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
17B:										
Croswell--------	A									
		January	3.5	>6.0	Apparent	---	---	---	---	---
		February	3.5	>6.0	Apparent	---	---	---	---	---
		March	2.5	>6.0	Apparent	---	---	---	---	---
		April	2.0	>6.0	Apparent	---	---	---	---	---
		May	2.0	>6.0	Apparent	---	---	---	---	---
		June	3.5	>6.0	Apparent	---	---	---	---	---
		July	2.0	>6.0	Apparent	---	---	---	---	---
		August	3.0	>6.0	Apparent	---	---	---	---	---
		September	2.0	>6.0	Apparent	---	---	---	---	---
		October	3.0	>6.0	Apparent	---	---	---	---	---
		November	2.5	>6.0	Apparent	---	---	---	---	---
		December	2.0	>6.0	Apparent	---	---	---	---	---
18A:										
Au Gres---------	B									
		January	1.5	>6.0	Apparent	---	---	---	---	---
		February	1.5	>6.0	Apparent	---	---	---	---	---
		March	1.0	>6.0	Apparent	---	---	---	---	---
		April	0.5	>6.0	Apparent	---	---	---	---	---
		May	0.5	>6.0	Apparent	---	---	---	---	---
		June	1.0	>6.0	Apparent	---	---	---	---	---
		July	2.0	>6.0	Apparent	---	---	---	---	---
		August	3.0	>6.0	Apparent	---	---	---	---	---
		September	2.0	>6.0	Apparent	---	---	---	---	---
		October	1.0	>6.0	Apparent	---	---	---	---	---
		November	1.0	>6.0	Apparent	---	---	---	---	---
		December	1.5	>6.0	Apparent	---	---	---	---	---
24A:										
Kinross---------	A/D									
		January	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		February	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		March	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		April	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		June	0.5	>6.0	Apparent	---	---	---	---	---
		July	1.5	>6.0	Apparent	---	---	---	---	---
		August	2.0	>6.0	Apparent	---	---	---	---	---
		September	1.0	>6.0	Apparent	---	---	---	---	---
		October	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		November	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		December	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
Au Gres---------	B									
		January	1.5	>6.0	Apparent	---	---	---	---	---
		February	1.5	>6.0	Apparent	---	---	---	---	---
		March	1.0	>6.0	Apparent	---	---	---	---	---
		April	0.5	>6.0	Apparent	---	---	---	---	---
		May	0.5	>6.0	Apparent	---	---	---	---	---
		June	1.0	>6.0	Apparent	---	---	---	---	---
		July	2.0	>6.0	Apparent	---	---	---	---	---
		August	3.0	>6.0	Apparent	---	---	---	---	---
		September	2.0	>6.0	Apparent	---	---	---	---	---
		October	1.0	>6.0	Apparent	---	---	---	---	---
		November	1.0	>6.0	Apparent	---	---	---	---	---
		December	1.5	>6.0	Apparent	---	---	---	---	---

Table 23.--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
32B:										
Kellogg---------	A									
		March	2.5	3.0-3.0	Perched	---	---	---	---	---
		April	2.5	3.0-3.0	Perched	---	---	---	---	---
		May	2.5	3.0-3.0	Perched	---	---	---	---	---
		September	2.5	3.0-3.0	Perched	---	---	---	---	---
		October	2.5	3.0-3.0	Perched	---	---	---	---	---
		November	2.5	3.0-3.0	Perched	---	---	---	---	---
32C:										
Kellogg---------	A									
		March	2.5	3.0-3.0	Perched	---	---	---	---	---
		April	2.5	3.0-3.0	Perched	---	---	---	---	---
		May	2.5	3.0-3.0	Perched	---	---	---	---	---
		September	2.5	3.0-3.0	Perched	---	---	---	---	---
		October	2.5	3.0-3.0	Perched	---	---	---	---	---
		November	2.5	3.0-3.0	Perched	---	---	---	---	---
37B:										
Richter---------	B									
		January	1.5	>6.0	Apparent	---	---	---	---	---
		February	1.5	>6.0	Apparent	---	---	---	---	---
		March	1.0	>6.0	Apparent	---	---	---	---	---
		April	0.5	>6.0	Apparent	---	---	---	---	---
		May	0.5	>6.0	Apparent	---	---	---	---	---
		June	1.0	>6.0	Apparent	---	---	---	---	---
		July	2.0	>6.0	Apparent	---	---	---	---	---
		August	3.0	>6.0	Apparent	---	---	---	---	---
		September	2.0	>6.0	Apparent	---	---	---	---	---
		October	1.0	>6.0	Apparent	---	---	---	---	---
		November	1.0	>6.0	Apparent	---	---	---	---	---
		December	1.5	>6.0	Apparent	---	---	---	---	---
41B:										
McGinn----------	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
41C:										
McGinn----------	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
44B:										
Ossineke--------	B									
		March	1.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		October	1.5	3.0-3.0	Perched	---	---	---	---	---
		November	1.5	3.0-3.0	Perched	---	---	---	---	---
		December	1.5	3.0-3.0	Perched	---	---	---	---	---
44C:										
Ossineke--------	B									
		March	1.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		October	1.5	3.0-3.0	Perched	---	---	---	---	---
		November	1.5	3.0-3.0	Perched	---	---	---	---	---
		December	1.5	3.0-3.0	Perched	---	---	---	---	---
47D:										
Graycalm--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---

Table 23.--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
47F:										
Graycalm--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
53B:										
Negwegon--------	C									
		March	1.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		October	1.5	3.0-3.0	Perched	---	---	---	---	---
		November	1.5	3.0-3.0	Perched	---	---	---	---	---
		December	1.5	3.0-3.0	Perched	---	---	---	---	---
53C:										
Negwegon--------	C									
		March	1.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		October	1.5	3.0-3.0	Perched	---	---	---	---	---
		November	1.5	3.0-3.0	Perched	---	---	---	---	---
		December	1.5	3.0-3.0	Perched	---	---	---	---	---
54A:										
Algonquin-------	D									
		January	1.0	1.5-1.5	Perched	---	---	---	---	---
		February	1.0	1.5-1.5	Perched	---	---	---	---	---
		March	1.0	1.5-1.5	Perched	---	---	---	---	---
		April	0.5	1.5-1.5	Perched	---	---	---	---	---
		May	0.5	1.5-1.5	Perched	---	---	---	---	---
		October	0.5	1.5-1.5	Perched	---	---	---	---	---
		November	1.0	1.5-1.5	Perched	---	---	---	---	---
		December	1.0	1.5-1.5	Perched	---	---	---	---	---
59B:										
Algonquin-------	D									
		January	1.0	1.5-1.5	Perched	---	---	---	---	---
		February	1.0	1.5-1.5	Perched	---	---	---	---	---
		March	1.0	1.5-1.5	Perched	---	---	---	---	---
		April	0.5	1.5-1.5	Perched	---	---	---	---	---
		May	0.5	1.5-1.5	Perched	---	---	---	---	---
		June	0.5	1.5-1.5	Perched	---	---	---	---	---
		October	0.5	1.5-1.5	Perched	---	---	---	---	---
		November	1.0	1.5-1.5	Perched	---	---	---	---	---
		December	1.0	1.5-1.5	Perched	---	---	---	---	---
Springport------	D									
		January	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		February	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		March	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		April	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		May	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		June	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		July	1.0	1.5-1.5	Perched	---	---	---	---	---
		August	1.0	1.5-1.5	Perched	---	---	---	---	---
		September	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		October	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		November	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		December	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---

Table 23.--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
62A:										
Allendale-------	C									
		January	1.0	3.0-3.0	Perched	---	---	---	---	---
		February	1.0	3.0-3.0	Perched	---	---	---	---	---
		March	1.0	3.0-3.0	Perched	---	---	---	---	---
		April	0.5	3.0-3.0	Perched	---	---	---	---	---
		May	0.5	3.0-3.0	Perched	---	---	---	---	---
		June	1.0	3.0-3.0	Perched	---	---	---	---	---
		September	1.0	3.0-3.0	Perched	---	---	---	---	---
		October	1.0	3.0-3.0	Perched	---	---	---	---	---
		November	1.0	3.0-3.0	Perched	---	---	---	---	---
		December	1.0	3.0-3.0	Perched	---	---	---	---	---
72:										
Dorval----------	A/D									
		January	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		February	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		March	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		April	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		May	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		June	0.0	2.5-2.5	Perched	---	---	---	---	---
		July	0.5	2.5-2.5	Perched	---	---	---	---	---
		August	0.5	2.5-2.5	Perched	---	---	---	---	---
		September	0.0	2.5-2.5	Perched	---	---	---	---	---
		October	0.0	2.5-2.5	Perched	---	---	---	---	---
		November	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		December	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
75B:										
Rubicon---------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
75D:										
Rubicon---------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
75E:										
Rubicon---------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
75F:										
Rubicon---------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
78:										
Pits, borrow.										
81B:										
Grayling--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
81D:										
Grayling--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
81E:										
Grayling--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
82B:										
Udorthents------	---									
		All months	>6.0	>6.0	---	---	---	---	---	---

Table 23.--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
83B:										
Udipsamments----	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
86:										
Histosols-------	D									
		January	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		February	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		March	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		April	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		June	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		July	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		August	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		September	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		October	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		November	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		December	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
Aquents---------	D									
		January	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		February	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		March	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		April	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		June	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		July	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		August	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		September	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		October	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		November	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
		December	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	---	---
87:										
Ausable---------	D									
		January	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	Long	Frequent.
		February	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	Long	Frequent.
		March	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	Long	Frequent.
		April	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	Long	Frequent.
		May	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	Long	Frequent.
		June	0.5	>6.0	Apparent	---	---	---	---	---
		July	1.5	>6.0	Apparent	---	---	---	---	---
		August	2.0	>6.0	Apparent	---	---	---	---	---
		September	1.0	>6.0	Apparent	---	---	---	---	---
		October	0.0	>6.0	Apparent	---	---	---	---	---
		November	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	Long	Frequent.
		December	0.0	>6.0	Apparent	0.0-1.0	Very long	Frequent	Long	Frequent.
90B:										
Chinwhisker-----	A									
		January	5.0	>6.0	Apparent	---	---	---	---	---
		February	5.0	>6.0	Apparent	---	---	---	---	---
		March	2.5	>6.0	Apparent	---	---	---	---	---
		April	2.0	>6.0	Apparent	---	---	---	---	---
		May	2.0	>6.0	Apparent	---	---	---	---	---
		June	3.5	>6.0	Apparent	---	---	---	---	---
		July	2.0	>6.0	Apparent	---	---	---	---	---
		August	3.0	>6.0	Apparent	---	---	---	---	---
		September	2.0	>6.0	Apparent	---	---	---	---	---
		October	3.0	>6.0	Apparent	---	---	---	---	---
		November	2.5	>6.0	Apparent	---	---	---	---	---
		December	2.0	>6.0	Apparent	---	---	---	---	---

Table 23.--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
94F:										
Klacking--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
McGinn----------	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
95D:										
Menominee-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
97:										
Colonville------	C									
		January	1.5	>6.0	Apparent	---	---	---	Brief	Occasional.
		February	1.5	>6.0	Apparent	---	---	---	Brief	Occasional.
		March	1.0	>6.0	Apparent	---	---	---	Brief	Occasional.
		April	0.5	>6.0	Apparent	---	---	---	Brief	Occasional.
		May	0.5	>6.0	Apparent	---	---	---	Brief	Occasional.
		June	1.0	>6.0	Apparent	---	---	---	---	---
		July	2.0	>6.0	Apparent	---	---	---	---	---
		August	3.0	>6.0	Apparent	---	---	---	---	---
		September	2.0	>6.0	Apparent	---	---	---	---	---
		October	1.0	>6.0	Apparent	---	---	---	---	---
		November	1.0	>6.0	Apparent	---	---	---	---	---
		December	1.5	>6.0	Apparent	---	---	---	Brief	Occasional.
116B:										
Mancelona-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
116C:										
Mancelona-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
116D:										
Mancelona-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
116E:										
Mancelona-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
116F:										
Mancelona-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
123D:										
Klacking--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
125B:										
Melita----------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
147B:										
Lindquist-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
147E:										
Lindquist-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---

Table 23.--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
307B:										
Klacking--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
307E:										
Klacking--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
307F:										
Klacking--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
350B:										
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
350D:										
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
350E:										
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
351A:										
Allendale-------	C									
		January	1.0	3.0-3.0	Perched	---	---	---	---	---
		February	1.0	3.0-3.0	Perched	---	---	---	---	---
		March	1.0	3.0-3.0	Perched	---	---	---	---	---
		April	0.5	3.0-3.0	Perched	---	---	---	---	---
		May	0.5	3.0-3.0	Perched	---	---	---	---	---
		June	1.0	3.0-3.0	Perched	---	---	---	---	---
		September	1.0	3.0-3.0	Perched	---	---	---	---	---
		October	1.0	3.0-3.0	Perched	---	---	---	---	---
		November	1.0	3.0-3.0	Perched	---	---	---	---	---
		December	1.0	3.0-3.0	Perched	---	---	---	---	---
Wakeley---------	D									
		January	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		February	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		March	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		April	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		May	0.5	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		June	1.5	2.5-2.5	Perched	---	---	---	---	---
		September	0.0	2.5-2.5	Perched	---	---	---	---	---
		October	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		November	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		December	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
Dorval----------	A/D									
		January	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		February	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		March	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		April	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		May	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		June	0.0	2.5-2.5	Perched	---	---	---	---	---
		July	0.5	2.5-2.5	Perched	---	---	---	---	---
		August	0.5	2.5-2.5	Perched	---	---	---	---	---
		September	0.0	2.5-2.5	Perched	---	---	---	---	---
		October	0.0	2.5-2.5	Perched	---	---	---	---	---
		November	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		December	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---

Table 23.--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
352B:										
Deford----------	A/D									
		January	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		February	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		March	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		April	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		June	0.5	>6.0	Apparent	---	---	---	---	---
		July	1.5	>6.0	Apparent	---	---	---	---	---
		August	2.0	>6.0	Apparent	---	---	---	---	---
		September	1.0	>6.0	Apparent	---	---	---	---	---
		October	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		November	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		December	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
Au Gres---------	B									
		January	1.5	>6.0	Apparent	---	---	---	---	---
		February	1.5	>6.0	Apparent	---	---	---	---	---
		March	1.0	>6.0	Apparent	---	---	---	---	---
		April	0.5	>6.0	Apparent	---	---	---	---	---
		May	0.5	>6.0	Apparent	---	---	---	---	---
		June	1.0	>6.0	Apparent	---	---	---	---	---
		July	2.0	>6.0	Apparent	---	---	---	---	---
		August	3.0	>6.0	Apparent	---	---	---	---	---
		September	2.0	>6.0	Apparent	---	---	---	---	---
		October	1.0	>6.0	Apparent	---	---	---	---	---
		November	1.0	>6.0	Apparent	---	---	---	---	---
		December	1.5	>6.0	Apparent	---	---	---	---	---
Croswell--------	A									
		January	3.5	>6.0	Apparent	---	---	---	---	---
		February	3.5	>6.0	Apparent	---	---	---	---	---
		March	2.5	>6.0	Apparent	---	---	---	---	---
		April	2.0	>6.0	Apparent	---	---	---	---	---
		May	2.0	>6.0	Apparent	---	---	---	---	---
		June	3.5	>6.0	Apparent	---	---	---	---	---
		July	2.0	>6.0	Apparent	---	---	---	---	---
		August	3.0	>6.0	Apparent	---	---	---	---	---
		September	2.0	>6.0	Apparent	---	---	---	---	---
		October	3.0	>6.0	Apparent	---	---	---	---	---
		November	2.5	>6.0	Apparent	---	---	---	---	---
		December	2.0	>6.0	Apparent	---	---	---	---	---
353B:										
Mancelona-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Ossineke--------	B									
		March	1.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		October	1.5	3.0-3.0	Perched	---	---	---	---	---
		November	1.5	3.0-3.0	Perched	---	---	---	---	---
		December	1.5	3.0-3.0	Perched	---	---	---	---	---
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
354F:										
Mancelona-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---

Table 23.--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
359C:										
Algonquin-------	D									
		January	1.0	1.5-1.5	Perched	---	---	---	---	---
		February	1.0	1.5-1.5	Perched	---	---	---	---	---
		March	1.0	1.5-1.5	Perched	---	---	---	---	---
		April	0.5	1.5-1.5	Perched	---	---	---	---	---
		May	0.5	1.5-1.5	Perched	---	---	---	---	---
		October	0.5	1.5-1.5	Perched	---	---	---	---	---
		November	1.0	1.5-1.5	Perched	---	---	---	---	---
		December	1.0	1.5-1.5	Perched	---	---	---	---	---
Negwegon--------	C									
		March	1.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		October	1.5	3.0-3.0	Perched	---	---	---	---	---
		November	1.5	3.0-3.0	Perched	---	---	---	---	---
		December	1.5	3.0-3.0	Perched	---	---	---	---	---
Dorval----------	A/D									
		January	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		February	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		March	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		April	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		May	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		June	0.0	2.5-2.5	Perched	---	---	---	---	---
		July	0.5	2.5-2.5	Perched	---	---	---	---	---
		August	0.5	2.5-2.5	Perched	---	---	---	---	---
		September	0.0	2.5-2.5	Perched	---	---	---	---	---
		October	0.0	2.5-2.5	Perched	---	---	---	---	---
		November	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		December	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
360:										
Wakeley---------	D									
		January	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		February	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		March	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		April	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		May	0.5	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		June	1.5	2.5-2.5	Perched	---	---	---	---	---
		September	0.0	2.5-2.5	Perched	---	---	---	---	---
		October	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		November	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
		December	0.0	2.5-2.5	Perched	0.0-1.0	---	---	---	---
361B:										
Allendale-------	C									
		January	1.0	3.0-3.0	Perched	---	---	---	---	---
		February	1.0	3.0-3.0	Perched	---	---	---	---	---
		March	1.0	3.0-3.0	Perched	---	---	---	---	---
		April	0.5	3.0-3.0	Perched	---	---	---	---	---
		May	0.5	3.0-3.0	Perched	---	---	---	---	---
		June	1.0	3.0-3.0	Perched	---	---	---	---	---
		September	1.0	3.0-3.0	Perched	---	---	---	---	---
		October	1.0	3.0-3.0	Perched	---	---	---	---	---
		November	1.0	3.0-3.0	Perched	---	---	---	---	---
		December	1.0	3.0-3.0	Perched	---	---	---	---	---

Table 23.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table			Ponding			Flooding	
			Upper limit	Lower limit	Kind	Surface water depth	Duration	Frequency	Duration	Frequency
361B:										
Dorval----------	A/D									
		January	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		February	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		March	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		April	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		May	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		June	0.0	2.5-2.5	Perched	---	---	---	---	---
		July	0.5	2.5-2.5	Perched	---	---	---	---	---
		August	0.5	2.5-2.5	Perched	---	---	---	---	---
		September	0.0	2.5-2.5	Perched	---	---	---	---	---
		October	0.0	2.5-2.5	Perched	---	---	---	---	---
		November	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
		December	0.0	2.5-2.5	Perched	0.0-1.0	Long	Frequent	---	---
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
362B:										
Millersburg-----	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
362D:										
Millersburg-----	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
362E:										
Millersburg-----	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
363D:										
Mancelona-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Millersburg-----	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
364E:										
Mancelona-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Millersburg-----	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
369:										
Deford----------	A/D									
		January	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		February	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		March	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		April	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		June	0.5	>6.0	Apparent	---	---	---	---	---
		July	1.5	>6.0	Apparent	---	---	---	---	---
		August	2.0	>6.0	Apparent	---	---	---	---	---
		September	1.0	>6.0	Apparent	---	---	---	---	---
		October	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		November	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		December	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---

Table 23.--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
371:										
Springport------	D									
		January	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		February	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		March	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		April	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		May	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		June	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		July	1.0	1.5-1.5	Perched	---	---	---	---	---
		August	1.0	1.5-1.5	Perched	---	---	---	---	---
		September	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		October	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		November	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
		December	0.0	1.5-1.5	Perched	0.0-1.0	Long	Frequent	---	---
380:										
Access denied.										
384B:										
Iosco-----------	B									
		January	1.0	>6.0	Apparent	---	---	---	---	---
		February	1.0	>6.0	Apparent	---	---	---	---	---
		March	1.0	>6.0	Apparent	---	---	---	---	---
		April	0.5	>6.0	Apparent	---	---	---	---	---
		May	0.5	3.0-3.0	Perched	---	---	---	---	---
		June	1.0	>6.0	Apparent	---	---	---	---	---
		September	1.0	>6.0	Apparent	---	---	---	---	---
		October	1.0	>6.0	Apparent	---	---	---	---	---
		November	1.0	>6.0	Apparent	---	---	---	---	---
		December	1.0	>6.0	Apparent	---	---	---	---	---
385D:										
Lindquist-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
386B:										
Mancelona-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Rubicon---------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
386D:										
Mancelona-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Rubicon---------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
387E:										
Mancelona-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Rubicon---------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
387F:										
Mancelona-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Rubicon---------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---

Table 23.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Month	Water table			Ponding			Flooding	
			Upper limit	Lower limit	Kind	Surface water depth	Duration	Frequency	Duration	Frequency
388B:										
Millersburg-----	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
Klacking--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Graycalm--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
388D:										
Millersburg-----	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
Klacking--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Graycalm--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
388E:										
Millersburg-----	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
Klacking--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Graycalm--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
389B:										
Horsehead-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
389D:										
Horsehead-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
389E:										
Horsehead-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
390B:										
Horsehead-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Graycalm--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
390D:										
Horsehead-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Graycalm--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
390E:										
Horsehead-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Graycalm--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---

Table 23.--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
390F:										
Horsehead-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Graycalm--------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
391B:										
Horsehead-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
391D:										
Horsehead-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
392:										
Caffey----------	C									
		January	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		February	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		March	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		April	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		May	0.5	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		June	1.5	>6.0	Apparent	---	---	---	---	---
		September	0.0	>6.0	Apparent	---	---	---	---	---
		October	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		November	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		December	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
393B:										
Morganlake------	B									
		March	2.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		September	2.5	3.0-3.0	Perched	---	---	---	---	---
		October	2.5	3.0-3.0	Perched	---	---	---	---	---
		November	2.5	3.0-3.0	Perched	---	---	---	---	---
393C:										
Morganlake------	B									
		March	2.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		September	2.5	3.0-3.0	Perched	---	---	---	---	---
		October	2.5	3.0-3.0	Perched	---	---	---	---	---
		November	2.5	3.0-3.0	Perched	---	---	---	---	---
394B:										
Ocqueoc---------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
399D:										
Menominee-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Bamfield--------	C									
		All months	>6.0	>6.0	---	---	---	---	---	---
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---

Table 23.--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
400F:										
Menominee-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
Bamfield--------	C									
		All months	>6.0	>6.0	---	---	---	---	---	---
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
420A:										
Otisco----------	A									
		January	1.5	>6.0	Apparent	---	---	---	---	---
		February	1.5	>6.0	Apparent	---	---	---	---	---
		March	1.0	>6.0	Apparent	---	---	---	---	---
		April	0.5	>6.0	Apparent	---	---	---	---	---
		May	0.5	>6.0	Apparent	---	---	---	---	---
		June	1.0	>6.0	Apparent	---	---	---	---	---
		July	2.0	>6.0	Apparent	---	---	---	---	---
		August	3.0	>6.0	Apparent	---	---	---	---	---
		September	2.0	>6.0	Apparent	---	---	---	---	---
		October	1.0	>6.0	Apparent	---	---	---	---	---
		November	1.0	>6.0	Apparent	---	---	---	---	---
		December	1.5	>6.0	Apparent	---	---	---	---	---
421A:										
Richter---------	B									
		January	1.5	>6.0	Apparent	---	---	---	---	---
		February	1.5	>6.0	Apparent	---	---	---	---	---
		March	1.0	>6.0	Apparent	---	---	---	---	---
		April	0.5	>6.0	Apparent	---	---	---	---	---
		May	0.5	>6.0	Apparent	---	---	---	---	---
		June	1.0	>6.0	Apparent	---	---	---	---	---
		July	2.0	>6.0	Apparent	---	---	---	---	---
		August	3.0	>6.0	Apparent	---	---	---	---	---
		September	2.0	>6.0	Apparent	---	---	---	---	---
		October	1.0	>6.0	Apparent	---	---	---	---	---
		November	1.0	>6.0	Apparent	---	---	---	---	---
		December	1.5	>6.0	Apparent	---	---	---	---	---
Caffey----------	C									
		January	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		February	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		March	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		April	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		May	0.5	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		June	1.5	>6.0	Apparent	---	---	---	---	---
		September	0.0	>6.0	Apparent	---	---	---	---	---
		October	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		November	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		December	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
422B:										
Morganlake------	B									
		March	2.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		September	2.5	3.0-3.0	Perched	---	---	---	---	---
		October	2.5	3.0-3.0	Perched	---	---	---	---	---
		November	2.5	3.0-3.0	Perched	---	---	---	---	---

Table 23.--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
422B:										
Iosco-----------	B									
		January	1.0	>6.0	Apparent	---	---	---	---	---
		February	1.0	>6.0	Apparent	---	---	---	---	---
		March	1.0	>6.0	Apparent	---	---	---	---	---
		April	0.5	>6.0	Apparent	---	---	---	---	---
		May	0.5	3.0-3.0	Perched	---	---	---	---	---
		June	1.0	>6.0	Apparent	---	---	---	---	---
		September	1.0	>6.0	Apparent	---	---	---	---	---
		October	1.0	>6.0	Apparent	---	---	---	---	---
		November	1.0	>6.0	Apparent	---	---	---	---	---
		December	1.0	>6.0	Apparent	---	---	---	---	---
Deford----------	A/D									
		January	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		February	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		March	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		April	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		May	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		June	0.5	>6.0	Apparent	---	---	---	---	---
		July	1.5	>6.0	Apparent	---	---	---	---	---
		August	2.0	>6.0	Apparent	---	---	---	---	---
		September	1.0	>6.0	Apparent	---	---	---	---	---
		October	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		November	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
		December	0.0	>6.0	Apparent	0.0-1.0	Long	Frequent	---	---
423B:										
Richter---------	B									
		January	1.5	>6.0	Apparent	---	---	---	---	---
		February	1.5	>6.0	Apparent	---	---	---	---	---
		March	1.0	>6.0	Apparent	---	---	---	---	---
		April	0.5	>6.0	Apparent	---	---	---	---	---
		May	0.5	>6.0	Apparent	---	---	---	---	---
		June	1.0	>6.0	Apparent	---	---	---	---	---
		July	2.0	>6.0	Apparent	---	---	---	---	---
		August	3.0	>6.0	Apparent	---	---	---	---	---
		September	2.0	>6.0	Apparent	---	---	---	---	---
		October	1.0	>6.0	Apparent	---	---	---	---	---
		November	1.0	>6.0	Apparent	---	---	---	---	---
		December	1.5	>6.0	Apparent	---	---	---	---	---
Algonquin-------	D									
		January	1.0	1.5-1.5	Perched	---	---	---	---	---
		February	1.0	1.5-1.5	Perched	---	---	---	---	---
		March	1.0	1.5-1.5	Perched	---	---	---	---	---
		April	0.5	1.5-1.5	Perched	---	---	---	---	---
		May	0.5	1.5-1.5	Perched	---	---	---	---	---
		October	0.5	1.5-1.5	Perched	---	---	---	---	---
		November	1.0	1.5-1.5	Perched	---	---	---	---	---
		December	1.0	1.5-1.5	Perched	---	---	---	---	---
424B:										
Morganlake------	B									
		March	2.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		September	2.5	3.0-3.0	Perched	---	---	---	---	---
		October	2.5	3.0-3.0	Perched	---	---	---	---	---
		November	2.5	3.0-3.0	Perched	---	---	---	---	---

Table 23.--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
424B:										
Ossineke--------	B									
		March	1.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		October	1.5	3.0-3.0	Perched	---	---	---	---	---
		November	1.5	3.0-3.0	Perched	---	---	---	---	---
		December	1.5	3.0-3.0	Perched	---	---	---	---	---
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
424C:										
Morganlake------	B									
		March	2.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		September	2.5	3.0-3.0	Perched	---	---	---	---	---
		October	2.5	3.0-3.0	Perched	---	---	---	---	---
		November	2.5	3.0-3.0	Perched	---	---	---	---	---
Ossineke--------	B									
		March	1.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		October	1.5	3.0-3.0	Perched	---	---	---	---	---
		November	1.5	3.0-3.0	Perched	---	---	---	---	---
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
450B:										
Millersburg-----	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
450D:										
Millersburg-----	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
450E:										
Millersburg-----	B									
		All months	>6.0	>6.0	---	---	---	---	---	---
Blue Lake-------	A									
		All months	>6.0	>6.0	---	---	---	---	---	---
451B:										
Annalake--------	B									
		March	2.5	3.5-3.5	Perched	---	---	---	---	---
		April	2.5	3.5-3.5	Perched	---	---	---	---	---
		May	2.5	3.5-3.5	Perched	---	---	---	---	---
		June	2.5	3.5-3.5	Perched	---	---	---	---	---
		September	2.5	3.5-3.5	Perched	---	---	---	---	---
		October	2.5	3.5-3.5	Perched	---	---	---	---	---
		November	2.5	3.5-3.5	Perched	---	---	---	---	---

Table 23.--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
451C:										
Annalake--------	B									
		March	2.5	3.5-3.5	Perched	---	---	---	---	---
		April	2.5	3.5-3.5	Perched	---	---	---	---	---
		May	2.5	3.5-3.5	Perched	---	---	---	---	---
		June	2.5	3.5-3.5	Perched	---	---	---	---	---
		September	2.5	3.5-3.5	Perched	---	---	---	---	---
		October	2.5	3.5-3.5	Perched	---	---	---	---	---
		November	2.5	3.5-3.5	Perched	---	---	---	---	---
452D:										
Bamfield--------	C									
		All months	>6.0	>6.0	---	---	---	---	---	---
452E:										
Bamfield--------	C									
		All months	>6.0	>6.0	---	---	---	---	---	---
453B:										
Ossineke--------	B									
		March	1.5	3.0-3.0	Perched	---	---	---	---	---
		April	1.5	3.0-3.0	Perched	---	---	---	---	---
		May	1.5	3.0-3.0	Perched	---	---	---	---	---
		October	1.5	3.0-3.0	Perched	---	---	---	---	---
		November	1.5	3.0-3.0	Perched	---	---	---	---	---
		December	1.5	3.0-3.0	Perched	---	---	---	---	---

Table 24.--Classification of the Soils

Soil name	Family or higher taxonomic class
Algonquin	Fine, mixed, semiactive, frigid Aquic Hapludalfs
Allendale	Sandy over clayey, mixed, semiactive, frigid Alfic Epiaquods
Annalake	Coarse-loamy, mixed, superactive, frigid Alfic Oxyaquic Haplorthods
Aquents	Aquents
Au Gres	Sandy, mixed, frigid Typic Endoaquods
Ausable	Sandy, mixed, frigid Histic Humaquepts
Bamfield	Fine-loamy, mixed, active, frigid Haplic Glossudalfs
Blue Lake	Sandy, mixed, frigid Lamellic Haplorthods
Caffey	Sandy over loamy, mixed, semiactive, nonacid, frigid Aeric Endoaquents
Chinwhisker	Sandy, mixed, frigid Lamellic Haplorthods
Colonville	Coarse-loamy, mixed (calcareous), active, frigid Fluvaquentic Endoaquolls
Croswell	Sandy, mixed, frigid Oxyaquic Haplorthods
Dawson	Sandy or sandy-skeletal, mixed, dysic, frigid Terric Haplosaprists
Deford	Mixed, frigid Typic Psammaquents
Dorval	Clayey, mixed, euic, frigid Terric Haplosaprists
Graycalm	Mixed, frigid Lamellic Udipsamments
Grayling	Mixed, frigid Typic Udipsamments
Histosols	Histosols
Horsehead	Sandy-skeletal, mixed, frigid Arenic Hapludalfs
Iosco	Sandy over loamy, mixed, active, frigid Argic Endoaquods
Kellogg	Sandy over clayey, mixed, active, frigid Alfic Oxyaquic Haplorthods
Kinross	Sandy, mixed, frigid Typic Endoaquods
Klacking	Loamy, mixed, semiactive, frigid Arenic Glossudalfs
Lindquist	Sandy, mixed, frigid Lamellic Haplorthods
Loxley	Dysic, frigid Typic Haplosaprists
Lupton	Euic, frigid Typic Haplosaprists
Mancelona	Sandy, mixed, frigid Alfic Haplorthods
McGinn	Coarse-loamy, mixed, semiactive, frigid Haplic Glossudalfs
Melita	Sandy, mixed, frigid Alfic Haplorthods
Menominee	Sandy over loamy, mixed, active, frigid Alfic Haplorthods
Millersburg	Coarse-loamy, mixed, active, frigid Haplic Glossudalfs
Morganlake	Sandy over loamy, mixed, active, frigid Alfic Oxyaquic Haplorthods
Negwegon	Fine, mixed, semiactive, frigid Oxyaquic Glossudalfs
Ocqueoc	Sandy over loamy, mixed, active, frigid Entic Haplorthods
Ossineke	Fine-loamy, mixed, semiactive, frigid Oxyaquic Glossudalfs
Otisco	Sandy, mixed, frigid Argic Endoaquods
Richter	Coarse-loamy, mixed, semiactive, frigid Argic Endoaquods
Rubicon	Sandy, mixed, frigid Entic Haplorthods
Springport	Fine, mixed, semiactive, frigid Typic Epiaquolls
Tawas	Sandy or sandy-skeletal, mixed, euic, frigid Terric Haplosaprists
Udipsamments	Udipsamments
Udorthents	Udorthents
Wakeley	Sandy over clayey, mixed, nonacid, frigid Aeric Epiaquents