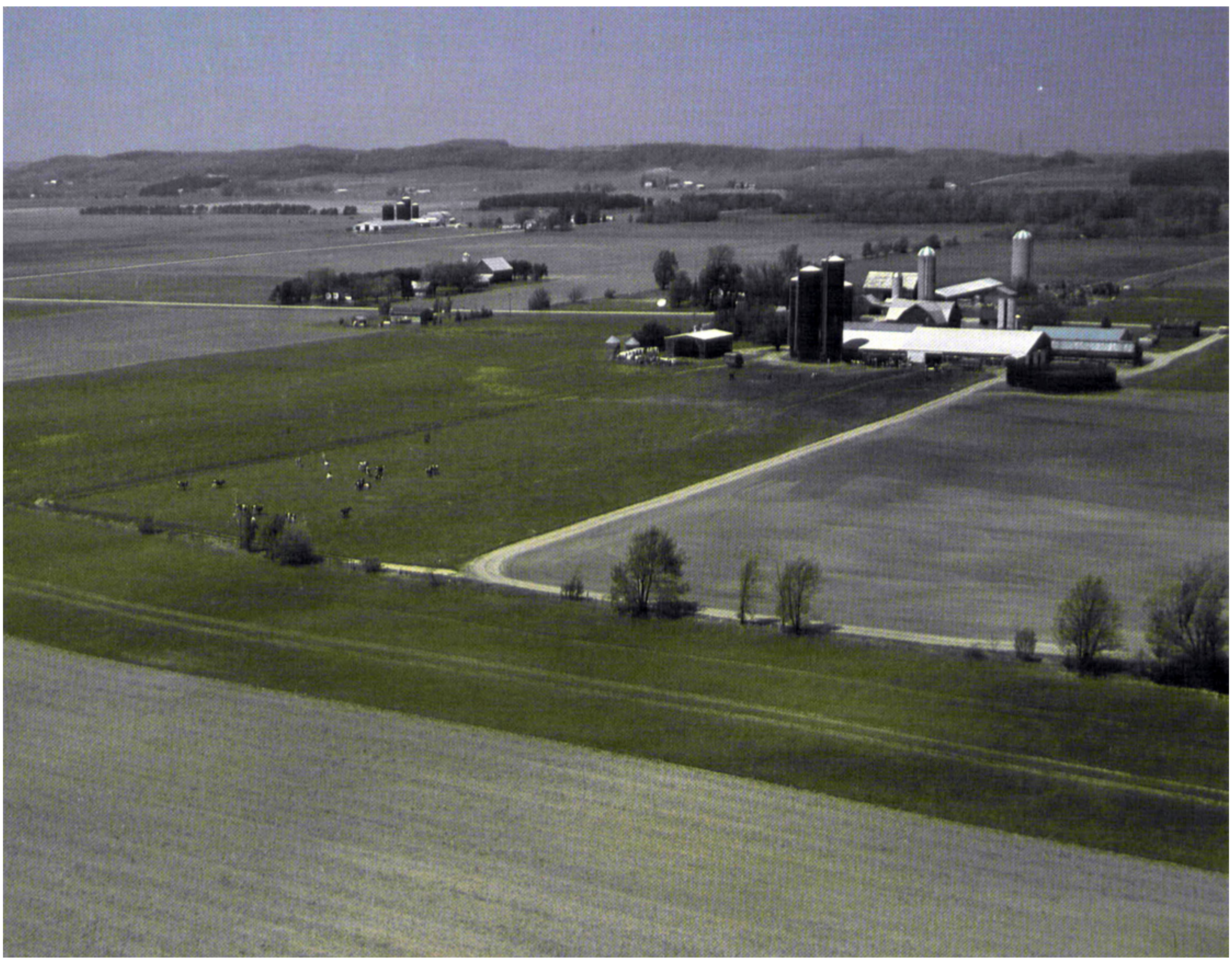
United States Department of Agriculture
Natural Resources Conservation Service and
Forest Service

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

Soil Survey of Mason County, Michigan



How To Use This Soil Survey

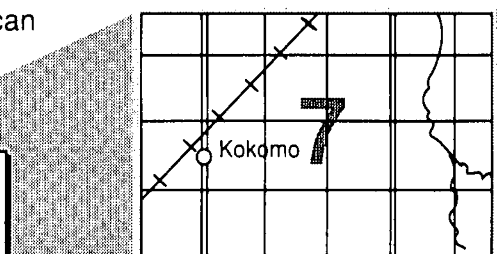
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, 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.

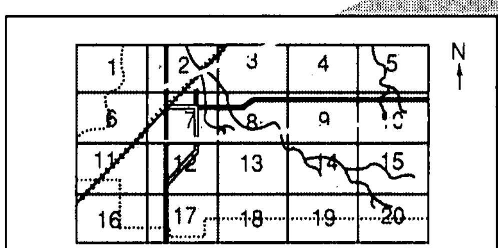
Detailed Soil Maps

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



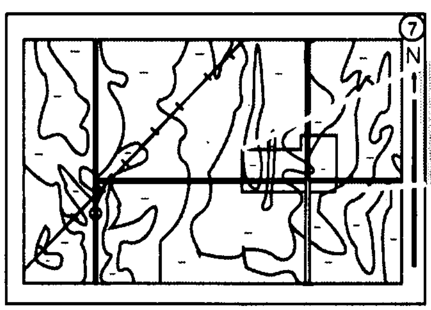
MAP SHEET

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

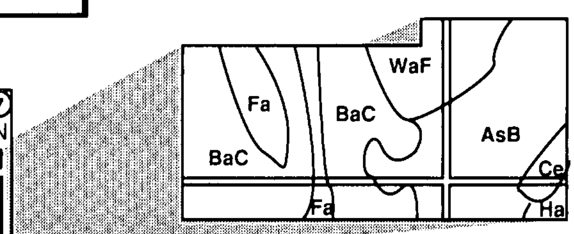


INDEX TO MAP SHEETS

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



MAP SHEET



AREA OF INTEREST

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

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

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 1990. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1990. This survey was made cooperatively by the Natural Resources Conservation Service, the Forest Service, the Michigan Department of Agriculture, the Michigan Agricultural Experiment Station, the Cooperative Extension Service, and the Michigan Technological University. Financial assistance for the survey was made available by the Mason County Board of Commissioners. The survey is part of the technical assistance furnished to the Mason County Board of Commissioners and the Mason County Soil Conservation District.

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.

All programs of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Diary farming in an area of the Capac-Wixom association.

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Issued September 1995

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Foreword

This soil survey contains information that can be used in land-planning programs in Mason County. The survey contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

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

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

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

Carole Jett
State Conservationist
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Soil Survey of Mason County, Michigan

By Erik P. Johnson, Michigan Department of Agriculture

Fieldwork by Joseph K. Calus, Robert E. Evon, Peter V. Kish, and Bruce D. Knapp, Natural Resources Conservation Service; Erik P. Johnson and Thomas Bauer, Michigan Department of Agriculture; and Jeffery Bruggink and Richard Watson, Forest Service

United States Department of Agriculture, Natural Resources Conservation Service and Forest Service,
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MASON COUNTY is in the western part of the Lower Peninsula of Michigan (fig. 1). The county is bordered on the north by Manistee County, on the east by Lake County, on the south by Oceana County, and on the west by Lake Michigan. Mason County has an area of 326,970 acres, or about 511 square miles.

About 50 percent of the acreage in the county is forested, 17 percent is used for agriculture, 4 percent is open water, and 29 percent is used for transportation facilities, urban development, and other purposes. Ludington, the county seat, has a population of about 8,500.

Soil scientists have determined that there are 177 different kinds of soil in the county. The soils vary widely in texture, natural drainage, nutrient availability, and other physical and chemical properties. Well drained soils make up about 64 percent of the county; somewhat poorly drained soils, 17 percent; and poorly drained and very poorly drained, mineral and organic soils, 14 percent. Urban land complexes, miscellaneous soil areas, and water areas make up about 5 percent of the county.

This soil survey updates the survey of Mason County published in 1939 *(14)*. The present survey provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section gives general information about the county. It describes the history and development, climate, agriculture, industry and transportation facilities, physiography, and lakes and streams.

History and Development

Mason County was established in 1855 by legislation that separated it from Ottawa County. Mason County was divided into three townships—Freesoil, Little Sable, and Pere Marquette. When these divisions were made, the Lincoln, Big Sable, and Pere Marquette Rivers were used as boundaries. In 1873, Ludington was named the county seat. The county was named after Steven T. Mason, who was twice elected Governor after Michigan's admission to the Union in 1837.

The earliest inhabitants of this survey area were members of the Ottawa Tribe of Native Americans, who established an estimated 52 villages in the area. Fur trading was commercially prominent from the 1600's to the 1840's *(10)*, a period when the population of Native Americans diminished.

In the mid-1840's, the first white settlers began to arrive in the survey area. Burr Caswell, a fur trader,

Figure 1.—Location of Mason County in Michigan.

built the first wood-frame house in the area. He later became the first probate judge of the county.

After the 1850's, the fur trade was replaced by the lumber industry as the area's economic base and agriculture and commerce were established as the population increased. By the early 1900's, the lumber industry became less economically important and was gradually replaced by light manufacturing, a chemical industry, and water-related recreation activities.

Climate

Prepared by the Michigan Department of Agriculture, Climatology Division, Climatology Program, East Lansing, Michigan.

The major climatic variations in the county are primarily the result of differences in topography and the proximity to Lake Michigan, inland lakes, and connecting waterways. Ludington is the only reporting station in the county with a 30-year period of record, from 1951 to 1980. Baldwin, in adjacent Lake County, has the same period of record and was used to provide data about the climate in the inland areas of Mason County.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Ludington and Baldwin. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring, and table 3 provides data on the length of growing season.

In winter, the average temperature is 24.2 degrees F at Ludington and 22.0 degrees at Baldwin. The average daily minimum temperature is 17.3 degrees at Ludington and 12.5 degrees at Baldwin. The lowest recorded temperatures were -38 degrees at Ludington and -49 degrees at Baldwin, both on February 11, 1899. The highest recorded temperatures are 99 degrees at Ludington and 104 degrees at Baldwin.

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 31.86 inches at Ludington and 33.97 inches at Baldwin. Of these totals, 17.52 inches at Ludington and 19.19 inches at Baldwin usually fall in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 14.35 inches at Ludington and 15.81 inches at Baldwin. The heaviest 1-day rainfall during the period of record was 4.58 inches at Ludington on August 7, 1965, and 3.75 inches at Baldwin on July 28, 1969. Thunderstorms occur on about 33 days each year. An average of six thunderstorms per month occur in June, July, and August.

The average seasonal snowfall is 82.8 inches at Ludington and 83.7 inches at Baldwin. The greatest snow depth at any one time during the period of record was 51 inches at Ludington and 41 inches at Baldwin. On the average, 86 days of the year at Ludington and 111 days of the year at Baldwin have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The heaviest 1-day snowfall on record is 27.1 inches at Ludington and 33.5 inches at Baldwin. The greatest monthly snowfall was 66.7 inches in January 1977 at Ludington and 65.3 inches in January 1982 at Baldwin. The greatest seasonal snowfall was 159.7 inches in 1985-86 at Ludington and 126.1 inches in 1981-82 at Baldwin. The least seasonal snowfall was 26.5 inches at Ludington in 1931-32 and 23.5 inches at Baldwin in 1901-02.

The average relative humidity at 1:00 p.m. is about 63 percent. Humidity is higher at night, and the average at about 7:00 a.m. is about 82 percent. The prevailing wind is from the southwest or south-southwest. Average windspeed is highest, about 12 miles per hour, in January. The sun shines about 62 percent of the time possible in summer and 30 percent in winter.

Agriculture

The agricultural history of Mason County began with Native Americans and early settlers, who raised staple crops and livestock on a small scale for domestic use. With the decline of the lumber industry, farming became increasingly important and attention was given to improving crop and livestock production.

The fruit industry in the county was started in 1864 by George McClatchie, a young Canadian. Alfalfa was first grown in the county in 1900 *(10)*.

In 1982, farmland made up 85,809 acres in the county, or about 26 percent of the total area. More than 62,500 acres of this land was cropland.

The major fruit crops are tart cherries followed by apples and sweet cherries. Peaches, pears, plums, apricots, and nectarines, although of lesser extent, also are significant. Most of the fruit crops are grown in the higher areas, where air drainage is good and frost damage is minimal. Because of its proximity to Lake Michigan, the western part of the county tends to have a longer frost-free period than the inland areas and therefore supports the bulk of the fruit production in the county.

Vegetables are grown throughout the county. Asparagus and snap beans are the primary vegetable crops. Conifer nurseries and Christmas tree plantations are important enterprises. Dairy products, livestock, grain crops, and hay also are important parts of the agriculture in the county.

Industry and Transportation Facilities

The major industrial activities in Mason County are chemical manufacturing and hydroelectric power production. The many light industries manufacture a variety of goods, including furniture, tools, metal tool boxes, styrofoam products, board games, auto parts and trim, concrete, and processed agricultural products.

The areas of dune sand along Lake Michigan provide raw material for the casting industry. Several sawmills and many active oil wells are throughout the county.

Port Ludington serves as a link to other areas in the country and to foreign areas. The port is the point of export for the agricultural and industrial products of the area.

One railroad freight line and one commercial airport serve the county. Two major highways, U.S. 31 and U.S. 10, link Mason County with other parts of the State.

Physiography

Most of the landscape features in the county were formed by the complex action of the Lake Michigan lobe of the Wisconsin glacial ice sheet. This glacial action produced five dominant land features—moraines, till plains, outwash plains, lake plains, and drainageways. Winds modified some of the land features and deposited large dunes along most of the coast of Lake Michigan. Winds also modified the interior landscape by reshaping old beach ridges and outwash plains. The lower areas were modified by the movement of shallow water.

The Lake Border morainic system crosses the county from the southwest to the northeast and makes up most of the rolling to steep features in the county. This morainic system is skirted by gently rolling till plains.

The east-central part of the county, along the Pere Marquette River and north of Gun Lake, is dominated by areas of nearly level to gently rolling outwash plains.

Nearly level, sandy lake plains are throughout the western half of the county. Many areas are partly covered by rolling dune formations.

The many streams of the county have dissected the landscape, making steep ravines. The elevation of Mason County ranges from 580 feet above sea level at the Lake Michigan shoreline to 960 feet above sea level in western Riverton Township.

Lakes and Streams

Mason County has about 14,500 acres of lakes and ponds, more than 200 miles of rivers, and 26 miles of Lake Michigan shoreline. The lakes are in scattered areas throughout the county. They range from 5 to 4,990 acres in size. Some lakes are in marshes and exhibit all stages of filling by vegetation. The largest lakes are Hamlin Lake, 4,990 acres; Round Lake, 571 acres; Bass Lake, 524 acres; Gun Lake, 219 acres; and Ford Lake, 208 acres. Additionally, the Ludington pump-storage reservoir is more than 800 acres.

The major rivers are the Pere Marquette, the Lincoln, and the Big Sable, all of which flow westward to Lake Michigan. The Big Sable River drains the northern part of the county and enters Hamlin Lake before emptying into Lake Michigan. The Lincoln River and its two branches drain the central part of the county. The Pere Marquette and its south branch drain the southern part of the county. They enter Pere Marquette Lake and pass through Port Ludington before emptying into Lake Michigan.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; and the kinds of crops and native plants growing on the soils. 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 in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil 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-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. 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 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 assure 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.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. 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 soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns 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 (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

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

Survey Procedures

The general procedures followed in making this survey are described in the National Soils Handbook *(17)* of the Natural Resources Conservation Service. The Huron-Manistee National Forest Ecological Classification System *(18)* was used in conjunction with the handbook on most of the Forest Service lands and on some private tracts within the Manistee National Forest administrative boundary. The design of the map units in these areas differs from that of the units in other parts of the county.

The Ecological Classification System includes evaluation and classification of landscape areas by ecological approaches. Areas of ecological units are mapped on aerial photographs, and inventory maps are used to make interpretations for forest land and resource management.

Procedures for Map Units 1 to 99D

The soil survey maps made for conservation planning prior to the start of the project and for the survey of the county published in 1939 *(14)* were among the references used. Before the fieldwork began, preliminary boundaries of slopes and landforms were plotted stereoscopically on 1:15,840 leaf-off aerial photography. U.S. Geologic Survey topographic maps, at a scale of 1:24,000, helped the soil scientists to relate land and image features.

A reconnaissance was made by vehicle before the soil scientists traversed the surface on foot, examining the soils. In areas where the soil pattern is complex, traverses and random observations were spaced as close as 200 yards. In areas where the soil pattern is relatively simple, traverses were about 0.25 mile apart.

As they traversed the surface, the soil scientists divided the landscape into segments. For example, a hillside would be separated from a swale or a gently sloping ridgetop from a very steep side slope.

Observations of such items as landforms, blown-down trees, vegetation, and roadbanks were made without regard to spacing. Soil boundaries were determined on the basis of soil examinations, observations, and photo interpretation. The soil material was examined with the aid of a hand auger or a spade to a depth of about 5 feet. The pedons described as typical were observed and studied in pits that were dug with shovels, mattocks, and digging bars.

Notes were taken on the composition of map units during each year of the project. These notes were supplemented with information provided by transects and additional investigations as mapping progressed and the composition of individual map units was determined for the survey area.

Samples for chemical and physical analyses were taken from representative sites of some soils in the survey area. The analyses were made by the Soil Research Laboratory, Michigan Technological University, Houghton, Michigan, and the Soil Survey Laboratory, Lincoln, Nebraska. The results of the studies can be obtained on request from the two laboratories or from the State Office of the Natural Resources Conservation Service at East Lansing, Michigan.

After completion of the soil mapping on aerial photographs, map unit delineations were transferred by hand to another set of the same photographs. Cultural features were recorded from observations of the maps and the landscape.

Procedures for Map Units 210B to 282

Prior to ecological unit mapping, information on the climate, geology, soils, hydrology, and vegetation was collected in the survey area. Research techniques were used in mid-to-late successional stands to collect information on vegetative and soil components in areas on uplands. Samples were not collected in early successional aspen stands, young stands, plantations, or stands disturbed by recent harvesting or fires. The results were used to develop the ecological map units, which are defined on the basis of both abiotic landscape characteristics (generally stable characteristics, such as climate and landforms) and biotic landscape characteristics (generally unstable characteristics, such as vegetation).

A premapping reconnaissance was conducted in the survey area before field inventory began. Important results of the reconnaissance activities were a listing of the ecological units expected to be mapped in the area, definition of the features differentiating the units, and a set of specific sites in the Manistee National Forest where detailed data were collected for quality-control analysis in a laboratory.

Following reconnaissance, the mapping personnel traversed the landscape, evaluated the components of the current ecosystems, determined and observed ecological unit boundaries in the field, and delineated preliminary map units on aerial photographs. During field mapping, stereo images, photo-tones, and photo colors were used to delineate landscape features on the aerial photographs. Some important characteristics used by the field personnel to evaluate an area included water table levels, soil texture and color, drainage systems, geologic indicators, and interpretation of groups of vegetative species.

Mappers inventoried 300 to 500 acres per day. They performed detailed evaluations and completed note cards on 10 to 15 specific sites. Those sites were strategically identified for their landscape features and as points for the collection of data on overstory, understory, ground flora, forest floor, soil, substratum, and ground water for keying ecological units. Sandy soils were described to a depth of 15 feet. Textural bands at the sites have been shown to have a significant influence on tree growth and species composition *(6, 7)*. As a result, the presence, absence, and intensity of deep textural bands were recorded as part of the sampling and inventory scheme. These data are a permanent part of the forest records available at the office of the supervisor of the Huron-Manistee National Forest.

Following field inventory, the final ecological unit boundaries were drawn onto the aerial photographs. The completed photography was checked for line closure and matching of delineations across photographs.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. 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 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.

Soil Descriptions

Areas of Nearly Level to Very Steep, Excessively Drained to Moderately Well Drained, Sandy Soils and Areas of Dune Land

Most areas of these soils are used as woodland. The major management concerns are an equipment limitation and seedling mortality. The major soils are generally unsuited to cropland and are poorly suited or unsuited to pasture. Droughtiness is the major management concern.

1. Dune Land-Nordhouse-Quartzipsamments Association

Dune land and gently sloping to very steep, excessively drained, sandy soils on dunes

This association consists of soils and Dune land on knolls, ridges, and hills. Slopes range from 3 to 75 percent.

This association makes up about 3 percent of the county. It is about 30 percent Dune land, 25 percent Nordhouse soils, 21 percent Quartzipsamments, and 24 percent soils of minor extent.

The Dune land is typically pale brown fine sand about 60 inches thick.

Typically, the surface layer of the Nordhouse soils is black and very dark gray fine sand about 6 inches thick. The subsurface layer is light brownish gray fine sand about 12 inches thick. The subsoil is loose fine sand about 31 inches thick. The upper part is brownish yellow, and the lower part is yellowish brown. The substratum to a depth of about 72 inches is light yellowish brown fine sand.

The Quartzipsamments are typically pale brown fine sand about 60 inches thick.

Of minor extent in this association are the excessively drained Entic Haplorthods, sandy; the well drained Epworth soils; and the poorly drained Psammaquents. The Entic Haplorthods are in landscape positions similar to those of the major soils. The Epworth soils are in level areas and on ridges. The Psammaquents are in depressions.

Most areas of this association are used as woodland, building sites, or recreational areas. Use of the association is limited in many areas by state regulation of the Dune land. Onsite investigation is needed.

2. Grattan-Epworth Association

Nearly level to steep, excessively drained to moderately well drained, sandy soils on lake plains and outwash plains

This association consists of soils on broad plains. Slopes range from 0 to 35 percent.

This association makes up about 9 percent of the county. It is about 55 percent Grattan soils, 35 percent Epworth soils, and 10 percent soils of minor extent.

The Grattan soils are nearly level to steep and are excessively drained. Typically, the surface layer is very dark gray sand about 1 inch thick. The subsurface layer is pinkish gray sand about 2 inches thick. The subsoil is very friable sand about 42 inches thick. The upper part is dark brown, and the lower part is strong brown. The substratum to a depth of about 60 inches is reddish yellow and yellowish brown sand.

The Epworth soils are nearly level to rolling and are well drained. Typically, the surface layer is black fine sand about 3 inches thick. The subsurface layer is grayish brown fine sand about 3 inches thick. The subsoil is fine sand about 24 inches thick. The upper part is strong brown and very friable, and the lower part is strong brown and loose. The substratum to a depth of about 60 inches is brownish yellow and yellow fine sand.

Of minor extent in this association are the poorly drained Kingsville soils and the moderately well drained Covert soils. The Kingsville soils are in depressions, and the Covert soils are in the slightly lower landscape positions.

Most areas of this association are used as woodland. The major management concerns are an equipment limitation and seedling mortality.

The major soils are well suited to building site development and septic tank absorption fields. The major management concern on building sites is the instability of cutbanks. Rapid permeability and the hazard of ground-water contamination are the management concerns on sites for septic tank absorption fields.

3. Plainfield-Coloma Association

Nearly level to very steep, excessively drained, sandy soils on outwash plains

This association consists of soils on broad plains and low ridges. Slopes are dominantly 0 to 12 percent but range from 0 to 40 percent.

This association makes up about 5 percent of the county. It is about 48 percent Plainfield soils, 18 percent Coloma soils, and 34 percent soils of minor extent.

The Plainfield soils are nearly level to steep. Typically, the surface layer is very dark gray sand about 3 inches thick. The subsoil is brown, loose sand about 24 inches thick. The substratum to a depth of about 60 inches is light yellowish brown and very pale brown sand.

The Coloma soils are nearly level to very steep. Typically, the surface layer is dark brown sand about 7 inches thick. The subsurface layer is yellowish brown sand about 38 inches thick. The subsoil to a depth of about 60 inches is light yellowish brown, loose sand that has bands of strong brown loamy sand.

Of minor extent in this association are the very poorly drained Houghton and Adrian soils, the excessively drained Grattan soils, and the poorly drained Kingsville soils. The Kingsville, Houghton, and Adrian soils are in depressions. The Grattan soils are in landscape positions similar to those of the major soils.

Most areas of this association are used as woodland. The major management concerns are an equipment limitation and seedling mortality. Erosion is a hazard on the steeper Coloma soils.

Depending on the slope, the major soils are well suited or moderately well suited to building site development and septic tank absorption fields. Because of rapid permeability and the hazard of ground-water contamination, special precautions are needed when a septic tank absorption field is installed.

4. Typic Udipsamments Association

Nearly level to rolling, excessively drained and moderately well drained, sandy soils on outwash plains and stream terraces

This association consists of soils on broad plains. Slopes are dominantly 0 to 6 percent but range from 0 to 18 percent.

This association makes up about 6 percent of the county. It is about 80 percent Typic Udipsamments and 20 percent soils of minor extent.

Typically, the surface layer of the Typic Udipsamments is very dark gray sand about 2 inches thick. The subsoil is sand about 38 inches thick. The upper part is dark yellowish brown and friable, and the lower part is yellowish brown and loose. The substratum to a depth of about 180 inches is light yellowish brown sand.

Of minor extent in this association are the excessively drained Entic Haplorthods, sandy, and Alfic Udipsamments in landscape positions similar to those of the major soils.

Most areas of this association are used as woodland. The major management concerns are an equipment limitation and seedling mortality.

5. Entic Haplorthods, Sandy Association

Nearly level to hilly, excessively drained, sandy soils on moraines and outwash plains

This association consists of soils on broad plains, knolls, ridges, and hills. Slopes range from 0 to 25 percent.

This association makes up about 5 percent of the county. It is about 90 percent Entic Haplorthods, sandy, and 10 percent soils of minor extent.

Typically, the surface layer of the Entic Haplorthods is very dark gray sand about 3 inches thick. The subsurface layer is pinkish gray sand about 2 inches thick. The subsoil is friable sand about 30 inches thick. The upper part is strong brown, and the lower part is reddish yellow. The substratum to a depth of about 90 inches is light yellowish brown sand.

Of minor extent in this association are the excessively drained Typic Udipsamments and the very poorly drained Medisaprists. The Typic Udipsamments are in landscape positions similar to those of the major soils. The Medisaprists are in depressions and along drainageways.

Most areas of this association are used as woodland. The major management concerns are an equipment limitation and seedling mortality.

Nearly Level and Undulating, Poorly Drained to Excessively Drained, Sandy Soils on Outwash Plains and Lake Plains

Most areas of these soils are used as woodland. The major management concerns are an equipment limitation, windthrow, seedling mortality, and plant competition. The major soils are generally unsuited to cropland and are poorly suited or unsuited to pasture. Droughtiness, wetness, and soil blowing are management concerns in areas of crops and pasture.

6. Covert-Pipestone-Saugatuck Association

Nearly level and undulating, moderately well drained and somewhat poorly drained, sandy soils on outwash plains and lake plains

This association consists of soils on broad plains and low ridges. Slopes range from 0 to 6 percent.

This association makes up about 16 percent of the county. It is about 27 percent Covert soils, 18 percent Pipestone soils, 15 percent Saugatuck soils, and 40 percent soils of minor extent.

The Covert soils are nearly level and undulating and are moderately well drained. Typically, the surface layer is dark gray sand about 3 inches thick. The subsurface layer is pinkish gray sand about 5 inches thick. The subsoil is very friable sand about 28 inches thick. The upper part is dark reddish brown, the next part is strong brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is light yellowish brown, mottled sand.

The Pipestone soils are nearly level and somewhat poorly drained. Typically, the surface layer is brown fine sand about 4 inches thick. The subsurface layer is brownish gray fine sand about 7 inches thick. The subsoil is about 29 inches thick. It is very friable and mottled. The upper part is dark reddish brown fine sand, and the lower part is strong brown sand. The substratum to a depth of about 60 inches is yellowish brown sand.

The Saugatuck soils are nearly level and somewhat poorly drained. Typically, the surface layer is black sand about 2 inches thick. The subsurface layer is light gray, mottled sand about 10 inches thick. The subsoil is about 33 inches thick. The upper part is very dusky red, mottled, firm sand, and the lower part is yellowish brown, mottled, loose sand. The substratum to a depth of about 60 inches is yellowish brown sand.

Of minor extent in this association are the poorly drained Kingsville, Kinross, and Jebavy soils in depressions and drainageways and the excessively drained Grattan soils on low ridges.

Most areas of this association are used as woodland. The major management concerns are an equipment limitation, seedling mortality, windthrow, and plant competition.

The Pipestone and Saugatuck soils are poorly suited to building site development, and the Covert soils are moderately well suited. The seasonal high water table is the major management concern. Because of wetness, the major soils are poorly suited to septic tank absorption fields.

7. Entic Haplorthods, Sandy-Aeric Haplaquods, Sandy-Aquic Udipsamments Association

Nearly level and undulating, excessively drained to somewhat poorly drained, sandy soils on lake plains and outwash plains

This association consists of soils on broad plains. Slopes range from 0 to 6 percent.

This association makes up about 3 percent of the county. It is about 45 percent Entic Haplorthods, sandy; 24 percent Aeric Haplaquods, sandy; 13 percent Aquic Udipsamments; and 18 percent soils of minor extent.

The Entic Haplorthods are nearly level and undulating and are excessively drained to moderately well drained. Typically, the surface layer is very dark gray sand about 3 inches thick. The subsurface layer is pinkish gray sand about 2 inches thick. The subsoil is friable sand about 30 inches thick. The upper part is strong brown, and the lower part is reddish yellow. The substratum to a depth of about 180 inches is light yellowish brown sand.

The Aeric Haplaquods are nearly level and somewhat poorly drained. Typically, the surface layer is very dark grayish brown sand about 3 inches thick. The subsurface layer is light brownish gray, mottled sand about 5 inches thick. The subsoil is about 22 inches thick. The upper part is dark reddish brown, mottled, moderately cemented sand; the next part is brown, mottled, moderately cemented sand; and the lower part is yellowish brown, mottled, loose sand. The substratum to a depth of about 60 inches is yellowish brown sand.

The Aquic Udipsamments are nearly level and moderately well drained. Typically, the surface layer is very dark gray sand about 2 inches thick. The subsurface layer is brown sand about 5 inches thick. The subsoil is sand about 38 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown sand.

Of minor extent in this association are the poorly drained Typic Haplaquods, sandy, and Medisaprists in depressions and the well drained Alfic Haplorthods, sandy, in landscape positions similar to those of the major soils.

Most areas of this association are used as woodland. The major management concerns are an equipment limitation, windthrow, seedling mortality, and plant competition.

Nearly Level and Undulating, Somewhat Poorly Drained, Sandy and Loamy Soils

These soils generally are used as cropland or pasture. They are moderately well suited to cropland. The major management concerns are wetness, soil blowing, and poor tilth.

8. Ithaca-Arkona Association

Nearly level and undulating, somewhat poorly drained, loamy and sandy soils on lake plains and till plains

This association consists of soils on broad plains. Slopes range from 0 to 4 percent.

This association makes up about 8 percent of the county. It is about 40 percent Ithaca and similar soils, 28 percent Arkona and similar soils, and 32 percent soils of minor extent.

The Ithaca soils are nearly level. Typically, the surface layer is dark brown loam about 10 inches thick. The subsoil is about 50 inches thick. The upper part is yellowish brown and pale brown, friable clay loam; the next part is reddish brown, mottled, friable clay; and the lower part is brown, mottled, friable clay loam.

The Arkona soils are nearly level and undulating. Typically, the surface layer is black loamy sand about 9 inches thick. The subsurface layer is grayish brown, mottled sand about 3 inches thick. The subsoil is about 48 inches thick. In sequence downward, it is dark brown and strong brown, mottled, loose sand; yellowish brown, mottled, loose sand; dark brown, firm silty clay and light brownish gray loamy sand; and brown, mottled, firm silty clay.

Of minor extent in this association are the poorly drained Ziegenfuss and Bono soils, the very poorly drained Houghton soils, and the well drained Perrinton soils. The Ziegenfuss, Bono, and Houghton soils are in depressions and along drainageways. The Perrinton soils are on low knolls and ridges.

Most areas of this association are used as cropland (fig. 2). Some areas are used as woodland or pasture.

The major soils are well suited or moderately well suited to cropland and are well suited to pasture. The main management concerns are wetness in the Ithaca and Arkona soils, poor tilth in the Ithaca soils, and soil blowing, droughtiness, and a low organic matter content in areas of the Arkona soils. Droughtiness in the Arkona soils and compaction on the Ithaca soils are management concerns if pastures are overgrazed.

In the areas used as woodland, the major management concerns are an equipment limitation and plant competition.

Because of wetness, the major soils are poorly suited to building site development and septic tank absorption fields. Slow permeability and the shrink-swell potential in the Ithaca soils and in the lower part of the Arkona soils are additional limitations.

9. Capac-Wixom Association

Nearly level and undulating, somewhat poorly drained, loamy and sandy soils on lake plains, till plains, and moraines

This association consists of soils on broad plains. Slopes range from 0 to 4 percent.

This association makes up about 8 percent of the county. It is 39 percent Capac soils, 37 percent Wixom soils, and 24 percent soils of minor extent.

Typically, the surface layer of the Capac soils is dark brown loam about 9 inches thick. The subsoil is about 41 inches thick. The upper part is brown, mottled, friable clay loam; the next part is light gray, mottled, friable sandy loam; and the lower part is brown, mottled, firm clay loam.

Typically, the surface layer of the Wixom soils is black loamy sand about 9 inches thick. The subsurface layer is grayish brown, mottled loamy sand about 2 inches thick. The subsoil is about 22 inches thick. The upper part is dark brown, friable loamy sand; the next part is brownish yellow, mottled, friable sand; and the lower part is reddish brown, mottled, friable sandy loam. The substratum to a depth of about 60 inches is pinkish gray, mottled, stratified fine sand and silty clay loam.

Of minor extent in this association are the well drained Marlette and Fern soils and the poorly drained Parkhill soils. The Marlette and Fern soils are on low knolls and ridges. The Parkhill soils are in upland depressions.

Most of this association is used as cropland. Some areas are used as woodland or pasture.

The major soils are well suited or moderately well suited to cropland and are well suited to pasture. The main management concerns are wetness in the Capac and Wixom soils, poor tilth in the Capac soils, and soil

Figure 2.—Cropland and pasture in an area of the Ithaca-Arkona association.

blowing, droughtiness, and a low organic matter content in areas of the Wixom soils. Soil blowing on the Wixom soils and compaction on the Capac soils are management concerns if pastures are overgrazed.

In the areas used as woodland, the major management concerns are an equipment limitation and plant competition. Windthrow and seedling mortality are additional management concerns on the Wixom soils.

Because of wetness, the major soils are poorly suited to building site development.

Nearly Level to Very Steep, Excessively Drained, Well Drained, and Somewhat Poorly Drained Soils

These soils are used as cropland or pasture. They are well suited or moderately well suited to cropland and pasture. The major management concerns are water erosion, wetness, soil blowing, and compaction.

10. Perrinton-Ithaca Association

Nearly level to steep, well drained and somewhat poorly drained, loamy soils on till plains and moraines

This association consists of soils on broad plains, knolls, and ridges. Slopes range from 0 to 35 percent.

This association makes up about 3 percent of the county. It is about 51 percent Perrinton soils, 20 percent Ithaca soils, and 29 percent soils of minor extent.

The Perrinton soils are nearly level to steep and are well drained. Typically, the surface layer is dark brown, friable loam about 7 inches thick. The subsoil is firm clay loam about 53 inches thick. The upper part is light brownish gray and dark brown, the next part is dark brown, and the lower part is yellowish brown.

The Ithaca soils are nearly level and somewhat poorly drained. Typically, the surface layer is dark brown loam about 10 inches thick. The subsoil is about 50 inches thick. The upper part is yellowish brown and pale brown, friable clay loam; the next part is reddish brown, mottled, friable clay; and the lower part is brown, mottled, friable clay loam.

Of minor extent in this association are the poorly drained Ziegenfuss soils, the well drained Fern soils, and the very poorly drained Houghton soils. The Ziegenfuss and Houghton soils are in depressions and along drainageways. The Fern soils are on low knolls and ridges.

Most areas of this association are used as cropland. Some areas are used as woodland or pasture.

The major soils are well suited or moderately well suited to cropland and pasture. The main management concerns are water erosion on the Perrinton soils, wetness in the Ithaca soils, and poor tilth in both soils. If pastures are overgrazed, compaction is a management concern on both soils and water erosion is a management concern on the Perrinton soils.

In the areas used as woodland, the major management concern is plant competition.

The Perrinton soils are well suited, moderately well suited, or poorly suited to building site development, depending on the slope. Because of wetness, the Ithaca soils are poorly suited to building site development. Slow permeability is a management concern if the major soils are used as sites for septic tank absorption fields.

11. Fern-Marlette Association

Nearly level to very steep, well drained, sandy and loamy soils on moraines and till plains

This association consists of soils on broad plains. Slopes range from 0 to 45 percent.

This association makes up about 7 percent of the county. It is about 35 percent Fern soils, 33 percent Marlette soils, and 32 percent soils of minor extent.

The Fern soils are nearly level to very steep. Typically, the surface layer is dark brown fine sand about 13 inches thick. The subsurface layer is pale brown fine sand about 10 inches thick. The subsoil is about 37 inches thick. The upper part is strong brown, very friable loam; the next part is pale brown, friable fine sand; and the lower part is brown, friable loam.

The Marlette soils are nearly level to very steep. Typically, the surface layer is very dark grayish brown fine sandy loam about 9 inches thick. The subsoil is about 29 inches thick. The upper part is strong brown, friable clay loam; the next part is light brownish gray, friable fine sandy loam; and the lower part is dark brown, firm clay loam. The substratum to a depth of about 60 inches is brown clay loam.

Of minor extent in this association are the very poorly drained Houghton soils, the somewhat poorly drained Capac soils, the excessively drained Grattan soils, and the well drained Spinks soils. The Grattan soils and Spinks soils are in landscape positions similar to those of the major soils. The Capac soils are in the slightly lower positions. The Houghton soils are in depressions.

Most areas of this association are used as cropland. Some areas are used as woodland or pasture.

The major soils are well suited or moderately well suited to cropland and pasture. The main management concerns are water erosion on both of the major soils, poor tilth in the Marlette soils, and soil blowing, droughtiness, and a low organic matter content in areas of the Fern soils. If pastures are overgrazed, droughtiness in the Fern soils and compaction on the Marlette soils are management concerns.

In the areas used as woodland, plant competition is a management concern on both of the major soils and an equipment limitation is a management concern on the Fern soils.

The major soils are well suited to building site development and are well suited, moderately well suited, or poorly suited to septic tank absorption fields. The major management concern on sites for septic tank absorption fields is moderately slow permeability in the Marlette soils and in the lower part of the Fern soils.

12. Coloma-Spinks-Fern Association

Nearly level to very steep, well drained and excessively drained, sandy soils on outwash plains, moraines, and lake plains

This association consists of soils on broad uplands, knolls, and ridges. Slopes range from 0 to 45 percent.

This association makes up about 17 percent of the county. It is about 25 percent Coloma soils, 25 percent Spinks soils, 15 percent Fern soils, and 35 percent soils of minor extent.

The Coloma soils are nearly level to very steep and are excessively drained. Typically, the surface layer is dark brown sand about 7 inches thick. The subsoil is about 53 inches thick. The upper part is yellowish brown, loose sand, and the lower part is light yellowish brown, loose sand that has bands of strong brown, loose loamy sand.

The Spinks soils are nearly level to very steep and are well drained. Typically, the surface layer is very dark grayish brown sand about 4 inches thick. The subsoil is about 56 inches thick. The upper part is yellowish brown, very friable sand; the next part is very pale brown, very friable sand and strong brown, very friable loamy sand; and the lower part is light yellowish

Figure 3.—Cropland, woodland, and hayland in an area of the Coloma-Spinks-Fern association.

brown, very friable sand and strong brown, very friable loamy sand.

The Fern soils are nearly level to very steep and are well drained. Typically, the surface layer is dark brown fine sand about 13 inches thick. The subsurface layer is pale brown fine sand about 10 inches thick. The subsoil is about 37 inches thick. The upper part is strong brown, very friable loam; the next part is pale brown, friable fine sand; and the lower part is brown, friable loam.

Of minor extent in this association are the well drained Remus, Tekenink, and Perrinton soils and the somewhat poorly drained Pipestone soils. The Remus, Tekenink, and Perrinton soils are in landscape positions similar to those of the major soils. The Pipestone soils are in the slightly lower positions.

Most areas of this association are used as cropland or woodland (fig. 3). Some areas are used as pasture.

The major soils are well suited, moderately well suited, or poorly suited to cropland and pasture, depending on the slope. The main management concerns are water erosion in the steeper areas and soil blowing in all areas.

In the areas used as woodland, the main management concerns are an equipment limitation and seedling mortality. Droughtiness and soil blowing are management concerns on the major soils if pastures are overgrazed.

The major soils are well suited, moderately well suited, poorly suited, or unsuited to building site development and septic tank absorption fields, depending on the slope. Rapid permeability and the hazard of ground-water contamination are additional management concerns if the Coloma soils are used as sites for septic tank absorption fields.

13. Alfic Haplorthods, Sandy-Entic Haplorthods, Sandy-Haplic Glossudalfs, Fine-Loamy Association

Nearly level to very steep, excessively drained to well drained, sandy and loamy soils on moraines

This association is on broad uplands, knolls, ridges, and hills. Slopes range from 0 to 70 percent.

This association makes up about 2 percent of the county. It is about 60 percent Alfic Haplorthods, sandy; 20 percent Entic Haplorthods, sandy; 15 percent Haplic Glossudalfs, fine-loamy; and 5 percent soils of minor extent.

The Alfic Haplorthods are nearly level to steep and are well drained. Typically, the surface layer is very dark gray sand about 3 inches thick. The subsurface layer is grayish brown loamy sand about 2 inches thick. The subsoil is about 45 inches thick. In sequence downward, it is brown, friable loamy sand; strong brown, friable sand; yellowish brown, friable sand; and brown, firm sandy clay loam. The substratum to a depth of about 65 inches is yellowish brown loamy sand.

The Entic Haplorthods are nearly level to very steep and are excessively drained. Typically, the surface layer is very dark gray sand about 3 inches thick. The subsurface layer is pinkish gray sand about 2 inches thick. The subsoil is friable sand about 30 inches thick. The upper part is strong brown, and the lower part is reddish yellow. The substratum to a depth of about 90 inches is light yellowish brown sand.

The Haplic Glossudalfs are nearly level to steep and are well drained. Typically, the surface layer is black sandy loam about 4 inches thick. The subsurface layer is pale brown sandy loam about 6 inches thick. The subsoil is about 35 inches thick. The upper part is pale brown, friable sandy loam; the next part is brown, friable loam; and the lower part is reddish brown, firm sandy clay loam. The substratum to a depth of about 60 inches is brown sandy clay loam.

Of minor extent in this association are the well drained Spinks soils in landscape positions similar to those of the major soils.

Most areas of this association are used as woodland. The major management concerns are an equipment limitation and seedling mortality on the Entic Haplorthods and Alfic Haplorthods.

Nearly Level, Very Poorly Drained and Poorly Drained Soils

These soils are used as woodland and wildlife habitat. The main management concerns are an equipment limitation, windthrow, seedling mortality, and plant competition. The major soils are generally unsuited to cropland and pasture because of wetness.

14. Medisaprists-Mollic Psammaquents Association

Nearly level, very poorly drained and poorly drained, mucky soils on outwash plains, moraines, flood plains, and lake plains

This association consists of soils in depressions and drainageways. Slopes range from 0 to 2 percent.

This association makes up about 2 percent of the county. It is about 60 percent Medisaprists, 23 percent Mollic Psammaquents, and 17 percent soils of minor extent.

The Medisaprists are very poorly drained. Typically, the surface layer is black muck about 40 inches thick. The substratum to a depth of about 60 inches is gray sand.

The Mollic Psammaquents are poorly drained. Typically, the surface layer is black muck about 3 inches thick. The subsurface layer is black fine sandy loam about 3 inches thick. The substratum extends to a depth of about 60 inches. The upper part is light brownish gray sandy loam, and the lower part is dark brown and dark yellowish brown sand.

Of minor extent in this association are the poorly drained Aeric Haplaquods, sandy, and Typic Haplaquolls, sandy over loamy, in landscape positions similar to those of the major soils.

This association is used mainly as woodland and wildlife habitat. The major soils are poorly suited to woodland. The main management concerns are wetness, windthrow, an equipment limitation, seedling mortality, and plant competition.

15. Kingsville-Adrian Association

Nearly level, poorly drained and very poorly drained, sandy and mucky soils on outwash plains

This association consists of soils in depressions and drainageways. Slopes range from 0 to 2 percent.

This association makes up about 3 percent of the county. It is about 65 percent Kingsville soils, 30 percent Adrian soils, and 5 percent soils of minor extent.

The Kingsville soils are poorly drained. Typically, the surface layer is black mucky sand about 6 inches thick. The subsoil is gray, very friable fine sand about 19 inches thick. The substratum to a depth of about 60 inches is light brownish gray sand.

The Adrian soils are very poorly drained. Typically, the surface layer is black muck about 9 inches thick. The subsoil is black muck about 17 inches thick. The substratum to a depth of about 60 inches is light brownish gray sand.

Of minor extent in this association are the somewhat poorly drained Pipestone soils in the slightly higher landscape positions.

Most areas of this association are used as woodland and wildlife habitat. The major soils are generally unsuited to cropland and pasture and are poorly suited to woodland. In the areas used as woodland, the main management concerns are windthrow, an equipment limitation, seedling mortality, and plant competition.

The major soils are unsuited to building site development and septic tank absorption fields. Ponding is the major management concern.

16. Kerston-Carlisle-Glendora Association

Nearly level, poorly drained and very poorly drained, mucky and loamy soils on flood plains

This association consists of soils in drainageways. Slopes range from 0 to 2 percent.

This association makes up about 3 percent of the county. It is about 25 percent Kerston soils, 25 percent Carlisle soils, 25 percent Glendora soils, and 25 percent soils of minor extent.

The Kerston soils are very poorly drained. Typically, the surface layer is black muck about 18 inches thick. The substratum is about 54 inches thick. In sequence downward, it is very pale brown sand, black muck, grayish brown sand, and black muck.

The Carlisle soils are very poorly drained. Typically, the surface layer is black muck about 26 inches thick. Below this to a depth of about 60 inches is black and dark reddish brown muck.

The Glendora soils are poorly drained. Typically, the surface layer is black mucky silt loam about 9 inches thick. The substratum to a depth of about 60 inches is grayish brown, light brownish gray, and gray sand.

Of minor extent in this association are the excessively drained Grattan and moderately well drained Covert soils in the slightly higher areas adjacent to the flood plains.

This association is poorly suited to woodland. The main management concerns are windthrow, an equipment limitation, seedling mortality, and plant competition. The major soils are unsuited to building site development and septic tank absorption fields, mainly because of ponding.

Broad Land Use Considerations

The general soil map is helpful in identifying broad areas that can be developed for residential, industrial, agricultural, and other uses. It cannot be used, however, in the selection of sites for specific structures or specific crops.

The soils in Mason County vary widely in their suitability for major land uses. About 17 percent of the acreage in the county is cropland. Corn, small grain, alfalfa, hay, apples, cherries, snap beans, and asparagus are the major crops. The cropland is concentrated in associations 8, 9, 10, 11, and 12. The major soils in these associations are generally suited to crops. These soils are on nearly level to rolling uplands and on some of the steeper slopes. Controlling water erosion and soil blowing, reducing wetness, and maintaining good tilth are the main management concerns.

The major soils in associations 8, 9, 10, 11, and 12 are generally suited to permanent pasture. Those in associations 8 and 9 have a seasonal high water table. Grazing when the soils are wet causes compaction, which can retard the growth of pasture plants. Forage production is influenced by the number of livestock that are allowed to graze on a pasture, the length of the grazing period, and the distribution of rainfall. Good pasture management includes controlled stocking rates, weed control, annual applications of fertilizer, rotation grazing, timely deferment of grazing, and strategically located water for livestock.

About 46 percent of the county is woodland. Most of the woodland is in associations 1, 2, 3, 4, 5, 6, 7, 12, 13, 14, 15, and 16. Productivity is high on the soils on uplands in associations 12 and 13; moderately high or high in associations 14, 15, and 16; moderately high to low in associations 2, 3, 5, and 7; and low in associations 1, 4, and 6. Plant competition is the main management concern on the soils used as woodland. Erosion, an equipment limitation, seedling mortality, and windthrow are additional concerns on many soils.

The soils in the county are poorly suited, moderately well suited, or well suited to recreational uses, depending on the intensity of the expected use. The soils in associations 1 to 13 generally are suited to intensive recreational uses, such as playgrounds, camp areas, picnic areas, and paths and trails. Wetness is a limitation on the soils in associations 14, 15, and 16 and on the somewhat poorly drained soils in associations 2, 5, 8, 9, and 10. The sandy texture of the excessively drained, somewhat excessively drained, and well drained soils in associations 1, 3, 4, 6, and 12 is a limitation.

The suitability of the soils for wildlife habitat is generally good throughout the county. The soils in all of the associations are generally suited to habitat for openland and woodland wildlife. The very poorly drained, organic soils in associations 14, 15, and 16 and the somewhat poorly drained and poorly drained soils in associations 2, 5, 8, 9, and 10 are suited to habitat for wetland wildlife.

The soils in associations 3, 4, 6, 7, 11, 12, and 13 are generally well suited to building site development.

The slope is a limitation in some areas. The soils in associations 1, 2, 8, 9, 10, 14, 15, and 16 generally are poorly suited or unsuited to urban development. The slope, wetness, and the shrink-swell potential are management concerns in some areas of these associations.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under the heading "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil 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 or of the substratum, 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 or of the substratum. They also can differ in slope, stoniness, salinity, wetness, 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, Grattan sand, 0 to 6 percent slopes, is a phase of the Grattan series.

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

A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Coloma-Scalley complex, 2 to 6 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils 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 in the mapped areas are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Histosols and Aquents, ponded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, gravel and sand, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Some of the boundaries on the detailed soil maps of Mason County do not match those on the soil maps of adjacent counties, and some of the soil names and descriptions do not fully agree. Differences are the result of modifications or refinements in soil series concepts, variations in the intensity of mapping, and variations in the extent of the soils in each survey area.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The "Glossary" defines many of the terms used in describing the soils.

Soil Descriptions

1—Beaches

Setting

Landform: Beaches (fig. 4)
Position on the landform: Broad, nearly level areas adjacent to Lake Michigan

Figure 4.—Typical area of Beaches.

Slope: 0 to 3 percent
Shape of areas: Elongated
Size of areas: 20 to 200 acres

Typical Profile

Surface layer:
0 to 60 inches—pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained to poorly drained
Seasonal high water table: Within a depth of 2 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Very low
Hazard of water erosion: Severe
Hazard of soil blowing: Severe

Composition

Beaches: 100 percent

Use and Management

Land use: Dominant uses—recreation

Management measures:
• Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

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

2A—Del Rey silty clay loam, 0 to 3 percent slopes

Setting

Landform: Lake plains and water-worked till plains
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 10 to 500 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown silty clay loam
Subsoil:
8 to 38 inches—reddish brown, mottled silty clay
38 to 60 inches—reddish brown, mottled silty clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 1 to 3 feet from January through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Bono soils in depressions and drainageways
• The well drained Perrinton soils in the higher landscape positions
• Arkona soils, which are sandy in the upper part and clayey in the lower part and are in landscape positions similar to those of the Del Rey soil
Similar inclusions:
• Soils with sand at a depth of more than 40 inches
• Soils with less clay in the subsoil
• Soils with a stratified subsoil of silty clay, silt loam, and very fine sand

Use and Management

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

Cropland

Major management concerns: Seasonal wetness, tilth in the surface layer, compaction
Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, or a combination of these.
• Crop residue management, regular additions of organic material, and minimum tillage help to prevent surface crusting and maintain tilth.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction.

Pasture

Major management concerns: Seasonal wetness, compaction
Management measures:
• The quality and quantity of forage can be maintained by rotation grazing, restricted grazing during the wetter periods, clipping, weed control, and annual applications of fertilizer.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Buildings

Major management concerns: Seasonal wetness, the shrink-swell potential
Management measures:
• A surface or subsurface drainage system helps to lower the water table.
• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.
• 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, slow permeability
Management measures:
• 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 slow permeability.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3C
Michigan soil management group: 1.5b

5F—Udorthents and Udipsamments, very steep

Setting

Landform: Escarpments or lake bluffs parallel and adjacent to Lake Michigan (fig. 5)

Figure 5.—Lake bluffs in a typical area of Udorthents and Udipsamments, very steep.

Position on the landform: Side slopes
Slope: 60 to 80 percent
Shape of areas: Elongated
Size of areas: 10 to 40 acres

Composition

Udorthents and Udipsamments: 100 percent

Use and Management

Land use: None

Management measures:
Because of the slope of these soils, use is limited. Onsite investigation is needed.

Interpretive Groups

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

6—Kinross mucky fine sand

Setting

Landform: Lake plains and outwash plains
Position on the landform: Closed depressions
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Typical Profile

Surface layer:
0 to 9 inches—black mucky fine sand

Subsurface layer:
9 to 12 inches—grayish brown fine sand

Subsoil:
12 to 30 inches—dark brown fine sand

Substratum:
30 to 50 inches—yellowish brown fine sand
50 to 60 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from September through June
Surface runoff: Very slow or ponded
Flooding: None

Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Covert soils in the higher landscape positions
• The somewhat poorly drained Saugatuck soils in the slightly higher landscape positions
• Sickles soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Kinross soil

Similar inclusions:
• Soils with a lighter colored subsoil
• Soils with a cemented subsoil
• Soils with a surface layer of muck

Use and Management

Land use: Dominant use—woodland; other uses—none

Woodland

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

Management measures:
• Equipment should be used only during dry summer months and during periods in winter when the soil is frozen.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Buildings

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

Septic tank absorption fields

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

Interpretive Groups

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

7—Sloan silt loam, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Nearly level areas
Slope: 0 to 2 percent
Shape of areas: Elongated
Size of areas: 10 to 40 acres

Typical Profile

Surface layer:
0 to 18 inches—very dark gray silt loam

Subsoil:
18 to 36 inches—dark gray, mottled silt loam

Substratum:
36 to 60 inches—gray, mottled silt loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Within a depth of 1 foot from November through June
Surface runoff: Very slow or ponded
Flooding: Frequent
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate in the middle layer; low in the rest of the soil

Composition

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

Inclusions

Contrasting inclusions:
• The sandy Glendora soils in landscape positions similar to those of the Sloan soil
• The somewhat poorly drained Ithaca soils on toe slopes

Similar inclusions:
• Soils with a coarser textured subsoil
• Soils with a surface layer of muck
• Soils with a thinner surface layer

Use and Management

Land use: Dominant use—woodland; other uses—none

Woodland

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

Management measures:
• The seasonal high water table restricts the use of

equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Interpretive Groups

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

8B—Epworth fine sand, moderately wet, 0 to 6 percent slopes

Setting

Landform: Lake plains, beach ridges, outwash plains, and moraines
Position on the landform: Low ridges and nearly level areas
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Surface layer:
0 to 2 inches—black fine sand
Subsurface layer:
2 to 4 inches—grayish brown fine sand
Subsoil:
4 to 8 inches—dark brown fine sand
8 to 20 inches—strong brown fine sand
20 to 30 inches—yellowish brown fine sand
Substratum:
30 to 60 inches—light yellowish brown, mottled fine sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: At a depth of 2.0 to 3.5 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderately low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

The moderately wet Epworth soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Pipestone soils in the lower landscape positions
• The poorly drained Kingsville soils in depressions
Similar inclusions:
• Soils with a loamy substratum
• Soils with no mottles in the subsoil
• Soils with a cemented subsoil

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality, plant competition
Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.

Cropland

Major management concerns: Soil blowing, low available water capacity, low organic matter content
Management measures:
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface conserve soil moisture and help to control soil blowing.
• Regular additions of organic material increase the organic matter content and the available water capacity.
• Irrigation may be needed.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Ensuring that the level of nutrients in manure and fertilizer applications matches the plant nutrient requirements can help to prevent pollution of ground water.

Buildings

Major management concerns: Unstable cutbanks, the seasonal high water table
Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• Wetness in basements and crawl spaces can be

reduced by a drainage system around the structure.

Septic tank absorption fields

Major management concerns: The seasonal high water table, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)

Management measures:
• A subsurface drainage system helps to lower the water table.
• Large lots, an absorption system of shallow trenches, shrubbery around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

9—Kerston-Carlisle-Glendora complex, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Nearly level areas
Slope: 0 to 2 percent
Shape of areas: Elongated
Size of areas: 40 to 2,000 acres

Typical Profile

Kerston

Surface layer:
0 to 18 inches—black muck

Substratum:
18 to 21 inches—very pale brown sand
21 to 46 inches—black muck
46 to 58 inches—grayish brown sand
58 to 72 inches—black muck

Carlisle

Surface layer:
0 to 26 inches—black muck

Substratum:
26 to 36 inches—black muck
36 to 51 inches—dark reddish brown muck

Glendora

Surface layer:
0 to 9 inches—black mucky silt loam

Substratum:
9 to 21 inches—grayish brown, mottled sand
21 to 52 inches—light brownish gray sand
52 to 60 inches—gray sand

Soil Properties and Qualities

Permeability: Kerston—moderately slow to rapid; Carlisle—moderately slow to moderately rapid; Glendora—rapid
Available water capacity: Kerston and Carlisle—very high; Glendora—low
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from September through June
Surface runoff: Very slow or ponded
Flooding: Frequent
Organic matter content: Very high
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low

Composition

Kerston soil and similar soils: 25 to 35 percent
Carlisle soil and similar soils: 25 to 35 percent
Glendora soil and similar soils: 25 to 30 percent
Contrasting inclusions: 0 to 25 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Pipestone soils in the slightly higher landscape positions
• The moderately well drained Covert soils in the higher landscape positions
• Soils on steep side slopes adjacent to the uplands

Similar inclusions:
• Areas of muck underlain by a substratum of marl

Use and Management

Land use: Dominant use—woodland; other uses—none

Woodland

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

Management measures:
• 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.
• Because of wetness, severe seedling mortality, and plant competition, trees are not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 2W
Michigan soil management group: Kerston—L-Mc; Carlisle—Mc; Glendora—L-4c

10B—Perrinton loam, 2 to 6 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Nearly level and undulating plains, knolls, and ridges
Shape of areas: Irregular
Size of areas: 5 to 120 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown loam
Subsoil:
7 to 10 inches—light brownish gray fine sandy loam and dark brown clay loam
10 to 15 inches—dark brown clay loam and light brownish gray fine sandy loam
15 to 24 inches—dark brown clay loam
24 to 60 inches—yellowish brown silty clay loam and clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate

Composition

Perrinton soil and similar soils: 85 to 90 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Ithaca soils on foot slopes
• The well drained Tustin soils, which are sandy in the upper part and clayey in the lower part and are in landscape positions similar to those of the Perrinton soil
• The poorly drained Ziegenfuss soils in depressions and along drainageways

Similar inclusions:
• Soils with sand at a depth of more than 40 inches
• Soils with less clay in the subsoil
• Soils with a surface layer of sandy loam

Use and Management

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

Cropland

Major management concerns: Water erosion, tilth in the surface layer, compaction

Management measures:
• Crop rotations that include grasses and legumes and small grain help to control runoff and water erosion.
• 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.
• Crop residue management, no-till planting, a cropping sequence that includes grasses and legumes, and minimum tillage help to maintain tilth.
• 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

Management measures:
• Proper stocking rates and short-duration grazing during the summer help to maintain plant density and hardiness and keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Plant competition

Management measures:
• Carefully managed reforestation helps to control undesirable understory 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.

Buildings

Major management concerns: The shrink-swell potential

Management measures:
• 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: Slow permeability

Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the slow permeability.
• Backfilling the trenches with porous material helps to compensate for the slow permeability.

Interpretive Groups

Land capability classification: IIe

Woodland ordination symbol: 4A
Michigan soil management group: 1.5a

10B2—Perrinton clay loam, 2 to 6 percent slopes, eroded

Setting

Landform: Till plains and moraines
Position on the landform: Low knolls and low ridges
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Surface layer:
0 to 6 inches—dark brown clay loam

Subsoil:
6 to 12 inches—dark brown clay loam and light brownish gray fine sandy loam
12 to 21 inches—dark brown clay loam
21 to 60 inches—yellowish brown silty clay loam and clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Ithaca soils on foot slopes
• The poorly drained Ziegenfuss soils in depressions and along drainageways

Similar inclusions:
• Soils with sand at a depth of more than 40 inches
• Soils with less clay in the subsoil
• Soils with a surface layer of loam

Use and Management

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

Cropland

Major management concerns: Water erosion, tilth in the surface layer, compaction

Management measures:
• Crop rotations that include grasses and legumes and small grain help to control runoff and water erosion.
• Water erosion can be controlled by diversions, crop residue management, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations that include grasses and legumes, grade stabilization structures, or a combination of these.
• Crop residue management, no-till planting, a cropping sequence that includes grasses and legumes, and minimum tillage help to maintain tilth.
• 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

Management measures:
• Proper stocking rates and short-duration grazing during the summer help to maintain plant density and hardiness and keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Plant competition

Management measures:
• Carefully managed reforestation helps to control undesirable understory 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.

Buildings

Major management concerns: The shrink-swell potential

Management measures:
• 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: Slow permeability

Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the slow permeability.
• Backfilling the trenches with porous material helps to compensate for the slow permeability.

Interpretive Groups

Land capability classification: IIIe

Woodland ordination symbol: 4A
Michigan soil management group: 1.5a

10C—Perrinton loam, 6 to 12 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Knolls and ridges
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown loam

Subsoil:
7 to 10 inches—light brownish gray fine sandy loam and dark brown clay loam
10 to 15 inches—dark brown clay loam and light brownish gray fine sandy loam
15 to 24 inches—dark brown clay loam
24 to 60 inches—yellowish brown silty clay loam and clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Tustin soils, which are sandy in the upper part and clayey in the lower part and are in landscape positions similar to those of the Perrinton soil
• The somewhat poorly drained Ithaca soils on foot slopes
• The poorly drained Ziegenfuss soils in depressions

Similar inclusions:
• Soils with sand at a depth of more than 40 inches
• Soils with less clay in the subsoil
• Soils with a surface layer of clay loam

Use and Management

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

Cropland

Major management concerns: Water erosion, compaction, tilth in the surface layer

Management measures:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control water erosion.
• 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.
• Grassed waterways help to remove runoff from fields safely.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Pasture

Major management concerns: Water erosion, compaction

Management measures:
• Proper stocking rates and short-duration grazing during the summer help to control water erosion, maintain plant density and hardiness, and keep the pasture in good condition.
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.

Woodland

Major management concerns: Plant competition

Management measures:
• 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.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.

Buildings

Major management concerns: The shrink-swell potential, slope

Management measures:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Some land grading may be needed.
• 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: Slow permeability, slope

Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the slow permeability.
• Backfilling the trenches with porous material helps to compensate for the slow permeability.
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 4A
Michigan soil management group: 1.5a

10C2—Perrinton clay loam, 6 to 12 percent slopes, eroded

Setting

Landform: Till plains and moraines
Position on the landform: Knolls and ridges
Shape of areas: Irregular
Size of areas: 3 to 60 acres

Typical Profile

Surface layer:
0 to 6 inches—dark brown clay loam

Subsoil:
6 to 12 inches—dark brown clay loam and light brownish gray fine sandy loam
12 to 21 inches—dark brown clay loam
21 to 60 inches—yellowish brown silty clay loam and clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Perrinton soil
• The somewhat poorly drained Ithaca soils on foot slopes
• The poorly drained Ziegenfuss soils in depressions

Similar inclusions:
• Soils with sand at a depth of more than 40 inches
• Soils with less clay in the subsoil
• Soils with a surface layer of loam

Use and Management

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

Cropland

Major management concerns: Water erosion, compaction, tilth in the surface layer

Management measures:
• Water erosion can be controlled by diversions, crop residue management, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations that include grasses and legumes, grade stabilization structures, or a combination of these.
• Grassed waterways help to remove runoff from fields safely.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Buildings

Major management concerns: The shrink-swell potential, slope

Management measures:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Some land grading may be needed.

Septic tank absorption fields

Major management concerns: Slow permeability, slope

Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the slow permeability.
• Backfilling the trenches with porous material helps to compensate for the slow permeability.
• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IVe

Woodland ordination symbol: 4A
Michigan soil management group: 1.5a

10D—Perrinton loam, 12 to 18 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Knolls and hill slopes
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown loam
Subsoil:
7 to 10 inches—light brownish gray fine sandy loam and dark brown clay loam
10 to 15 inches—dark brown clay loam and light brownish gray fine sandy loam
15 to 24 inches—dark brown clay loam
24 to 60 inches—yellowish brown silty clay loam and clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Severe
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Perrinton soil
• The somewhat poorly drained Ithaca soils on foot slopes
Similar inclusions:
• Soils with sand at a depth of more than 40 inches
• Soils with less clay in the subsoil
• Soils with a surface layer of clay loam

Use and Management

Land use: Dominant use—cropland; other uses—woodland, pasture, building site development
Cropland
Major management concerns: Water erosion, compaction, tilth in the surface layer
Management measures:
• 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.
• 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.
• Grassed waterways, diversions, and grade stabilization structures help to prevent gully 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: Water erosion, compaction
Management measures:
• Proper stocking rates and short-duration grazing during the summer help to control soil blowing and water erosion, maintain plant density and hardiness, and keep the pasture in good condition.
Woodland
Major management concerns: Plant competition
Management measures:
• 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.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.
Buildings
Major management concerns: The shrink-swell potential, slope
Management measures:
• 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: Slow permeability, slope

Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the slow permeability.
• Backfilling the trenches with porous material helps to compensate for the slow permeability.
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 4A
Michigan soil management group: 1.5a

10D2—Perrinton clay loam, 12 to 18 percent slopes, eroded

Setting

Landform: Till plains and moraines
Position on the landform: Knolls and hill slopes
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Surface layer:
0 to 6 inches—dark brown clay loam
Subsoil:
6 to 12 inches—dark brown clay loam and light brownish gray fine sandy loam
12 to 21 inches—dark brown clay loam
21 to 60 inches—yellowish brown silty clay loam and clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Organic matter content: Low
Hazard of water erosion: Severe
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Perrinton soil
• The somewhat poorly drained Ithaca soils on foot slopes
Similar inclusions:
• Soils with sand at a depth of more than 40 inches
• Soils with clay in the subsoil
• Soils with a surface layer of loam

Use and Management

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

Cropland

Major management concerns: Water erosion, compaction, tilth in the surface layer
Management measures:
• 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.
• 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.
• Grassed waterways, diversions, and grade stabilization structures help to prevent gully erosion.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Buildings

Major management concerns: The shrink-swell potential, slope
Management measures:
• 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: Slow permeability, slope
Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the slow permeability.
• Backfilling the trenches with porous material helps to compensate for the slow permeability.
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 4A
Michigan soil management group: 1.5a

10E—Perrinton loam, 18 to 35 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Hill slopes and ridges
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 5 inches—dark brown loam

Subsoil:
5 to 8 inches—light brownish gray fine sandy loam and dark brown clay loam
8 to 13 inches—dark brown clay loam and light brownish gray fine sandy loam
13 to 22 inches—dark brown clay loam
22 to 60 inches—yellowish brown silty clay loam and clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Severe
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Perrinton soil

Similar inclusions:
• Soils with sand at a depth of more than 40 inches
• Soils with less clay in the subsoil
• Soils with a surface layer of clay loam

Use and Management

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

Woodland

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

Management measures:
• 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.
• The risk of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• 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.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.

Pasture

Major management concerns: Water erosion, compaction

Management measures:
• Proper stocking rates and short-duration grazing during the summer help to control soil blowing and water erosion, maintain plant density and hardiness, and keep the pasture in good condition.

Buildings

Major management concerns: The shrink-swell potential, slope

Management measures:
• 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: Slope
• Because of the slope, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 4R
Michigan soil management group: 1.5a

11A—Ithaca loam, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains and moraines
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 3 to 500 acres

Typical Profile

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

Subsoil:
10 to 15 inches—yellowish brown clay loam and pale brown fine sandy loam
15 to 24 inches—reddish brown, mottled clay
24 to 60 inches—brown, mottled clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 1 to 2 feet from October through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Ziegenfuss soils in depressions and drainageways
• The well drained Perrinton soils in the higher landscape positions
• Arkona soils, which are sandy in the upper part and clayey in the lower part and are in landscape positions similar to those of the Ithaca soil

Similar inclusions:
• Soils with sand at a depth of more than 40 inches
• Soils with less clay in the subsoil
• Soils with a surface layer of sandy loam

Use and Management

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

Cropland

Major management concerns: Seasonal wetness, tilth in the surface layer, compaction

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, or a combination of these.
• Crop residue management, regular additions of organic material, and minimum tillage help to prevent surface crusting.
• 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 measures:
• The quality and quantity of forage can be maintained by rotation grazing, restricted grazing during the wetter periods, clipping, weed control, and annual applications of fertilizer.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Equipment limitation, plant competition

Management measures:
• Skidders should not be used during wet periods, when ruts form easily.
• Equipment can be used only during dry summer months and during periods in winter when the soil is frozen.
• 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.

Buildings

Major management concerns: Seasonal wetness, the shrink-swell potential

Management measures:
• A surface or subsurface drainage system helps to lower 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.
• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.

Septic tank absorption fields

Major management concerns: Seasonal wetness, slow permeability

Management measures:
• 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 slow permeability.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4W
Michigan soil management group: 1.5b

12—Ziegenfuss loam

Setting

Landform: Till plains and moraines
Position on the landform: Depressions
Slope: 0 to 2 percent
Shape of areas: Oval
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray loam

Subsoil:
7 to 23 inches—light gray, mottled silty clay

Substratum:
23 to 60 inches—brown, mottled silty clay

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from November through May
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Perrinton soils in the higher landscape positions
• The somewhat poorly drained Ithaca soils in the higher landscape positions
• The poorly drained Poy soils, which are clayey in the upper part and sandy in the lower part and are in landscape positions similar to those of the Ziegenfuss soil

Similar inclusions:
• Soils with less clay in the subsoil
• Soils with a mucky surface layer
• Soils that are sandy at a depth of more than 40 inches

Use and Management

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

Cropland

Major management concerns: Ponding, seasonal wetness, slow permeability, compaction, tilth in the surface layer

Management measures:
• Surface and subsurface drainage systems can be used to reduce the wetness, but in some areas improving drainage is difficult because adequate subsurface outlets are not available.
• Shallow surface ditches help to remove surface water after heavy rains.
• Because of slow permeability, subsurface drains should be closely spaced.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Properly managing crop residue, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Woodland

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

Management measures:
• Equipment can be used only during dry summer months and during periods in winter when the soil is frozen.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Buildings

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

Septic tank absorption fields

Major management concerns: Ponding
• Because of ponding, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W
Michigan soil management group: 1.5c

13B—Marlette fine sandy loam, 2 to 6 percent slopes

Setting

Landform: Moraines and till plains
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown fine sandy loam
Subsoil:
9 to 18 inches—strong brown clay loam and light brownish gray fine sandy loam
18 to 38 inches—dark brown clay loam
Substratum:
38 to 60 inches—brown clay loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Capac soils in the lower landscape positions
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Marlette soil
• The poorly drained Parkhill soils in depressions
Similar inclusions:
• Soils with more clay in the subsoil
• Soils with less clay in the subsoil
• Soils with a sandy surface layer
• Soils with a sandy substratum

Use and Management

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

Cropland

Major management concerns: Water erosion, soil blowing, compaction, tilth in the surface layer
Management measures:
• Crop rotations that include grasses and legumes and small grain help to control runoff and water erosion.
• 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.
• Field windbreaks, vegetative barriers, crop residue management, and cover crops, such as rye, help to control soil blowing.
• 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
Management measures:
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.

Woodland

Major management concerns: Plant competition
Management measures:
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.
• 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.

Buildings

Major management concerns: None

Septic tank absorption fields

Major management concerns: Moderately slow permeability
Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the moderately slow permeability.
• Backfilling the trenches with porous material helps to compensate for the moderately slow permeability.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3A
Michigan soil management group: 2.5a

13B2—Marlette loam, 2 to 6 percent slopes, eroded

Setting

Landform: Till plains and moraines
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown loam
Subsoil:
9 to 14 inches—strong brown clay loam and pale brown fine sandy loam
14 to 34 inches—dark brown clay loam
Substratum:
34 to 60 inches—brown clay loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Capac soils in the lower landscape positions
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Marlette soil
• The poorly drained Parkhill soils in depressions
Similar inclusions:
• Soils with more clay in the subsoil
• Soils with less clay in the subsoil
• Soils with a sandy surface layer
• Soils with a sandy substratum

Use and Management

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

Cropland

Major management concerns: Water erosion, compaction, tilth in the surface layer
Management measures:
• Crop rotations that include grasses and legumes and small grain help to control runoff and water erosion.
• Water erosion can be controlled by diversions, crop residue management, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations that include grasses and legumes, grade stabilization structures, or a combination of these.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Buildings

Major management concerns: None

Septic tank absorption fields

Major management concerns: Moderately slow permeability
Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the moderately slow permeability.
• Backfilling the trenches with porous material helps to compensate for the moderately slow permeability.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3A
Michigan soil management group: 2.5a

13C—Marlette fine sandy loam, 6 to 12 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Knolls and ridges
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown fine sandy loam
Subsoil:
9 to 18 inches—strong brown clay loam and light brownish gray fine sandy loam

18 to 38 inches—dark brown clay loam

Substratum:

38 to 60 inches—brown clay loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:

- The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Marlette soil
- The somewhat poorly drained Capac soils in the lower landscape positions
- The poorly drained Parkhill soils in depressions

Similar inclusions:

- Soils with more clay in the subsoil
- Soils with a surface layer of clay loam
- Soils with a sandy substratum

Use and Management

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

Cropland

Major management concerns: Water erosion, soil blowing, compaction, tilth in the surface layer

Management measures:

- Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control water erosion.
- 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.
- Field windbreaks, vegetative barriers, crop residue management, and cover crops, such as rye, help to control soil blowing.
- 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

Management measures:

- Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.

Woodland

Major management concerns: Plant competition

Management measures:

- After trees are cut, controlling the competition from brush improves the regeneration of desired species.
- 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.

Buildings

Major management concerns: Slope

Management measures:

- Some land grading may be needed.

Septic tank absorption fields

Major management concerns: Moderately slow permeability, slope

Management measures:

- Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the moderately slow permeability.
- Backfilling the trenches with porous material helps to compensate for the moderately slow permeability.
- Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3A
Michigan soil management group: 2.5a

13C2—Marlette loam, 6 to 12 percent slopes, eroded

Setting

Landform: Till plains and moraines
Position on the landform: Knolls and ridges
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

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

Subsoil:
9 to 14 inches—strong brown clay loam and light brownish gray fine sandy loam
14 to 34 inches—dark brown clay loam

Substratum:
34 to 60 inches—brown clay loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Capac soils in the lower landscape positions
- The poorly drained Parkhill soils in depressions

Similar inclusions:
- Soils with more clay in the subsoil
- Soils with less clay in the subsoil
- Soils with a surface layer of fine sandy loam
- Soils with a sandy substratum

Use and Management

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

Cropland

Major management concerns: Water erosion, compaction, tilth in the surface layer

Management measures:
- Water erosion can be controlled by diversions, crop residue management, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations that include grasses and legumes, grade stabilization structures, or a combination of these.
- Grassed waterways help to remove runoff from fields safely.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Buildings

Major management concerns: Slope

Management measures:
- Some land grading may be needed.

Septic tank absorption fields

Major management concerns: Moderately slow permeability, slope

Management measures:
- Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the moderately slow permeability.
- Backfilling the trenches with porous material helps to compensate for the moderately slow permeability.
- Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3A
Michigan soil management group: 2.5a

13D—Marlette fine sandy loam, 12 to 18 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Knolls and hill slopes
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Typical Profile

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

Subsoil:
9 to 18 inches—strong brown clay loam and light brownish gray fine sandy loam
18 to 38 inches—dark brown clay loam

Substratum:
38 to 60 inches—brown clay loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Organic matter content: Moderate

Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Marlette soil
• The somewhat poorly drained Capac soils on foot slopes
• The poorly drained Parkhill soils in depressions

Similar inclusions:
• Soils with more clay in the subsoil
• Soils with a surface layer of clay loam
• Soils with a sandy substratum

Use and Management

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

Cropland

Major management concerns: Water erosion, compaction, tilth in the surface layer

Management measures:
• Crop rotations that include grasses and legumes and small grain help to control runoff and water erosion.
• 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.
• 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.
• Grassed waterways, diversions, and grade stabilization structures help to prevent gully 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: Water erosion, compaction

Management measures:
• Proper stocking rates and short-duration grazing during the summer help to control soil blowing and water erosion, maintain plant density and hardiness, and keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests ensures the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Plant competition

Management measures:
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.
• 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.

Buildings

Major management concerns: Slope

Management measures:
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Moderately slow permeability, slope

Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the moderately slow permeability.
• Backfilling the trenches with porous material helps to compensate for the moderately slow permeability.
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3A
Michigan soil management group: 2.5a

13E—Marlette fine sandy loam, 18 to 35 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Hill slopes and ridges
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Typical Profile

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

Subsoil:
4 to 13 inches—strong brown clay loam and light brownish gray fine sandy loam
13 to 33 inches—dark brown clay loam
Substratum:
33 to 60 inches—brown clay loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Marlette soil
• The somewhat poorly drained Capac soils on foot slopes

Similar inclusions:
• Soils with less clay in the subsoil
• Soils with more clay in the subsoil
• Soils with a surface layer of clay loam
• Soils with a sandy substratum

Use and Management

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

Woodland

Major management concerns: Erosion hazard, equipment limitation, plant competition

Management measures:
• The risk of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Because 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.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.
• 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.

Buildings

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

Septic tank absorption fields

Major management concerns: Slope
• Because of the slope, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 2.5a

13F—Marlette fine sandy loam, 35 to 45 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Hill slopes and ridges
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Typical Profile

Surface layer:
0 to 4 inches—very dark grayish brown fine sandy loam
Subsoil:
4 to 13 inches—strong brown clay loam and light brownish gray fine sandy loam
13 to 33 inches—dark brown clay loam
Substratum:
33 to 60 inches—brown clay loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very rapid
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Marlette soil

Similar inclusions:
• Soils with more clay in the subsoil
• Soils with a surface layer of clay loam
• Soils with a sandy substratum

Use and Management

Land use: Dominant use—woodland; other uses—none

Woodland

Major management concerns: Erosion hazard, equipment limitation, plant competition

Management measures:
• The risk of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Because 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.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.
• 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.

Buildings

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

Septic tank absorption fields

Major management concerns: Slope
• Because of the slope, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 2.5a

14A—Capac loam, 0 to 3 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Nearly level areas, low knolls, and foot slopes
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Surface layer:
0 to 9 inches—dark brown loam

Subsoil:
9 to 12 inches—brown, mottled loam and light gray sandy loam
12 to 60 inches—brown, mottled clay loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 1 to 2 feet from November through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Wixom soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Capac soil
• The poorly drained Ziegenfuss soils in depressions and along drainageways
• The well drained Marlette soils in the slightly higher landscape positions

Similar inclusions:
• Soils with more clay in the subsoil
• Soils with sand in the substratum
• Soils with less clay in the subsoil

Use and Management

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

Cropland

Major management concerns: Seasonal wetness, tilth in the surface layer, compaction

Management measures:
• A drainage system can lower the water table.
• Conservation tillage, cover crops, and crop residue management improve tilth.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Properly managing crop residue, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Pasture

Major management concerns: Seasonal wetness, compaction

Management measures:
• The only hay and pasture plants that should be seeded are those that can withstand seasonal wetness.
• Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitation, plant competition

Management measures:
• Equipment can be used only during dry summer months and during periods in winter when the soil is frozen.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.

Buildings

Major management concerns: Seasonal wetness

Management measures:
• A surface or subsurface drainage system helps to lower the water table.
• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.
• Adding well compacted fill material can raise the building site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Seasonal wetness, moderately slow permeability

Management measures:
• 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 moderately slow permeability.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4W
Michigan soil management group: 2.5b

15—Parkhill loam

Setting

Landform: Till plains and moraines
Position on the landform: Depressions
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray loam

Subsoil:
8 to 35 inches—gray, mottled silty clay loam and clay loam

Substratum:
35 to 60 inches—yellowish brown, mottled clay loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from November through May
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Marlette soils in the higher landscape positions
• The somewhat poorly drained Capac soils in the higher landscape positions
• Sickles soils, which are sandy in the upper part and clayey in the lower part and are in landscape positions similar to those of the Parkhill soil

Similar inclusions:
• Soils with less clay in the subsoil
• Soils with a mucky surface layer
• Soils with sand at a depth of more than 40 inches

Use and Management

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

Cropland

Major management concerns: Ponding, seasonal wetness, slow permeability, compaction, tilth in the surface layer

Management measures:
• Surface and subsurface drainage systems can be used to reduce the wetness, but in some areas improving drainage is difficult because adequate subsurface outlets are not available.
• Shallow surface ditches help to remove surface water after heavy rains.
• Because of moderately slow permeability, subsurface drains should be closely spaced.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Properly managing crop residue, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Woodland

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

Management measures:
• Equipment can be used only during dry summer months and during periods in winter when the soil is frozen.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Buildings

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

Septic tank absorption fields

Major management concerns: Ponding
• Because of ponding, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W
Michigan soil management group: 2.5c

16B—Remus fine sandy loam, 1 to 6 percent slopes

Setting

Landform: Moraines
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Surface layer:
0 to 6 inches—brown fine sandy loam

Subsoil:
6 to 15 inches—light yellowish brown fine sandy loam and reddish brown sandy clay loam
15 to 34 inches—reddish brown sandy clay loam and brown sandy loam
34 to 42 inches—dark brown sandy clay loam
42 to 50 inches—reddish brown loam
50 to 60 inches—brown loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderately low
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Remus soil
• The well drained, sandy Spinks soils in landscape positions similar to those of the Remus soil
• The somewhat poorly drained Capac soils in the lower landscape positions

Similar inclusions:
• Soils with more clay in the subsoil
• Soils with a surface layer of loam
• Soils with less clay in the subsoil

Use and Management

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

Woodland

Major management concerns: Plant competition

Management measures:

• 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.

Cropland

Major management concerns: Water erosion, soil blowing

Management measures:

• Crop rotations that include grasses and legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.
• Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing.

Buildings

Major management concerns: None

Septic tank absorption fields

Major management concerns: Moderately slow permeability

Management measures:

• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the moderately slow permeability.

Interpretive Groups

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

16C—Remus fine sandy loam, 6 to 12 percent slopes

Setting

Landform: Moraines
Position on the landform: Low knolls
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Surface layer:
0 to 6 inches—brown fine sandy loam

Subsoil:
6 to 15 inches—light yellowish brown fine sandy loam and reddish brown sandy clay loam
15 to 34 inches—reddish brown sandy clay loam and brown sandy loam
34 to 42 inches—dark brown sandy clay loam
42 to 50 inches—reddish brown loam
50 to 60 inches—brown loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderately low
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:

• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Remus soil
• The well drained, sandy Spinks soils in landscape positions similar to those of the Remus soil

Similar inclusions:

• Soils with more clay in the subsoil
• Soils with a surface layer of loam
• Soils with less clay in the subsoil

Use and Management

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

Woodland

Major management concerns: Plant competition

Management measures:

• 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.

Cropland

Major management concerns: Water erosion, soil blowing

Management measures:

• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control water erosion.
• Conservation tillage, windbreaks, vegetative barriers,

cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing.

Buildings

Major management concerns: Slope

Management measures:
• Some land grading may be needed.

Septic tank absorption fields

Major management concerns: Moderately slow permeability, slope

Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the moderately slow permeability.
• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

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

16D—Remus fine sandy loam, 12 to 18 percent slopes

Setting

Landform: Moraines
Position on the landform: Knolls, ridges, and hill slopes
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Surface layer:
0 to 6 inches—brown fine sandy loam

Subsoil:
6 to 15 inches—light yellowish brown fine sandy loam and reddish brown sandy clay loam
15 to 34 inches—reddish brown sandy clay loam and brown fine sandy loam
34 to 42 inches—dark brown sandy clay loam
42 to 50 inches—reddish brown loam
50 to 60 inches—brown loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Organic matter content: Moderately low
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Remus soil
• The well drained, sandy Spinks soils in landscape positions similar to those of the Remus soil

Similar inclusions:
• Soils with more clay in the subsoil
• Soils with a sandy surface layer
• Soils with less clay in the subsoil

Use and Management

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

Woodland

Major management concerns: Plant competition

Management measures:
• 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.

Cropland

Major management concerns: Water erosion, soil blowing

Management measures:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• Grassed waterways, diversions, and grade stabilization structures help to prevent gully erosion.
• Conservation tillage, windbreaks and other vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing.

Buildings

Major management concerns: Slope

Management measures:
• 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, moderately slow permeability

Management measures:

• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the moderately slow permeability.

Interpretive Groups

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

18B—Fern-Spinks complex, 0 to 6 percent slopes

Setting

Landform: Moraines and lake plains
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 10 to 60 acres

Typical Profile

Fern

Surface layer:
0 to 13 inches—dark brown fine sand

Subsurface layer:
13 to 23 inches—pale brown fine sand

Subsoil:
23 to 33 inches—pale brown loamy fine sand and strong brown loam
33 to 50 inches—strong brown loam and pale brown loamy fine sand
50 to 60 inches—brown loam

Spinks

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

Subsurface layer:
4 to 28 inches—yellowish brown sand

Subsoil:
28 to 41 inches—very pale brown sand that has bands of strong brown loamy sand
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Fern—rapid in the upper part of the profile and moderate in the lower part; Spinks—moderately rapid
Available water capacity: Fern—moderate; Spinks—low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Fern soil and similar soils: 40 to 60 percent
Spinks soil and similar soils: 40 to 50 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:

• The excessively drained Grattan soils in landscape positions similar to those of the Fern and Spinks soils

• The loamy Marlette soils in landscape positions similar to those of the Fern and Spinks soils

Similar inclusions:

• Spinks soils that have bands of strong brown loamy sand that total less than 6 inches thick

• Spinks soils that are darker in the upper part of the subsoil

• Fern soils in which the sandy layers are more than 40 inches thick

• Soils with a surface layer and subsoil of sandy loam

Use and Management

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

Cropland

Major management concerns: Soil blowing, water erosion, seasonal droughtiness, low organic matter content

Management measures:

• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control water erosion.

• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.

• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.

• Increasing the organic matter content in the root zone can improve the ability of the soils to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.

Pasture

Major management concerns: Seasonal droughtiness

Management measures:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitation and plant competition on both soils, seedling mortality on the Spinks soil

Management measures:
• 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.
• Exposing the soil just prior to the emergence of seedlings or prior to artificial seeding can help desirable tree seedlings to become established quickly and to compete better with undesirable vegetation.

Buildings

Major management concerns: Unstable cutbanks

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: None

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 4S
Michigan soil management group: Fern—4/2a; Spinks—4a

18C—Fern-Spinks complex, 6 to 12 percent slopes

Setting

Landform: Moraines and lake plains
Position on the landform: Low knolls and low ridges
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Fern

Surface layer:
0 to 13 inches—dark brown fine sand

Subsurface layer:
13 to 23 inches—pale brown fine sand

Subsoil:
23 to 33 inches—pale brown loamy fine sand and strong brown loam
33 to 50 inches—strong brown loam and pale brown loamy fine sand
50 to 60 inches—brown loam

Spinks

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

Subsurface layer:
4 to 28 inches—yellowish brown sand

Subsoil:
28 to 41 inches—very pale brown sand that has bands of strong brown loamy sand
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Fern—rapid in the upper part of the profile and moderate in the lower part; Spinks—moderately rapid
Available water capacity: Fern—moderate; Spinks—low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Fern soil and similar soils: 40 to 60 percent
Spinks soil and similar soils: 40 to 50 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The excessively drained Grattan soils in landscape positions similar to those of the Fern and Spinks soils
• The well drained Remus soils in landscape positions similar to those of the Fern and Spinks soils

Similar inclusions:
• Spinks soils that have bands of strong brown loamy sand that total less than 6 inches thick

• Spinks soils that are darker in the upper part of the subsoil
• Fern soils in which the sandy layers are more than 40 inches thick

Use and Management

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

Cropland

Major management concerns: Water erosion, soil blowing, seasonal droughtiness, low organic matter content

Management measures:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control water erosion.
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soils to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.

Pasture

Major management concerns: Seasonal droughtiness

Management measures:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitation and plant competition on both soils, seedling mortality on the Spinks soil

Management measures:
• 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.
• Exposing the soil just prior to the emergence of seedlings or prior to artificial seeding can help desirable tree seedlings to become established quickly and to compete better with undesirable vegetation.

Buildings

Major management concerns: Slope, unstable cutbanks

Management measures:
• Some land grading may be needed.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Slope

Management measures:
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 4S
Michigan soil management group: Fern—4/2a; Spinks—4a

18D—Fern-Spinks complex, 12 to 18 percent slopes

Setting

Landform: Moraines and lake plains
Position on the landform: Knolls, side slopes, hill slopes, and low ridges
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Fern

Surface layer:
0 to 8 inches—dark brown fine sand

Subsurface layer:
8 to 20 inches—pale brown fine sand

Subsoil:
20 to 30 inches—pale brown loamy fine sand and strong brown loam
30 to 47 inches—strong brown loam and pale brown loamy fine sand
47 to 60 inches—brown loam

Spinks

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

Subsurface layer:
4 to 28 inches—yellowish brown sand

Subsoil:
28 to 41 inches—very pale brown sand that has bands of strong brown loamy sand
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Fern—rapid in the upper part of the profile and moderate in the lower part; Spinks—moderately rapid
Available water capacity: Fern—moderate; Spinks—low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Fern soil and similar soils: 40 to 60 percent
Spinks soil and similar soils: 40 to 50 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The excessively drained Grattan soils in landscape positions similar to those of the Fern and Spinks soils
• The well drained Remus soils in landscape positions similar to those of the Fern and Spinks soils

Similar inclusions:
• Spinks soils that have bands of strong brown loamy sand that total less than 6 inches thick
• Spinks soils that are darker in the subsoil
• Fern soils in which the sandy layers are more than 40 inches thick

Use and Management

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

Cropland

Major management concerns: Soil blowing, water erosion, seasonal droughtiness, low organic matter content

Management measures:
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.
• Crop rotations that include grasses and legumes and small grain help to control runoff and water erosion.
• 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.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soils to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.

Pasture

Major management concerns: Seasonal droughtiness

Management measures:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitation and plant competition on both soils, seedling mortality on the Spinks soil

Management measures:
• 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.
• Exposing the soil just prior to the emergence of seedlings or prior to artificial seeding can help desirable tree seedlings to become established quickly and to compete better with undesirable vegetation.

Buildings

Major management concerns: Slope, unstable cutbanks

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

Septic tank absorption fields

Major management concerns: Slope

Management measures:
• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 4S
Michigan soil management group: Fern—4/2a; Spinks—4a

18E—Fern-Spinks complex, 18 to 35 percent slopes

Setting

Landform: Moraines
Position on the landform: Knolls, side slopes, hill slopes, and ridges
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Fern

Surface layer:
0 to 6 inches—dark brown fine sand

Subsurface layer:
6 to 20 inches—pale brown fine sand

Subsoil:
20 to 30 inches—pale brown loamy fine sand and strong brown loam
30 to 47 inches—strong brown loam and pale brown loamy fine sand
47 to 60 inches—brown loam

Spinks

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

Subsurface layer:
4 to 28 inches—yellowish brown sand

Subsoil:
28 to 41 inches—very pale brown sand that has bands of strong brown loamy sand
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Fern—rapid in the upper part of the profile and moderate in the lower part; Spinks—moderately rapid
Available water capacity: Fern—moderate; Spinks—low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Fern soil and similar soils: 40 to 60 percent
Spinks soil and similar soils: 40 to 50 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The excessively drained Grattan soils in landscape positions similar to those of the Fern and Spinks soils
• The loamy Marlette soils in landscape positions similar to those of the Fern and Spinks soils

Similar inclusions:
• Spinks soils that have bands of strong brown loamy sand that total less than 6 inches thick
• Spinks soils that have a darker subsoil
• Fern soils in which the sandy layers are more than 40 inches thick
• Fern soils that have a darker subsoil

Use and Management

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

Woodland

Major management concerns: Equipment limitation and erosion hazard on both soils, seedling mortality on the Spinks soil

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• 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.
• The risk of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Planting when the soil is moist can reduce the seedling mortality rate.
• Exposing the soil just prior to the emergence of seedlings or prior to artificial seeding can help desirable tree seedlings to become established quickly and to compete better with undesirable vegetation.

Pasture

Major management concerns: Seasonal droughtiness

Management measures:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Buildings

Major management concerns: Slope, unstable cutbanks
• Because of the slope, these soils are generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Slope

• Because of the slope, these soils are generally unsuitable as sites for septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 4R
Michigan soil management group: Fern—4/2a; Spinks—4a

19A—Kibbie loam, 0 to 3 percent slopes

Setting

Landform: Lake plains
Position on the landform: Nearly level areas
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Surface layer:
0 to 9 inches—dark brown loam

Subsurface layer:
9 to 11 inches—dark yellowish brown, mottled loamy fine sand

Subsoil:
11 to 18 inches—strong brown, mottled loam
18 to 37 inches—brown, mottled silty clay loam

Substratum:
37 to 60 inches—brown, mottled, stratified silty clay loam and silt loam

Soil Properties and Qualities

Permeability: Moderate
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 1 to 2 feet from November through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Wixom soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Kibbie soil
• The poorly drained Bono soils in depressions and along drainageways
• The moderately well drained Tuscola soils in the slightly higher landscape positions

Similar inclusions:
• Soils with more clay in the subsoil
• Soils with a sandy substratum
• Soils with less clay in the subsoil

Use and Management

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

Cropland

Major management concerns: Seasonal wetness, tilth in the surface layer, compaction

Management measures:
• A subsurface drainage system can lower the water table.
• Conservation tillage, cover crops, and crop residue management improve tilth.
• 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: Seasonal wetness, compaction

Management measures:
• The only hay and pasture plants that should be seeded are those that can withstand seasonal wetness.
• Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitation, plant competition

Management measures:
• Equipment can be used only during dry summer months and during periods in winter when the soil is frozen.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.

Buildings

Major management concerns: Seasonal wetness

Management measures:
• A surface or subsurface drainage system helps to lower the water table.

• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.
• Adding well compacted fill material can raise the building site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Seasonal wetness

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

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4W
Michigan soil management group: 2.5b-s

20—Bono silty clay loam

Setting

Landform: Lake plains and water-worked till plains
Position on the landform: Depressions
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 11 inches—very dark gray silty clay loam

Subsoil:
11 to 15 inches—grayish brown, mottled silty clay loam
15 to 32 inches—gray, mottled silty clay loam and silty clay

Substratum:
32 to 48 inches—gray, mottled silty clay
48 to 60 inches—reddish brown, mottled silty clay

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from November through May
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Del Rey soils in the slightly higher landscape positions
• Sickles soils, which are sandy in the upper part and clayey in the lower part and are in landscape positions similar to those of the Bono soil
• The well drained Perrinton soils in the higher landscape positions

Similar inclusions:
• Soils with less clay in the subsoil
• Soils with a mucky surface layer
• Soils that are sandy at a depth of more than 40 inches

Use and Management

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

Cropland

Major management concerns: Ponding, seasonal wetness, slow permeability, compaction, tilth in the surface layer

Management measures:
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Shallow surface ditches help to remove surface water after heavy rains.
• Because of slow permeability, subsurface drains should be closely spaced.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Properly managing crop residue, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Woodland

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

Management measures:
• Equipment can be used only during dry summer months and during periods in winter when the soil is frozen.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Buildings

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

Septic tank absorption fields

Major management concerns: Ponding

• Because of ponding, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 4W
Michigan soil management group: 1c

22B—Arkport loamy fine sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 3 inches—black loamy fine sand

Subsurface layer:
3 to 6 inches—brown loamy fine sand
6 to 11 inches—yellowish brown loamy fine sand
11 to 22 inches—brownish yellow loamy fine sand

Subsoil:
22 to 39 inches—very pale brown loamy fine sand that has bands of dark brown fine sandy loam
39 to 60 inches—light gray loamy very fine sand that has bands of dark brown very fine sandy loam

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:

• The somewhat poorly drained Freesoil soils in the lower landscape positions
• The poorly drained Lamson soils in depressions
• The well drained Spinks soils in landscape positions similar to those of the Arkport soil

Similar inclusions:

• Soils that are coarser textured throughout
• Soils with a surface layer of sandy loam

Use and Management

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

Cropland

Major management concerns: Soil blowing, water erosion, available water capacity, low organic matter content

Management measures:

• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control water erosion.
• Cover crops and green manure crops protect the surface. They use nutrients that otherwise would be lost from the root zone of most plants.
• The water intake rate can be increased by growing cover crops, leaving crop residue on the surface, and regularly adding other organic material.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.

Woodland

Major management concerns: None

Buildings

Major management concerns: None

Septic tank absorption fields

Major management concerns: None

Interpretive Groups

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

22C—Arkport loamy fine sand, 6 to 12 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Knolls and hill slopes

Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Surface layer:
0 to 3 inches—black loamy fine sand

Subsurface layer:
3 to 6 inches—brown loamy fine sand
6 to 11 inches—yellowish brown loamy fine sand
11 to 22 inches—brownish yellow loamy fine sand

Subsoil:
22 to 39 inches—very pale brown loamy fine sand that has bands of dark brown fine sandy loam
39 to 60 inches—light gray loamy very fine sand that has bands of dark brown very fine sandy loam

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Freesoil soils in the lower landscape positions
• The moderately well drained Tuscola soils in the slightly lower landscape positions

Similar inclusions:
• Soils that are coarser textured throughout
• Soils with a surface layer of sandy loam

Use and Management

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

Cropland

Major management concerns: Water erosion, soil blowing, available water capacity, low organic matter content

Management measures:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.
• Cover crops and green manure crops protect the surface. They use nutrients that otherwise would be lost from the root zone of most plants.
• The water intake rate can be increased by growing cover crops, leaving crop residue on the surface, and regularly adding other organic material.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.

Woodland

Major management concerns: Plant competition

Management measures:
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.

Buildings

Major management concerns: Slope

Management measures:
• Some land grading may be needed.

Septic tank absorption fields

Major management concerns: Slope

Management measures:
• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

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

23A—Freesoil loamy very fine sand, 0 to 3 percent slopes

Setting

Landform: Lake plains and water-worked till plains
Position on the landform: Nearly level areas
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown loamy very fine sand

Subsoil:
8 to 50 inches—light yellowish brown, mottled, stratified very fine sandy loam, loamy very fine sand, very fine sand, and silt loam

Substratum:
50 to 60 inches—grayish brown, mottled very fine sand that has a stratum of silty clay loam about 2 inches thick

Soil Properties and Qualities

Permeability: Moderate in the upper part of the profile and moderate or moderately rapid in the lower part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 0.5 foot to 1.5 feet from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Parkhill soils in the slightly lower landscape positions
• The loamy Kibbie soils in landscape positions similar to those of the Freesoil soil
• The sandy Pipestone soils on low ridges

Similar inclusions:
• Poorly drained soils in depressions
• Soils with a darker subsoil
• Soils with a loamy or silty surface layer
• Soils with more clay in the subsoil and substratum

Use and Management

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

Cropland

Major management concerns: Seasonal wetness, soil blowing, moderate available water capacity

Management measures:
• Surface and subsurface drainage systems can be used to reduce the wetness.
• 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.
• To protect ground water, the level of nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing and conserve soil moisture.

Pasture

Major management concerns: Seasonal wetness

Management measures:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

Woodland

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

Management measures:
• 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.
• The 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.
• 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.

Buildings

Major management concerns: Seasonal wetness, unstable cutbanks

Management measures:
• A surface or subsurface drainage system helps to lower the water table.
• Adding well compacted fill material can raise the building site a sufficient distance above the water table.
• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.
• Reinforcing trench walls helps to keep cutbanks from caving.

Septic tank absorption fields

Major management concerns: Seasonal wetness

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

Interpretive Groups

Land capability classification: IIIw

Woodland ordination symbol: 3W
Michigan soil management group: 3b-s

24—Lamson fine sandy loam

Setting

Landform: Lake plains and water-worked till plains
Position on the landform: Depressions and swales
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 120 acres

Typical Profile

Surface layer:
0 to 13 inches—very dark gray fine sar dy loam
Subsurface layer:
13 to 15 inches—light brownish gray sand
15 to 18 inches—yellowish brown, mottled sand
Subsoil:
18 to 31 inches—light gray, mottled sandy clay loam
Substratum:
31 to 40 inches—yellowish brown, mottled sandy loam
40 to 60 inches—light brownish gray, mottled fine sand

Soil Properties and Qualities

Permeability: Moderate or moderately rapid
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from November through May
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Parkhill soils in landscape positions similar to those of the Lamson soil
Similar inclusions:
• Soils with a mucky surface layer
• Soils with a silty surface layer
• Somewhat poorly drained soils on low knolls

Use and Management

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

Cropland

Major management concerns: Seasonal wetness, soil blowing, available water capacity, low organic matter content

Management measures:
• Surface and subsurface drainage systems are needed to reduce the wetness.
• 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.
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Crop residue management, green manure crops, manure, cover crops, and conservation tillage help to increase the available water capacity and the organic matter content.
• Cover crops and green manure crops protect the surface. They use nutrients that otherwise would be lost from the root zone of most plants.

Pasture

Major management concerns: Seasonal wetness, seasonal droughtiness

Management measures:
• Deferred grazing during wet periods helps to keep the pasture in good condition.
• The quality and quantity of forage can be maintained by rotation grazing, restricted grazing during the drier periods, clipping, weed control, and annual applications of fertilizer.

Woodland

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

Management measures:
• Skidders should not be used during wet periods, when ruts form easily.
• Equipment can be used only during dry summer months and during periods in winter when the soil is frozen.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Buildings

Major management concerns: Ponding

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

Septic tank absorption fields

Major management concerns: Ponding

• Because of ponding, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 8W
Michigan soil management group: 3c-s

26A—Kibbie fine sandy loam, sandy substratum, 0 to 3 percent slopes

Setting

Landform: Lake plains
Position on the landform: Nearly level areas
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Surface layer:
0 to 9 inches—dark brown loam

Subsoil:
9 to 13 inches—brown, mottled clay loam and light gray fine sandy loam
13 to 20 inches—strong brown, mottled loam
20 to 42 inches—brown, mottled silty clay loam

Substratum:
42 to 60 inches—light yellowish brown, mottled sand that has thin strata of silt loam

Soil Properties and Qualities

Permeability: Moderate in the upper part of the profile and rapid in the lower part
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 1 to 2 feet from November through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:

• Arkona soils, which are sandy in the upper part and clayey in the lower part and are in landscape positions similar to those of the Kibbie soil
• The poorly drained Ziegenfuss soils in depressions and along drainageways
• The well drained Perrinton soils in the slightly higher landscape positions

Similar inclusions:

• Soils with more clay in the subsoil
• Soils that are loamy in the substratum
• Soils with less clay in the subsoil

Use and Management

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

Cropland

Major management concerns: Seasonal wetness, tilth in the surface layer, compaction

Management measures:

• Surface and subsurface drainage systems are needed to reduce the wetness.
• Conservation tillage, cover crops, and crop residue management improve tilth.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Properly managing crop residue, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Woodland

Major management concerns: Equipment limitation, plant competition

Management measures:

• Equipment can be used only during dry summer months and during periods in winter when the soil is frozen.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.

Buildings

Major management concerns: Seasonal wetness

Management measures:

• A surface or subsurface drainage system helps to lower the water table.
• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.
• Adding well compacted fill material can raise the building site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Seasonal wetness

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

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4W
Michigan soil management group: 3/5b

27—Poy silty clay loam

Setting

Landform: Lake plains
Position on the landform: Depressions and level areas
Shape of areas: Irregular
Size of areas: 3 to 80 acres

Typical Profile

Surface layer:
0 to 8 inches—black silty clay loam
Subsoil:
8 to 18 inches—gray, mottled silty clay
Substratum:
18 to 23 inches—gray, mottled silty clay
23 to 60 inches—light brownish gray, mottled loamy sand

Soil Properties and Qualities

Permeability: Slow in the upper part of the profile and rapid in the lower part
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from November through May
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: High in the upper part of the profile and low in the lower part

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Ithaca soils in the slightly higher landscape positions
• The poorly drained, clayey Ziegenfuss soils in landscape positions similar to those of the Poy soil
• The somewhat poorly drained Arkona soils in the slightly higher landscape positions

Similar inclusions:
• Soils with less clay in the subsoil and in the upper part of the substratum
• Soils in which loamy sand is at a depth of less than 20 inches
• Somewhat poorly drained soils on low knolls

Use and Management

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

Cropland

Major management concerns: Ponding, seasonal wetness, slow permeability, compaction, tilth in the surface layer

Management measures:
• Surface and subsurface drainage systems are needed to reduce the wetness, but in some areas improving drainage is difficult because adequate subsurface outlets are not readily available.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Properly managing crop residue, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Woodland

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

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Buildings

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

Septic tank absorption fields

Major management concerns: Ponding
• Because of ponding, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4W
Michigan soil management group: 1.5c

28B—Scalley fine sandy loam, 2 to 6 percent slopes

Setting

Landform: Moraines
Position on the landform: Low knolls and low ridges
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Surface layer:
0 to 6 inches—very dark grayish brown fine sandy loam
Subsoil:
6 to 9 inches—strong brown clay loam and pale brown fine sandy loam
9 to 23 inches—strong brown and dark brown clay loam
Substratum:
23 to 60 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Moderately slow in the upper part of the profile and rapid in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The excessively drained Coloma soils in landscape positions similar to those of the Scalley soil
• The somewhat poorly drained Capac soils in the lower landscape positions
• The somewhat poorly drained Wixom soils in the lower landscape positions
Similar inclusions:
• Soils with more clay in the subsoil
• Soils in which the sandy substratum is at a depth of more than 40 inches
• Somewhat poorly drained soils in the slightly lower landscape positions

Use and Management

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

Cropland

Major management concerns: Water erosion, soil blowing
Management measures:
• 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.
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.
• Cover crops and green manure crops protect the surface. They use nutrients that otherwise would be lost from the root zone of most plants.

Woodland

Major management concerns: Plant competition
Management measures:
• 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.

Buildings

Major management concerns: Unstable cutbanks
Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Rapid permeability in the lower part of the profile
Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3A
Michigan soil management group: 3/5a

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

Setting

Landform: Outwash plains and moraines
Position on the landform: Nearly level areas, low ridges, and low knolls
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark brown loamy sand
Subsurface layer:
8 to 18 inches—dark yellowish brown loamy sand
Subsoil:
18 to 25 inches—dark brown sandy loam
Substratum:
25 to 33 inches—yellowish brown very gravelly sand
33 to 60 inches—very pale brown gravelly sand

Soil Properties and Qualities

Permeability: Moderately rapid in the upper part of the profile and very rapid in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The loamy Remus soils in landscape positions similar to those of the Boyer soil
• The well drained, sandy Spinks soils in landscape positions similar to those of the Boyer soil
• The excessively drained, sandy Grattan soils in landscape positions similar to those of the Boyer soil
Similar inclusions:
• Soils with a subsoil of loamy sand
• Soils with a surface layer of sandy loam
• Soils with no gravel in the substratum

Use and Management

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

Cropland

Major management concerns: Soil blowing, low available water capacity, low organic matter content
Management measures:
• Conservation tillage, crop residue management, windbreaks, and cover crops conserve soil moisture and help to control soil blowing.
• Irrigation may be needed.
• Inclusion of green manure crops in the cropping sequence, no-till planting, and crop residue management increase the organic matter content.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.

Woodland

Major management concerns: None

Buildings

Major management concerns: Unstable cutbanks
Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Rapid permeability
Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

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

Setting

Landform: Outwash plains and moraines
Position on the landform: Low ridges and knolls
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark brown loamy sand
Subsurface layer:
8 to 18 inches—dark yellowish brown loamy sand
Subsoil:
18 to 25 inches—dark brown sandy loam
Substratum:
25 to 33 inches—yellowish brown very gravelly sand
33 to 60 inches—very pale brown gravelly sand

Soil Properties and Qualities

Permeability: Moderately rapid in the upper part of the profile and very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained, loamy Remus soils in landscape positions similar to those of the Boyer soil
• The well drained, sandy Spinks soils in landscape positions similar to those of the Boyer soil

Similar inclusions:
• Soils with a subsoil of loamy sand
• Soils with a surface layer of sandy loam
• Soils with no gravel in the substratum

Use and Management

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

Cropland

Major management concerns: Soil blowing, water erosion, low available water capacity, low organic matter content

Management measures:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control water erosion.
• Conservation tillage, crop residue management, windbreaks, and cover crops conserve soil moisture and help to control soil blowing.
• Inclusion of green manure crops in the cropping sequence, no-till planting, and crop residue management increase the organic matter content.
• Irrigation may be needed.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.

Woodland

Major management concerns: Plant competition

Management measures:
• 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.

Buildings

Major management concerns: Unstable cutbanks, slope

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• Some land grading may be needed

Septic tank absorption fields

Major management concerns: Rapid permeability, slope

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

Interpretive Groups

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

32B—Fern fine sand, 0 to 6 percent slopes

Setting

Landform: Lake plains and moraines
Position on the landform: Nearly level and undulating areas
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 13 inches—dark brown fine sand

Subsurface layer:
13 to 23 inches—pale brown fine sand

Subsoil:
23 to 33 inches—pale brown loamy fine sand and strong brown loam
33 to 50 inches—strong brown loam and pale brown loamy fine sand
50 to 60 inches—brown loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderate in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained, loamy Marlette soils in landscape positions similar to those of the Fern soil
• The somewhat poorly drained Wixom soils in the lower landscape positions
• The excessively drained, sandy Grattan soils in landscape positions similar to those of the Fern soil

Similar inclusions:
• Soils in which the loamy substratum is at a depth of more than 40 inches
• Soils with a darker subsoil

Use and Management

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

Cropland

Major management concerns: Soil blowing, water erosion, seasonal droughtiness, low organic matter content

Management measures:
• Crop residue management and a cropping sequence that includes close-growing crops help to control water erosion.
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing and conserve soil moisture.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.
• Cover crops and green manure crops protect the surface. They use nutrients that otherwise would be lost from the root zone of most plants.

Pasture

Major management concerns: Seasonal droughtiness

Management measures:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

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

Management measures:
• 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.
• Carefully managed reforestation helps to control undesirable understory 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.
• Species preference can be managed by selective cutting.

Buildings

Major management concerns: Unstable cutbanks

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: None

Interpretive Groups

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

32C—Fern fine sand, 6 to 12 percent slopes

Setting

Landform: Lake plains and moraines
Position on the landform: Low knolls and low ridges
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 13 inches—dark brown fine sand

Subsurface layer:
13 to 23 inches—pale brown fine sand

Subsoil:
23 to 33 inches—pale brown loamy fine sand and strong brown loam

33 to 50 inches—strong brown loam and pale brown loamy fine sand
50 to 60 inches—brown loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderate in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained, loamy Marlette soils in landscape positions similar to those of the Fern soil
• The excessively drained, sandy Grattan soils in landscape positions similar to those of the Fern soil

Similar inclusions:
• Soils in which the loamy substratum is at a depth of more than 40 inches
• Soils with a darker subsoil
• Soils with silty clay loam in the substratum

Use and Management

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

Cropland

Major management concerns: Water erosion, soil blowing, low available water capacity, low organic matter content

Management measures:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control water erosion.
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing and conserve soil moisture.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.
• Cover crops and green manure crops protect the surface. They use nutrients that otherwise would be lost from the root zone of most plants.

Pasture

Major management concerns: Seasonal droughtiness

Management measures:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

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

Management measures:
• 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.
• Carefully managed reforestation helps to control undesirable understory 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.

Buildings

Major management concerns: Slope, unstable cutbanks, the shrink-swell potential

Management measures:
• Some land grading may be needed.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Slope

Management measures:
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

Interpretive Groups

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

32D—Fern fine sand, 12 to 18 percent slopes

Setting

Landform: Lake plains and moraines
Position on the landform: Hill slopes, knolls, and ridges
Shape of areas: Irregular
Size of areas: 5 to 70 acres

Typical Profile

Surface layer:
0 to 8 inches—dark brown fine sand
Subsurface layer:
8 to 20 inches—pale brown fine sand
Subsoil:
20 to 30 inches—pale brown loamy fine sand and strong brown loam
30 to 47 inches—strong brown loam and pale brown loamy fine sand
47 to 60 inches—brown loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderate in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained, loamy Marlette soils in landscape positions similar to those of the Fern soil
• The excessively drained, sandy Grattan soils in landscape positions similar to those of the Fern soil
Similar inclusions:
• Soils in which the loamy substratum is at a depth of more than 40 inches
• Soils with darker colors in the subsoil

Use and Management

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

Cropland

Major management concerns: Soil blowing, water erosion, seasonal droughtiness, low organic matter content

Management measures:
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing and conserve soil moisture.
• 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.
• Cover crops and green manure crops protect the surface. They use nutrients that otherwise would be lost from the root zone of most plants.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.

Pasture

Major management concerns: Seasonal droughtiness

Management measures:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

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

Management measures:
• 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.
• Carefully managed reforestation helps to control undesirable understory 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.

Buildings

Major management concerns: Slope, unstable cutbanks

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

Septic tank absorption fields

Major management concerns: Slope

Management measures:
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

Interpretive Groups

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

32F—Fern fine sand, 18 to 45 percent slopes

Setting

Landform: Lake plains and moraines
Position on the landform: Hill slopes, knolls, and ridges
Shape of areas: Irregular
Size of areas: 5 to 70 acres

Typical Profile

Surface layer:
0 to 5 inches—dark brown fine sand
Subsurface layer:
5 to 20 inches—pale brown fine sand
Subsoil:
20 to 30 inches—pale brown loamy fine sand and strong brown loam
30 to 47 inches—strong brown loam and pale brown loamy fine sand
47 to 60 inches—brown loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderate in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained, loamy Marlette soils in landscape positions similar to those of the Fern soil
• The excessively drained, sandy Grattan soils in landscape positions similar to those of the Fern soil
Similar inclusions:
• Soils in which the loamy substratum is at a depth of more than 40 inches
• Soils with a darker subsoil

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 measures:
• 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.
• Planting when the soil is moist can reduce the seedling mortality rate.
• Carefully managed reforestation helps to control undesirable understory 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.
• Species preference can be managed by selective cutting.

Buildings

Major management concerns: Slope, unstable cutbanks
Management measures:
• 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
• Because of the slope, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 4R
Michigan soil management group: 4/2a

34B—Wixom loamy sand, 0 to 4 percent slopes

Setting

Landform: Lake plains and moraines
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 9 inches—black loamy sand

Subsurface layer:
9 to 11 inches—grayish brown, mottled loamy sand

Subsoil:
11 to 15 inches—dark brown, mottled loamy sand
15 to 27 inches—brownish yellow, mottled sand
27 to 33 inches—reddish brown, mottled sandy loam

Substratum:
33 to 60 inches—pinkish gray, mottled silty clay loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 0.5 foot to 1.5 feet from November through June
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
- The loamy Capac soils in landscape positions similar to those of the Wixom soil
- The moderately well drained, sandy Covert soils in the slightly higher landscape positions

Similar inclusions:
- Soils with more clay in the lower part of the subsoil and in the substratum
- Soils with a lighter colored subsoil
- Poorly drained soils in the lower landscape positions

Use and Management

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

Cropland

Major management concerns: Seasonal wetness, soil blowing

Management measures:
- Surface and subsurface drainage systems can be used to reduce the wetness.
- Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing and conserve soil moisture.
- Increasing the organic matter content in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.

Pasture

Major management concerns: Seasonal wetness

Management measures:
- The quality and quantity of forage can be maintained by rotation grazing, restricted grazing during the driest and wettest periods, clipping, weed control, and annual applications of fertilizer.

Woodland

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

Management measures:
- Skidders should not be used during wet periods, when ruts form easily.
- The 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.
- After trees are cut, controlling the competition from brush improves the regeneration of desired species.
- Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.
- 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.

Buildings

Major management concerns: Seasonal wetness

Management measures:
- A surface or subsurface drainage system helps to lower the water table.
- Adding well compacted fill material can raise the building site a sufficient distance above the water table.
- Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.

Septic tank absorption fields

Major management concerns: Seasonal wetness, moderately slow permeability

Management measures:
- Filling or mounding with suitable material helps to raise the absorption field above the water table.
- Increasing the size of the absorption area helps to compensate for the moderately slow permeability.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 6W
Michigan soil management group: 4/2b

36B—Fern-Marlette complex, 0 to 6 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Nearly level and undulating areas
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Fern

Surface layer:
0 to 13 inches—dark brown fine sand

Subsurface layer:
13 to 23 inches—pale brown fine sand

Subsoil:
23 to 33 inches—pale brown loamy fine sand and strong brown loam
33 to 50 inches—strong brown loam and pale brown loamy fine sand
50 to 60 inches—brown loam

Marlette

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

Subsoil:
9 to 18 inches—strong brown clay loam and light brownish gray fine sandy loam
18 to 38 inches—dark brown clay loam

Substratum:
38 to 60 inches—brown clay loam

Soil Properties and Qualities

Permeability: Fern—rapid in the upper part of the profile and moderate in the lower part; Marlette—moderately slow
Available water capacity: Fern—moderate; Marlette—high
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Fern—very slow; Marlette—medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Fern—slight; Marlette—moderate
Hazard of soil blowing: Fern—severe; Marlette—moderate
Shrink-swell potential: Low

Composition

Fern soil and similar soils: 40 to 60 percent
Marlette soil and similar soils: 30 to 45 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Scalley soils, which are loamy in the upper part and sandy in the lower part and are in landscape positions similar to those of the Fern and Marlette soils
• The excessively drained, sandy Grattan soils in landscape positions similar to those of the Fern and Marlette soils
• The somewhat poorly drained Wixom soils on foot slopes

Similar inclusions:
• Soils with sandy layers at a depth of more than 40 inches
• Sandy soils in which the substratum has less clay than that of the Fern soil
• Loamy soils in which the subsoil has less clay than that of the Marlette soil
• Loamy soils in which the subsoil has more clay than that of the Marlette soil

Use and Management

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

Cropland

Major management concerns: Soil blowing and water erosion on both soils, low organic matter content in the Fern soil

Management measures:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control water erosion.
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content.

Pasture

Major management concerns: Droughtiness in the Fern soil

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

Woodland

Major management concerns: Equipment limitation and seedling mortality on the Fern soil, plant competition on both soils

Management measures:

• 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.
• Carefully managed reforestation helps to control undesirable understory 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.

Buildings

Major management concerns: Unstable cutbanks in areas of the Fern soil

Management measures:

• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Moderately slow permeability in the Marlette soil

Management measures:

• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the moderately slow permeability in the Marlette soil.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: Fern—4S; Marlette—3A
Michigan soil management group: Fern—4/2a; Marlette—2.5a

36C—Fern-Marlette complex, 6 to 12 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Knolls and low ridges
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Fern

Surface layer:
0 to 13 inches—dark brown fine sand

Subsurface layer:
13 to 23 inches—pale brown fine sand

Subsoil:
23 to 33 inches—pale brown loamy fine sand and strong brown loam
33 to 50 inches—strong brown loam and pale brown loamy fine sand
50 to 60 inches—brown loam

Marlette

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

Subsoil:
9 to 18 inches—strong brown clay loam and light brownish gray fine sandy loam
18 to 38 inches—dark brown clay loam

Substratum:
38 to 60 inches—brown clay loam

Soil Properties and Qualities

Permeability: Fern—rapid in the upper part of the profile and moderate in the lower part; Marlette—moderately slow
Available water capacity: Fern—moderate; Marlette—high
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Fern—slow; Marlette—medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Fern—slight; Marlette—moderate
Hazard of soil blowing: Fern—severe; Marlette—moderate
Shrink-swell potential: Low

Composition

Fern soil and similar soils: 40 to 60 percent
Marlette soil and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:

• The well drained Scalley soils, which are loamy in the upper part and sandy in the lower part and are in landscape positions similar to those of the Fern and Marlette soils
• The excessively drained, sandy Grattan soils in landscape positions similar to those of the Fern and Marlette soils
• The somewhat poorly drained Wixom soils on foot slopes

Similar inclusions:

• Soils with sandy layers at a depth of more than 40 inches

• Loamy soils in which the subsoil has less clay than that of the Marlette soil
• Loamy soils in which the subsoil has more clay than that of the Marlette soil

Use and Management

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

Cropland

Major management concerns: Soil blowing and water erosion on both soils, low organic matter content in the Fern soil

Management measures:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control water erosion.
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content.

Pasture

Major management concerns: Droughtiness in the Fern soil

Management measures:
• Proper stocking rates and short-duration grazing during the summer help to control soil blowing and water erosion, maintain plant density and hardiness, and keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests ensures the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitation and seedling mortality on the Fern soil, plant competition on both soils

Management measures:
• 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.
• Carefully managed reforestation helps to control undesirable understory 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.

Buildings

Major management concerns: Slope

Management measures:
• Some land grading may be needed.

Septic tank absorption fields

Major management concerns: Slope in areas of both soils, moderately slow permeability in the Marlette soil

Management measures:
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the moderately slow permeability in the Marlette soil.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: Fern—4S; Marlette—3A
Michigan soil management group: Fern—4/2a; Marlette—2.5a

36D—Fern-Marlette complex, 12 to 18 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Ridges, side slopes, and hill slopes
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Fern

Surface layer:
0 to 8 inches—dark brown fine sand

Subsurface layer:
8 to 20 inches—pale brown fine sand

Subsoil:
20 to 30 inches—pale brown loamy fine sand and strong brown loam
30 to 47 inches—strong brown loam and pale brown loamy fine sand
47 to 60 inches—brown loam

Marlette

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

Subsoil:
9 to 18 inches—strong brown clay loam and light brownish gray fine sandy loam
18 to 38 inches—dark brown clay loam

Substratum:
38 to 60 inches—brown clay loam

Soil Properties and Qualities

Permeability: Fern—rapid in the upper part of the profile and moderately slow in the lower part; Marlette—moderately slow
Available water capacity: Fern—moderate; Marlette—high
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Fern—medium; Marlette—rapid
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Fern—moderate; Marlette—severe
Hazard of soil blowing: Fern—severe; Marlette—moderate
Shrink-swell potential: Low

Composition

Fern soil and similar soils: 40 to 60 percent
Marlette soil and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The well drained Scalley soils, which are loamy in the upper part and sandy in the lower part and are in landscape positions similar to those of the Fern and Marlette soils
• The excessively drained, sandy Grattan soils in landscape positions similar to those of the Fern and Marlette soils

Similar inclusions:
• Soils with sandy layers at a depth of more than 40 inches
• Loamy soils in which the subsoil has less clay than that of the Marlette soil
• Loamy soils in which the subsoil has more clay than that of the Marlette soil

Use and Management

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

Cropland

Major management concerns: Soil blowing and water erosion on both soils, low organic matter content in the Fern soil

Management measures:
• 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.
• Grassed waterways, diversions, and grade stabilization structures help to prevent gully erosion.
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content.

Pasture

Major management concerns: Water erosion, soil blowing, droughtiness

Management measures:
• Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitation and seedling mortality on the Fern soil, plant competition on both soils

Management measures:
• 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.
• Carefully managed reforestation helps to control undesirable understory 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.

Buildings

Major management concerns: Slope

Management measures:
• 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 in areas of both soils, moderately slow permeability in the Marlette soil

Management measures:
• Land shaping, pressurizing the absorption field, 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 moderately slow permeability in the Marlette soil.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: Fern—4S; Marlette—3A

Michigan soil management group: Fern—4/2a; Marlette—2.5a

36E—Fern-Marlette complex, 18 to 35 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Ridges and hill slopes
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Fern

Surface layer:
0 to 5 inches—dark brown fine sand

Subsurface layer:
5 to 20 inches—pale brown fine sand

Subsoil:
20 to 30 inches—pale brown fine loamy sand and strong brown loam
30 to 47 inches—strong brown loam and pale brown loamy fine sand
47 to 60 inches—brown loam

Marlette

Surface layer:
0 to 5 inches—very dark grayish brown fine sandy loam

Subsoil:
5 to 14 inches—strong brown clay loam and light brownish gray fine sandy loam
14 to 34 inches—dark brown clay loam

Substratum:
34 to 60 inches—brown clay loam

Soil Properties and Qualities

Permeability: Fern—rapid in the upper part of the profile and moderate in the lower part; Marlette—moderately slow
Available water capacity: Fern—moderate; Marlette—high
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Severe
Hazard of soil blowing: Fern—severe; Marlette—moderate
Shrink-swell potential: Low

Composition

Fern soil and similar soils: 40 to 55 percent
Marlette soil and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The well drained Scalley soils, which are loamy in the upper part and sandy in the lower part and are in landscape positions similar to those of the Fern and Marlette soils
• The excessively drained, sandy Grattan soils in landscape positions similar to those of the Fern and Marlette soils

Similar inclusions:
• Soils with sandy layers at a depth of more than 40 inches
• Loamy soils in which the subsoil has less clay than that of the Marlette soil
• Loamy soils in which the subsoil has more clay than that of the Marlette soil

Use and Management

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

Woodland

Major management concerns: Equipment limitation and seedling mortality on the Fern soil, plant competition on both soils

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• 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 when the soil is moist can reduce the seedling mortality rate.
• Carefully managed reforestation helps to control undesirable understory 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: Water erosion, soil blowing, droughtiness

Management measures:
• Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Buildings

Major management concerns: Slope

Management measures:
• 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
• Because of the slope, these soils are generally unsuitable as sites for septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Fern—4R; Marlette—3R
Michigan soil management group: Fern—4/2a; Marlette—2.5a

37B—Wixom-Capac complex, 0 to 4 percent slopes

Setting

Landform: Till plains
Position on the landform: Wixom soil—low knolls; Capac soil—nearly level areas
Shape of areas: Irregular
Size of areas: 20 to 1,000 acres

Typical Profile

Wixom

Surface layer:
0 to 9 inches—black loamy sand

Subsurface layer:
9 to 11 inches—grayish brown, mottled loamy sand

Subsoil:
11 to 15 inches—dark brown, mottled loamy sand
15 to 27 inches—brownish yellow, mottled sand
27 to 33 inches—reddish brown, mottled sandy loam

Substratum:
33 to 60 inches—pinkish gray, mottled silty clay loam

Capac

Surface layer:
0 to 9 inches—dark brown loam

Subsoil:
9 to 12 inches—brown, mottled loam and light gray sandy loam
12 to 60 inches—brown, mottled clay loam

Soil Properties and Qualities

Permeability: Wixom—rapid in the upper part of the profile and moderately slow in the lower part; Capac—moderately slow
Available water capacity: Wixom—moderate; Capac—high
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 0.5 foot to 2.0 feet from November through June
Surface runoff: Wixom—very slow; Capac—slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Wixom—severe; Capac—slight
Shrink-swell potential: Wixom—moderate in the lower part of the profile; Capac—low

Composition

Wixom soil and similar soils: 40 to 55 percent
Capac soil and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The well drained Marlette soils on knolls
• The moderately well drained Covert soils on low knolls and low ridges

Similar inclusions:
• Sandy soils with more clay in the substratum
• Sandy soils with a lighter colored subsoil
• Loamy soils with more clay in the subsoil
• Loamy soils with a surface layer of sandy loam
• Poorly drained soils in depressions

Use and Management

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

Cropland

Major management concerns: Seasonal wetness in both soils; soil blowing, seasonal droughtiness, and low organic matter content in areas of the Wixom soil; tilth in the surface layer and compaction in areas of the Capac soil

Management measures:
• Surface and subsurface drainage systems help to reduce the wetness.
• Shallow surface ditches help to remove surface water after heavy rains.
• 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.
• Field windbreaks, vegetative barriers, crop residue management, and cover crops, such as rye, help to control soil blowing.
• Leaving crop residue on the surface reduces the hazard of soil blowing and conserves soil moisture.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content.
• 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 measures:
• The quality and quantity of forage can be maintained by rotation grazing, restriction of grazing to the drier periods, clipping, weed control, and annual applications of fertilizer.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Equipment limitation and plant competition on both soils, seedling mortality and windthrow hazard in areas of the Wixom soil

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen.
• The 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.
• 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.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.

Buildings

Major management concerns: Seasonal wetness in both soils, the shrink-swell potential of the Wixom soil

Management measures:
• A surface or subsurface drainage system helps to lower the water table.
• Adding well compacted fill material can raise the building 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: Seasonal wetness and moderately slow permeability

Management measures:
• 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 moderately slow permeability.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: Wixom—6W; Capac—4W
Michigan soil management group: Wixom—4/2b; Capac—2.5b

38B—Remus-Spinks complex, 0 to 6 percent slopes

Setting

Landform: Moraines
Position on the landform: Nearly level and undulating areas and low knolls
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Remus

Surface layer:
0 to 6 inches—brown fine sandy loam

Subsoil:
6 to 15 inches—light yellowish brown fine sandy loam and reddish brown sandy clay loam
15 to 34 inches—reddish brown sandy clay loam and brown sandy loam
34 to 42 inches—dark brown sandy clay loam
42 to 50 inches—reddish brown loam
50 to 60 inches—brown loam

Spinks

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

Subsurface layer:
4 to 28 inches—yellowish brown sand

Subsoil:
28 to 41 inches—very pale brown sand that has bands of strong brown loamy sand
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Remus—moderately slow; Spinks—moderately rapid
Available water capacity: Remus—moderate; Spinks—low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Remus—medium; Spinks—slow
Flooding: None
Organic matter content: Remus—moderately low; Spinks—moderate

Hazard of water erosion: Remus—moderate; Spinks—slight
Hazard of soil blowing: Remus—moderate; Spinks—severe
Shrink-swell potential: Low

Composition

Remus soil and similar soils: 40 to 55 percent
Spinks soil and similar soils: 30 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The well drained Fern soils in landscape positions similar to those of the Remus and Spinks soils
• The somewhat poorly drained Wixom soils in the lower landscape positions

Similar inclusions:
• Sandy soils with no bands of loamy sand in the subsoil
• Loamy soils with more clay in the subsoil
• Loamy soils with less clay in the subsoil

Use and Management

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

Cropland

Major management concerns: Soil blowing on both soils, seasonal droughtiness and low organic matter content in the Spinks soil, water erosion on the Remus soil

Management measures:
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Crop rotations that include grasses and legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soils to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Conservation tillage and additions of organic material help to maintain the organic matter content and increase the available water capacity.
• Leaving crop residue on the surface or regularly adding other organic material increases the rate of water infiltration and minimizes crusting.

Woodland

Major management concerns: Equipment limitation and seedling mortality on the Spinks soil, plant competition on both soils

Management measures:
• 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.
• Carefully managed reforestation helps to control undesirable understory 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: Overgrazing

Management measures:
• Proper stocking rates, a uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.

Buildings

Major management concerns: Unstable cutbanks in areas of the Spinks soil

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Moderately slow permeability in the Remus soil

Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the moderately slow permeability in the Remus soil.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: Remus—3A; Spinks—4S
Michigan soil management group: Remus—3a; Spinks—4a

38C—Remus-Spinks complex, 6 to 12 percent slopes

Setting

Landform: Moraines
Position on the landform: Knolls and ridges
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Remus

Surface layer:
0 to 6 inches—brown fine sandy loam

Subsoil:
6 to 15 inches—light yellowish brown fine sandy loam and reddish brown sandy clay loam
15 to 34 inches—reddish brown sandy clay loam and brown sandy loam
34 to 42 inches—dark brown sandy clay loam
42 to 50 inches—reddish brown loam
50 to 60 inches—brown loam

Spinks

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

Subsurface layer:
4 to 28 inches—yellowish brown sand

Subsoil:
28 to 41 inches—very pale brown sand that has bands of strong brown loamy sand
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Remus—moderately slow; Spinks—moderately rapid
Available water capacity: Remus—moderate; Spinks—low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Remus—medium; Spinks—slow
Flooding: None
Organic matter content: Remus—moderately low; Spinks—moderate
Hazard of water erosion: Remus—moderate; Spinks—slight
Hazard of soil blowing: Remus—moderate; Spinks—severe
Shrink-swell potential: Low

Composition

Remus soil and similar soils: 40 to 55 percent
Spinks soil and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Fern soils in landscape positions similar to those of the Remus and Spinks soils

Similar inclusions:
• Sandy soils that do not have bands of loamy sand in the subsoil
• Loamy soils with more clay in the subsoil
• Loamy soils with less clay in the subsoil

Use and Management

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

Cropland

Major management concerns: Water erosion and soil blowing on both soils, seasonal droughtiness and low organic matter content in the Spinks soil

Management measures:
• Crop rotations that include grasses and legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.
• Increasing the organic matter content in the root zone can improve the ability of the soils to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Leaving crop residue on the surface or regularly adding other organic material increases the rate of water infiltration and minimizes crusting.

Woodland

Major management concerns: Equipment limitation and seedling mortality on the Spinks soil, plant competition on both soils

Management measures:
• 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.
• Carefully managed reforestation helps to control undesirable understory 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.

Buildings

Major management concerns: Slope in areas of both soils, unstable cutbanks in areas of the Spinks soil

Management measures:
• Some land grading may be needed.
• Because cutbanks are not stable and are subject to

caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Slope in areas of both soils, moderately slow permeability in the Remus soil

Management measures:
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the moderately slow permeability in the Remus soil.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: Remus—3A; Spinks—4S
Michigan soil management group: Remus—3a; Spinks—4a

38D—Remus-Spinks complex, 12 to 18 percent slopes

Setting

Landform: Moraines
Position on the landform: Knolls, hill slopes, and ridges
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Remus

Surface layer:
0 to 6 inches—brown fine sandy loam

Subsoil:
6 to 15 inches—light yellowish brown fine sandy loam and reddish brown sandy clay loam
15 to 34 inches—reddish brown sandy clay loam and brown sandy loam
34 to 42 inches—dark brown sandy clay loam
42 to 50 inches—reddish brown loam
50 to 60 inches—brown loam

Spinks

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

Subsurface layer:
4 to 28 inches—yellowish brown sand

Subsoil:
28 to 41 inches—very pale brown sand that has bands of strong brown loamy sand
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Remus—moderately slow; Spinks—moderately rapid
Available water capacity: Remus—moderate; Spinks—low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Remus—rapid; Spinks—slow
Flooding: None
Organic matter content: Remus—moderately low; Spinks—moderate
Hazard of water erosion: Remus—severe; Spinks—slight
Hazard of soil blowing: Remus—moderate; Spinks—severe
Shrink-swell potential: Low

Composition

Remus soil and similar soils: 40 to 55 percent
Spinks soil and similar soils: 30 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The well drained Fern soils in landscape positions similar to those of the Remus and Spinks soils

Similar inclusions:
• Sandy soils that do not have bands of loamy sand in the subsoil
• Loamy soils with sandy material at a depth of 20 to 40 inches
• Loamy soils with less clay in the subsoil

Use and Management

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

Cropland

Major management concerns: Soil blowing and water erosion on both soils, seasonal droughtiness and low organic matter content in the Spinks soil

Management measures:
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Water erosion can be controlled by diversions, crop residue management, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations that include grasses and legumes, grade stabilization structures, or a combination of these.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone

can improve the ability of the soils to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.
• Leaving crop residue on the surface or regularly adding other organic material increases the rate of water infiltration and minimizes crusting.

Woodland

Major management concerns: Equipment limitation and seedling mortality on the Spinks soil, plant competition on both soils

Management measures:
• 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.
• Carefully managed reforestation helps to control undesirable understory 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.

Buildings

Major management concerns: Slope in areas of both soils, unstable cutbanks in areas of the Spinks soil

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

Septic tank absorption fields

Major management concerns: Slope in areas of both soils, moderately slow permeability in the Remus soil

Management measures:
• Land shaping, pressurizing the absorption field, 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 moderately slow permeability in the Remus soil.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: Remus—3A; Spinks—4S
Michigan soil management group: Remus—3a; Spinks—4a

38E—Remus-Spinks complex, 18 to 30 percent slopes

Setting

Landform: Moraines
Position on the landform: Hill slopes, crests, and ridges
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Remus

Surface layer:
0 to 6 inches—brown fine sandy loam

Subsoil:
6 to 15 inches—light yellowish brown fine sandy loam and reddish brown sandy clay loam
15 to 34 inches—reddish brown sandy clay loam and brown sandy loam
34 to 42 inches—dark brown sandy clay loam
42 to 50 inches—reddish brown loam
50 to 60 inches—brown loam

Spinks

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

Subsurface layer:
4 to 28 inches—yellowish brown sand

Subsoil:
28 to 41 inches—very pale brown sand that has bands of strong brown loamy sand
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Remus—moderately slow; Spinks—moderately rapid
Available water capacity: Remus—moderate; Spinks—low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Remus—rapid; Spinks—medium
Flooding: None
Organic matter content: Remus—moderately low; Spinks—moderate
Hazard of water erosion: Remus—severe; Spinks—moderate
Hazard of soil blowing: Remus—moderate; Spinks—severe
Shrink-swell potential: Low

Composition

Remus soil and similar soils: 40 to 55 percent
Spinks soil and similar soils: 35 to 45 percent
Contrasting inclusions: 0 to 20 percent

Inclusions

Contrasting inclusions:
- The well drained Fern soils in landscape positions similar to those of the Remus and Spinks soils
- The well drained Boyer soils in valleys between ridges and hills

Similar inclusions:
- Sandy soils with no bands of loamy sand in the subsoil
- Loamy soils with more clay in the subsoil
- Loamy soils with less clay in the subsoil
- Loamy soils with sandy material at a depth of 20 to 40 inches

Use and Management

Land use: Dominant use—woodland; other uses—none

Woodland

Major management concerns: Erosion hazard, equipment limitation, and plant competition on both soils; seedling mortality on the Spinks soil

Management measures:
- Because of the erosion hazard, skid roads and skid trails should be established on the contour and water should be removed by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
- 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.
- Planting when the soil is moist can reduce the seedling mortality rate.
- Carefully managed reforestation helps to control undesirable understory 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.

Buildings

Major management concerns: Slope

Management measures:
- Because of the slope, these soils are poorly suited to building site development without extensive land shaping.

Septic tank absorption fields

Major management concerns: Slope
- Because of the slope, these soils are generally unsuitable as sites for septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Remus—3R; Spinks—4R
Michigan soil management group: Remus—3a; Spinks—4a

39B—Tustin loamy fine sand, 0 to 6 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 3 to 35 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark gray loamy fine sand

Subsoil:
9 to 29 inches—dark brown, strong brown, and brown loamy fine sand
29 to 37 inches—reddish brown silty clay

Substratum:
37 to 60 inches—brown silty clay loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and slow in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the upper part of the profile and high in the lower part

Composition

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

Inclusions

Contrasting inclusions:
- The well drained, loamy Perrinton soils in landscape positions similar to those of the Tustin soil
- The somewhat poorly drained Arkona soils in the lower landscape positions
- The excessively drained, sandy Grattan soils in landscape positions similar to those of the Tustin soil

Similar inclusions:
- Soils that have a sandy substratum
- Soils with less clay in the subsoil and substratum

Use and Management

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

Cropland

Major management concerns: Soil blowing, water erosion, seasonal droughtiness, low organic matter content

Management measures:

• Crop rotations that include grasses and legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.

• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing and conserve soil moisture.

• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.

• Cover crops and green manure crops protect the surface. They use nutrients that otherwise would be lost from the root zone of most plants.

Pasture

Major management concerns: Overgrazing

Management measures:

• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: None

Buildings

Major management concerns: Unstable cutbanks

Management measures:

• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Slow permeability in the lower part of the profile

Management measures:

• Enlarging or pressurizing the absorption field or installing alternative drain fields helps to overcome the slow permeability.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3A
Michigan soil management group: 4/1b

40B—Arkona loamy sand, 0 to 4 percent slopes

Setting

Landform: Till plains
Position on the landform: Nearly level areas, low knolls, and low ridges
Shape of areas: Irregular
Size of areas: 5 to 500 acres

Typical Profile

Surface layer:
0 to 9 inches—black loamy sand

Subsurface layer:
9 to 12 inches—grayish brown, mottled sand

Subsoil:
12 to 16 inches—dark brown, mottled sand
16 to 25 inches—strong brown, mottled sand
25 to 33 inches—yellowish brown, mottled sand
33 to 37 inches—dark brown silty clay and light brownish gray loamy sand
37 to 60 inches—brown, mottled silty clay

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and very slow in the lower part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 1 to 2 feet from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderately low
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the upper part of the profile and moderate in the lower part

Composition

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

Inclusions

Contrasting inclusions:

• The loamy Ithaca soils in landscape positions similar to those of the Arkona soil

• The well drained Perrinton soils in the higher landscape positions

• The poorly drained Ziegenfuss soils in depressions and drainageways

Similar inclusions:

• Soils that are lighter colored in the upper part of the subsoil

• Soils with less clay in the subsoil

• Soils with stratified fine sand and silt in the subsoil and substratum

Use and Management

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

Cropland

Major management concerns: Wetness, soil blowing, available water capacity, low organic matter content

Management measures:

• Subsurface drains can reduce the wetness if a suitable outlet is available.

• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.

• Cover crops and green manure crops protect the surface. They use nutrients that otherwise would be lost from the root zone of most plants.

• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.

Pasture

Major management concerns: Seasonal droughtiness, seasonal wetness

Management measures:

• The quality and quantity of forage can be maintained by rotation grazing, restricted grazing during the drier periods, clipping, weed control, and annual applications of fertilizer.

• Deferred grazing during wet periods helps to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitation, plant competition

Management measures:

• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen.

• Carefully managed reforestation helps to control undesirable understory 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.

Buildings

Major management concerns: Seasonal wetness, slow permeability, the shrink-swell potential in the lower part of the profile

Management measures:

• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.

• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

• Adding well compacted fill material can raise the building 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: Seasonal wetness, very slow permeability

Management measures:

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

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 2W
Michigan soil management group: 4/1b

41—Sickles loamy sand

Setting

Landform: Lake plains and till plains
Position on the landform: Depressions and drainageways
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 8 inches—black loamy sand

Subsoil:
8 to 22 inches—grayish brown and pale brown, mottled sand
22 to 60 inches—reddish brown silty clay

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and very slow in the lower part
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from November through May
Surface runoff: Ponded
Flooding: None
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: High in the lower part of the profile

Composition

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

Inclusions

Contrasting inclusions:

• The somewhat poorly drained Ithaca soils in the slightly higher landscape positions

• The very poorly drained Adrian soils in the lower landscape positions
• The loamy Ziegenfuss soils in landscape positions similar to those of the Sickles soil

Similar inclusions:
• Soils with less clay in the subsoil
• Soils with stratified fine sand and silt in the subsoil and substratum

Use and Management

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

Pasture

Major management concerns: Ponding, seasonal wetness

Management measures:
• The quality and quantity of forage can be maintained by rotation grazing, restricted grazing during the drier periods, clipping, weed control, and annual applications of fertilizer.
• Deferred grazing during wet periods helps to keep the pasture in good condition.

Woodland

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

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Cropland

Major management concerns: Wetness, soil blowing, available water capacity, low organic matter content

Management measures:
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Cover crops and green manure crops protect the surface. They use nutrients that otherwise would be lost from the root zone of most plants.

Buildings

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

Septic tank absorption fields

Major management concerns: Ponding
• Because of ponding, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

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

42B—Grattan sand, loamy substratum, 0 to 6 percent slopes

Setting

Landform: Lake plains and outwash plains
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 3 inches—brown sand

Subsoil:
3 to 16 inches—dark brown sand
16 to 33 inches—strong brown sand
33 to 55 inches—brownish yellow sand

Substratum:
55 to 60 inches—strong brown very fine sandy loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Pipestone soils in the slightly lower landscape positions

• The well drained Fern soils, which have a loamy layer at a depth of 20 to 40 inches and are in landscape positions similar to those of the Grattan soil

Similar inclusions:
• Soils with a darker subsoil
• Soils with a lighter colored subsoil
• Soils with bands of loamy sand in the substratum
• Soils with a substratum of sand

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.

Cropland

Major management concerns: Soil blowing, low available water capacity, low organic matter content

Management measures:
• Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing.
• Increasing the organic matter content in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content and the available water capacity.
• Irrigation may be needed.

Buildings

Major management concerns: Unstable cutbanks

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Rapid permeability in the upper part of the profile (which causes poor filtering and a hazard of ground-water pollution), slow permeability in the substratum

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.
• Increasing the size of the absorption area helps to compensate for the moderately slow permeability.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 9S
Michigan soil management group: 5/2a

43B—Covert sand, loamy substratum, 0 to 6 percent slopes

Setting

Landform: Outwash plains and lake plains
Position on the landform: Low ridges and low knolls
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray sand

Subsurface layer:
8 to 10 inches—light brownish gray sand

Subsoil:
10 to 14 inches—dark brown sand
14 to 26 inches—strong brown sand

Substratum:
26 to 46 inches—yellowish brown, mottled sand
46 to 60 inches—brown loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: At a depth of 2.0 to 3.5 feet from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Pipestone soils in the lower landscape positions
• The poorly drained Kingsville soils in depressions

• The somewhat poorly drained Wixom soils in the slightly lower landscape positions

Similar inclusions:

• Soils with a substratum of sand

• Soils that do not have mottles in the substratum

Use and Management

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

Woodland

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

Management measures:

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

• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.

Cropland

Major management concerns: Low available water capacity, low organic matter content, soil blowing

Management measures:

• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface conserve soil moisture and help to control soil blowing.

• Regular additions of organic material increase the organic matter content and the available water capacity.

• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.

• To protect ground water, the level of nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.

Buildings

Major management concerns: Unstable cutbanks, seasonal wetness

Management measures:

• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.

Septic tank absorption fields

Major management concerns: Seasonal wetness, rapid permeability in the upper part of the profile (which causes poor filtering and a hazard of ground-water pollution), moderately slow permeability in the substratum

Management measures:

• Mounding or adding suitable fill material helps to raise the absorption field above the water table and the moderately slowly permeable layer.

• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

44B—Pipestone fine sand, loamy substratum, 0 to 4 percent slopes

Setting

Landform: Lake plains and outwash plains
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown fine sand

Subsoil:
9 to 18 inches—dark yellowish brown, mottled fine sand
18 to 25 inches—yellowish brown, mottled sand
25 to 34 inches—brownish yellow, mottled sand
34 to 42 inches—strong brown, mottled sand

Substratum:
42 to 60 inches—reddish brown, mottled clay loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 0.5 foot to 1.5 feet from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Kingsville soils in the slightly lower landscape positions
• The moderately well drained Covert soils on low ridges
• Wixom soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Pipestone soil

Similar inclusions:
• Soils with a substratum of sand
• Soils with a lighter colored subsoil

Use and Management

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

Woodland

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

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen.
• The 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.
• 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.

Cropland

Major management concerns: Wetness, soil blowing, seasonal droughtiness, low organic matter content

Management measures:
• Subsurface or surface drains can reduce the wetness if a suitable outlet is available.
• Field windbreaks, vegetative barriers, crop residue management, and cover crops, such as rye, 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.
• Because of the limited available water capacity, irrigation may be needed.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.

Buildings

Major management concerns: Seasonal wetness, unstable cutbanks

Management measures:
• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.
• A surface or subsurface drainage system helps to lower the water table.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Seasonal wetness, moderately slow permeability, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)

Management measures:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Increasing the size of the absorption area helps to compensate for the moderately slow permeability in the lower part of the soil.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 3W
Michigan soil management group: 5/2b

47B—Spinks-Coloma sands, 0 to 6 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 10 to 500 acres

Typical Profile

Spinks

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

Subsurface layer:
4 to 28 inches—yellowish brown sand

Subsoil:
28 to 41 inches—very pale brown sand that has bands of strong brown loamy sand

41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Coloma

Surface layer:
0 to 7 inches—dark brown sand

Subsurface layer:
7 to 45 inches—yellowish brown sand

Subsoil:
45 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Spinks—moderately rapid; Coloma—rapid
Available water capacity: Low
Drainage class: Spinks—well drained; Coloma—excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Spinks soil and similar soils: 40 to 55 percent
Coloma soil and similar soils: 30 to 50 percent
Contrasting inclusions: 5 to 25 percent

Inclusions

Contrasting inclusions:
• The well drained Grattan soils in landscape positions similar to those of the Spinks and Coloma soils
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Spinks and Coloma soils

Similar inclusions:
• Soils that do not have bands of loamy sand in the subsoil
• Soils with a darker subsoil

Use and Management

Land use: Dominant use—cropland (fig. 6); other uses—woodland, pasture

Cropland

Major management concerns: Soil blowing, low organic matter content, seasonal droughtiness

Management measures:
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soils to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.
• Irrigation may be needed.

Pasture

Major management concerns: Seasonal droughtiness

Management measures:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests ensures the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitation and seedling mortality on both soils, plant competition on the Spinks soil

Management measures:
• 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.
• Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Unstable cutbanks

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Rapid permeability, which causes poor filtering and a hazard of ground-water pollution

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Spinks—4S; Coloma—2S

Figure 6.—Apples in an area of Spinks-Coloma sands, 0 to 6 percent slopes.

Michigan soil management group: Spinks—4a; Coloma—5a

47C—Spinks-Coloma sands, 6 to 12 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Low knolls and ridges
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Typical Profile

Spinks

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

Subsurface layer:
4 to 28 inches—yellowish brown sand

Subsoil:
28 to 41 inches—very pale brown sand that has bands of strong brown loamy sand
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Coloma

Surface layer:
0 to 7 inches—dark brown sand

Subsurface layer:
7 to 45 inches—yellowish brown sand

Subsoil:
45 to 60 inches—light yellowish brown fine sand that has bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Spinks—moderately rapid; Coloma—rapid
Available water capacity: Low
Drainage class: Spinks—well drained; Coloma—excessively drained

Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Spinks soil and similar soils: 40 to 55 percent
Coloma soil and similar soils: 30 to 50 percent
Contrasting inclusions: 5 to 25 percent

Inclusions

Contrasting inclusions:
• The well drained Grattan soils in landscape positions similar to those of the Spinks and Coloma soils
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Spinks and Coloma soils
• Boyer soils, which have a gravelly substratum and are in landscape positions similar to those of the Spinks and Coloma soils

Similar inclusions:
• Soils that do not have bands of loamy sand in the subsoil
• Soils with a darker subsoil

Use and Management

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

Cropland

Major management concerns: Soil blowing, low organic matter content, seasonal droughtiness

Management measures:
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soils to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.

Pasture

Major management concerns: Seasonal droughtiness

Management measures:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests ensures the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitation and seedling mortality on both soils, plant competition on the Spinks soil

Management measures:
• 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.
• Carefully managed reforestation helps to control undesirable understory plants.

Buildings

Major management concerns: Slope, unstable cutbanks

Management measures:
• Some land grading may be needed.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Slope, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)

Management measures:
• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Spinks—4S; Coloma—2S
Michigan soil management group: Spinks—4a; Coloma—5a

47D—Spinks-Coloma sands, 12 to 18 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Knolls, hill slopes, and ridges
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Typical Profile

Spinks

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

Subsurface layer:
4 to 28 inches—yellowish brown sand

Subsoil:
28 to 41 inches—very pale brown sand that has bands of strong brown loamy sand
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Coloma

Surface layer:
0 to 7 inches—dark brown sand

Subsurface layer:
7 to 45 inches—yellowish brown sand

Subsoil:
45 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Spinks—moderately rapid; Coloma—rapid
Available water capacity: Low
Drainage class: Spinks—well drained; Coloma—excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Spinks soil and similar soils: 40 to 50 percent
Coloma soil and similar soils: 30 to 50 percent
Contrasting inclusions: 0 to 25 percent

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Spinks and Coloma soils
• Boyer soils, which have a gravelly substratum and are in landscape positions similar to those of the Spinks and Coloma soils

Similar inclusions:
• Soils that do not have bands of loamy sand in the subsoil
• Soils with a darker subsoil

Use and Management

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

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, seasonal droughtiness

Management measures:
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.
• Crop rotations that include grasses and legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soils to hold water, nutrients, and pesticides and reduce the risk of groundwater pollution.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.

Pasture

Major management concerns: Seasonal droughtiness

Management measures:
• Proper stocking rates and short-duration grazing during the summer help to control soil blowing and water erosion, maintain plant density and hardiness, and keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests ensures the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitation and seedling mortality on both soils, plant competition on the Spinks soil

Management measures:
• 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.

Buildings

Major management concerns: Slope, unstable cutbanks

Management measures:
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Slope, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)

Management measures:

• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.

• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: Spinks—4S; Coloma—2S
Michigan soil management group: Spinks—4a; Coloma—5a

47E—Spinks-Coloma sands, 18 to 40 percent slopes

Setting

Landform: Moraines
Position on the landform: Knolls, crests, side slopes, hill slopes, and ridges
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Spinks

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

Subsurface layer:
4 to 28 inches—yellowish brown sand

Subsoil:
28 to 41 inches—very pale brown sand that has bands of strong brown loamy sand
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Coloma

Surface layer:
0 to 7 inches—dark brown sand

Subsurface layer:
7 to 45 inches—yellowish brown sand

Subsoil:
45 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Spinks—moderately rapid; Coloma—rapid
Available water capacity: Low
Drainage class: Spinks—well drained; Coloma—excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Spinks soil and similar soils: 40 to 50 percent
Coloma soil and similar soils: 30 to 50 percent
Contrasting inclusions: 5 to 25 percent

Inclusions

Contrasting inclusions:

• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Spinks and Coloma soils

• Boyer soils, which have a gravelly substratum and are in landscape positions similar to those of the Spinks and Coloma soils

Similar inclusions:

• Soils that do not have bands of loamy sand in the subsoil

• Soils with a darker subsoil

Use and Management

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

Woodland

Major management concerns: Erosion hazard, equipment limitation, and seedling mortality on both soils; plant competition on the Spinks soil

Management measures:

• The risk of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.

• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.

• Planting when the soil is moist can reduce the seedling mortality rate.

Pasture

Major management concerns: Seasonal droughtiness

Management measures:

• Proper stocking rates and short-duration grazing during the summer help to control soil blowing and water erosion, maintain plant density and hardiness, and keep the pasture in good condition.

• Applying lime and fertilizer according to the results of soil tests ensures the maximum growth of plants, especially legumes.

Buildings

Major management concerns: Slope

• Because of the slope, these soils are generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Slope

• Because of the slope, these soils are generally unsuitable as sites for septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Spinks—4R; Coloma—2R
Michigan soil management group: Spinks—4a; Coloma—5a

48B—Thetford fine sand, 0 to 4 percent slopes

Setting

Landform: Lake plains and outwash plains
Position on the landform: Nearly level and gently undulating areas
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 13 inches—dark brown fine sand

Subsurface layer:
13 to 19 inches—yellowish brown, mottled fine sand

Subsoil:
19 to 34 inches—light yellowish brown, mottled fine sand
34 to 41 inches—pale brown, mottled fine sand that has bands of yellowish brown loamy fine sand
41 to 60 inches—pale brown, mottled fine sand that has bands of dark yellowish brown loamy fine sand

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 1 to 2 feet from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:

• Wixom soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Thetford soils
• The well drained Spinks soils on low knolls
• The poorly drained Lamson soils in shallow depressions

Similar inclusions:

• Soils with no bands of loamy fine sand in the subsoil
• Soils with a loamy layer at a depth of more than 40 inches
• Soils with stratified very fine sand, fine sand, and silt in the subsoil

Use and Management

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

Cropland

Major management concerns: Seasonal wetness, soil blowing, seasonal droughtiness

Management measures:

• Surface and subsurface drainage systems can reduce the wetness.
• Subsurface drainage systems should be designed so that the rate of flowing water helps to keep fine sand from plugging the tile lines. Also, suitable filtering material may be needed to keep the fine sand from flowing into the tile lines.
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing and conserve soil moisture.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• To protect ground water, the level of nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.

Pasture

Major management concerns: Seasonal wetness, seasonal droughtiness

Management measures:
• Deferred grazing during wet or dry periods helps to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests ensures the maximum growth of plants, especially legumes.

Buildings

Major management concerns: Seasonal wetness, unstable cutbanks

Management measures:
• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Seasonal wetness, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)

Management measures:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

52C—Wallace fine sand, 3 to 15 percent slopes

Setting

Landform: Old beach ridges and dunes
Position on the landform: Gently undulating to rolling areas
Shape of areas: Elongated
Size of areas: 10 to 100 acres

Typical Profile

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

Surface layer:
0 to 4 inches—pinkish gray fine sand

Subsoil
4 to 15 inches—strong brown fine sand
15 to 19 inches—dark reddish brown, strongly cemented fine sand
19 to 30 inches—strong brown fine sand

Substratum:
30 to 42 inches—strong brown fine sand
42 to 60 inches—light yellowish brown fine sand

Soil Properties and Qualities

Permeability: Moderately rapid in the cemented layer and rapid in the rest of the soil
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The moderately well drained Covert soils in the slightly lower landscape positions

Similar inclusions:
• Soils that do not have a cemented layer
• Soils that have a loamy 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, windthrow hazard, seedling mortality

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting seedlings that can withstand droughty conditions lowers the seedling mortality rate. Replanting is needed in some areas.

Buildings

Major management concerns: Unstable cutbanks, slope

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• Some land grading may be needed.

Septic tank absorption fields

Major management concerns: Rapid permeability (which causes poor filtering and a hazard of ground-water pollution), slope

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 6D
Michigan soil management group: 5a-h

53A—Saugatuck-Jebavy complex, 0 to 3 percent slopes

Setting

Landform: Lake plains and outwash plains
Position on the landform: Nearly level areas and shallow depressions
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Saugatuck

Surface layer:
0 to 2 inches—black sand

Subsurface layer:
2 to 12 inches—light gray, mottled sand

Subsoil:
12 to 24 inches—very dusky red, mottled, strongly cemented sand
24 to 45 inches—yellowish brown, mottled sand

Substratum:
45 to 60 inches—yellowish brown, mottled sand

Jebavy

Surface layer:
0 to 2 inches—black mucky sand
2 to 4 inches—dark grayish brown sand

Subsurface layer:
4 to 22 inches—grayish brown and light gray, mottled sand

Subsoil
22 to 28 inches—dark reddish brown, mottled, strongly cemented sand
28 to 39 inches—brown, mottled sand and strong brown sand

Substratum:
39 to 60 inches—strong brown fine sand

Soil Properties and Qualities

Permeability: Moderate in the cemented layer and rapid in the rest of the soil
Available water capacity: Low
Drainage class: Saugatuck—somewhat poorly drained; Jebavy—poorly drained
Seasonal high water table: Saugatuck—at a depth of 1 to 2 feet from November through May; Jebavy—1 foot above to 1 foot below the surface from October through June
Surface runoff: Saugatuck—very slow; Jebavy—very slow or ponded
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Saugatuck soil and similar soils: 45 to 65 percent
Jebavy soil and similar soils: 25 to 35 percent
Contrasting inclusions: 0 to 20 percent

Inclusions

Contrasting inclusions:
• The poorly drained Kingsville soils in the slightly lower landscape positions
• The moderately well drained Covert soils on low ridges
• The well drained Epworth soils on knolls

Similar inclusions:
• Soils with a loamy substratum
• Soils with a lighter colored subsoil
• Soils in which the subsoil is not cemented

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 measures:
• Equipment should be used only when the soils are nearly dry or are frozen.
• The 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.
• 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.

Buildings

Major management concerns: Seasonal wetness in both soils, ponding on the Jebavy soil
• Because of ponding, the Jebavy soil is generally unsuited to building site development.

Management measures:
• Wetness can be reduced by a drainage system around the structure.

Septic tank absorption fields

Major management concerns: In areas of both soils, seasonal wetness and rapid permeability (which causes poor filtering and a hazard of ground-water pollution); ponding on the Jebavy soil
• Because of ponding, the Jebavy soil is generally unsuitable as a site for septic tank absorption fields.

Management measures:
• Filling or mounding with suitable material helps to raise the absorption field above the water table and reduces the pollution hazard.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 2W
Michigan soil management group: Saugatuck—5b-h; Jebavy—5c-h

54B—Grattan sand, dark subsoil, 0 to 6 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 5 to 450 acres

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 9 inches—dark reddish brown sand
9 to 22 inches—dark brown sand
22 to 50 inches—brownish yellow sand

Substratum:
50 to 60 inches—pale 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
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Pipestone soils in the slightly lower landscape positions
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Grattan soil

Similar inclusions:
• Soils in which the subsoil is cemented
• Soils in which the subsoil is lighter colored
• Soils with a loamy layer in the substratum
• Areas of fine sand

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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.

Cropland

Major management concerns: Soil blowing, low available water capacity, low organic matter content

Management measures:
• Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing.
• Increasing the organic matter content in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Keeping crop residue on the surface, regularly adding

other organic material, and applying a system of no-till planting increase the organic matter content and the available water capacity.
• To protect ground water, the level of nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.
• Irrigation may be needed.

Buildings

Major management concerns: Unstable cutbanks

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Rapid permeability, which causes poor filtering and a hazard of ground-water pollution

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 3S
Michigan soil management group: 5a

54C—Grattan sand, dark subsoil, 6 to 12 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Low ridges and low knolls
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—grayish brown sand

Subsoil:
7 to 9 inches—dark reddish brown sand
9 to 22 inches—dark brown sand
22 to 50 inches—brownish yellow sand

Substratum:
50 to 60 inches—pale 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
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Pipestone soils in the lower landscape positions
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Grattan soil

Similar inclusions:
• Soils in which the subsoil is cemented
• Soils in which the subsoil is lighter colored
• Soils with a loamy layer in the substratum
• Areas of fine sand

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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.

Buildings

Major management concerns: Unstable cutbanks, slope

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• Some land grading may be needed.

Septic tank absorption fields

Major management concerns: Rapid permeability (which causes poor filtering and a hazard of ground-water pollution), slope

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard 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: VIs
Woodland ordination symbol: 3S
Michigan soil management group: 5a

54D—Grattan sand, dark subsoil, 12 to 18 percent slopes

Setting

Landform: Moraines
Position on the landform: Hill slopes and knolls
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—grayish brown sand

Subsoil:
7 to 9 inches—dark reddish brown sand
9 to 22 inches—dark brown sand
22 to 50 inches—brownish yellow sand

Substratum:
50 to 60 inches—pale 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
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Grattan soil

Similar inclusions:
• Soils in which the subsoil is cemented
• Soils in which the subsoil is lighter colored
• Soils with bands of loamy sand in the substratum
• Areas of fine sand

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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.

Buildings

Major management concerns: Slope, unstable cutbanks

Management measures:
• Some land grading may be needed.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Slope, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)

Management measures:
• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3S
Michigan soil management group: 5a

56B—Pipestone-Saugatuck sands, 0 to 4 percent slopes

Setting

Landform: Lake plains and outwash plains
Position on the landform: Nearly level and gently undulating areas
Shape of areas: Irregular
Size of areas: 10 to 500 acres

Typical Profile

Pipestone

Surface layer:
0 to 4 inches—dark brown sand

Subsurface layer:
4 to 11 inches—light brownish gray, mottled sand

Subsoil:
11 to 14 inches—dark reddish brown, mottled sand
14 to 40 inches—strong brown, mottled sand

Substratum:
40 to 60 inches—yellowish brown sand

Saugatuck

Surface layer:
0 to 2 inches—black sand

Subsurface layer:
2 to 12 inches—light gray, mottled sand

Subsoil:
12 to 24 inches—very dusky red, mottled, strongly cemented sand
24 to 45 inches—yellowish brown, mottled sand

Substratum:
45 to 60 inches—yellowish brown, mottled sand

Soil Properties and Qualities

Permeability: Pipestone—rapid; Saugatuck—moderate in the cemented layer and rapid in the rest of the of the soil
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 1 to 2 feet from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Pipestone soil and similar soils: 40 to 50 percent
Saugatuck soil and similar soils: 30 to 50 percent
Contrasting inclusions: 0 to 25 percent

Inclusions

Contrasting inclusions:
- The poorly drained Kingsville soils in depressions
- The moderately well drained Covert soils in the higher landscape positions
- The somewhat poorly drained Wixom soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Saugatuck and Pipestone soils

Similar inclusions:
- Soils that have a loamy substratum at a depth of more than 40 inches
- Areas of fine sand

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 measures:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
- The trees that can withstand seasonal wetness should be selected for planting.

Buildings

Major management concerns: Seasonal wetness

Management measures:
- Adding well compacted fill material can raise the building site a sufficient distance above the water table.
- Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Seasonal wetness, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)

Management measures:
- Filling or mounding with suitable material helps to raise the absorption field above the water table.
- Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: Pipestone—3W; Saugatuck—2W
Michigan soil management group: Pipestone—5b; Saugatuck—5b-h

57B—Grattan sand, 0 to 6 percent slopes

Setting

Landform: Lake plains and outwash plains
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 5 to 450 acres

Typical Profile

Surface layer:
0 to 1 inch—very dark gray sand
Subsurface layer:
1 to 3 inches—pinkish gray sand
Subsoil:
3 to 11 inches—dark brown sand
11 to 45 inches—strong brown sand
Substratum:
45 to 60 inches—reddish yellow and light 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
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Pipestone soils in the slightly lower landscape positions
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Grattan soil
Similar inclusions:
• Soils with a darker subsoil
• Soils with a lighter colored subsoil
• Soils with bands of loamy sand in the substratum
• Soils with a mottled substratum

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality
Management measures:
• 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.

Cropland

Major management concerns: Soil blowing, available water capacity, low organic matter content
Management measures:
• Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing.
• Increasing the organic matter content in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content and the available water capacity.
• Irrigation may be needed.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• To protect ground water, the level of nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.

Buildings

Major management concerns: Unstable cutbanks
Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Rapid permeability, which causes poor filtering and a hazard of ground-water pollution
Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 9S
Michigan soil management group: 5.3a

57B3—Grattan sand, 0 to 10 percent slopes, severely eroded

Setting

Landform: Lake plains and outwash plains
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Surface layer:
0 to 20 inches—brownish yellow sand

Substratum:
20 to 60 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
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Grattan soil

Similar inclusions:
• Soils that are uneroded
• Soils with bands of loamy sand in the substratum
• Soils with a mottled substratum

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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.

Buildings

Major management concerns: Unstable cutbanks

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Rapid permeability, which causes poor filtering and a hazard of ground-water pollution

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 9S
Michigan soil management group: 5.3a

57C—Grattan sand, 6 to 12 percent slopes

Setting

Landform: Lake plains, outwash plains, and moraines
Position on the landform: Low ridges and low knolls
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 1 inch—very dark gray sand

Subsurface layer:
1 to 3 inches—pinkish gray sand

Subsoil:
3 to 11 inches—dark brown sand
11 to 45 inches—strong brown sand

Substratum:
45 to 60 inches—reddish yellow and light 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
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Grattan soil

• The somewhat poorly drained Pipestone soils in the lower landscape positions

Similar inclusions:
• Soils with a darker subsoil
• Soils with a lighter colored subsoil
• Soils with bands of loamy sand in the substratum
• Soils with loamy material in the substratum

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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.

Cropland

Major management concerns: Soil blowing, water erosion, available water capacity, low organic matter content

Management measures:
• Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing.
• Crop residue management and a cropping sequence that includes close-growing crops help to control water erosion.
• Increasing the organic matter content in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content and the available water capacity.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• To protect ground water, the level of nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.

Buildings

Major management concerns: Unstable cutbanks, slope

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• Some land grading may be needed.

Septic tank absorption fields

Major management concerns: Rapid permeability (which causes poor filtering and a hazard of ground-water pollution), slope

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard 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: VIs
Woodland ordination symbol: 9S
Michigan soil management group: 5.3a

57D—Grattan sand, 12 to 18 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Hill slopes and knolls
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 1 inch—very dark gray sand

Subsurface layer:
1 to 3 inches—pinkish gray sand

Subsoil:
3 to 11 inches—dark brown sand
11 to 45 inches—strong brown sand

Substratum:
45 to 60 inches—reddish yellow and light 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
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Grattan soil

Similar inclusions:
• Soils with a darker subsoil
• Soils with a lighter colored subsoil
• Soils with bands of loamy sand in the substratum

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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.

Cropland

Major management concerns: Soil blowing, water erosion, available water capacity, low organic matter content

Management measures:
• Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing.
• 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.
• Increasing the organic matter content in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content and the available water capacity.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• To protect ground water, the level of nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.

Buildings

Major management concerns: Unstable cutbanks, slope

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• Some land grading may be needed.

Septic tank absorption fields

Major management concerns: Rapid permeability (which causes poor filtering and a hazard of ground-water pollution), slope

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard 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: VIIs
Woodland ordination symbol: 9S
Michigan soil management group: 5.3a

57E—Grattan sand, 18 to 35 percent slopes

Setting

Landform: Moraines
Position on the landform: Hill slopes and knolls
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 1 inch—very dark gray sand

Subsurface layer:
1 to 3 inches—pinkish gray sand

Subsoil:
3 to 11 inches—dark brown sand
11 to 45 inches—strong brown sand

Substratum:
45 to 60 inches—reddish yellow and light 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

Surface runoff: Medium
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Grattan soil and similar soils: 90 to 95 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Grattan soil
• The gravelly Boyer soils in landscape positions similar to those of the Grattan soil

Similar inclusions:
• Soils with a darker subsoil
• Soils with a lighter colored subsoil
• Soils with bands of loamy sand in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—none

Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality

Management measures:
• Logging methods that do not disturb the layer of forest litter help to control erosion.
• Because of the erosion hazard, skid roads and skid trails should be established on the contour and water should be removed by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• 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.
• Planting when the soil is moist can reduce the seedling mortality rate.

Buildings

Major management concerns: Slope, unstable cutbanks

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

Septic tank absorption fields

Major management concerns: Slope
• Because of the slope, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 9R
Michigan soil management group: 5.3a

57F—Grattan sand, 35 to 50 percent slopes

Setting

Landform: Moraines
Position on the landform: Crests, ridgetops, and hill slopes
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 1 inch—very dark gray sand

Subsurface layer:
1 to 3 inches—pinkish gray sand

Subsoil:
3 to 11 inches—dark brown sand
11 to 45 inches—strong brown sand

Substratum:
45 to 60 inches—reddish yellow and light 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
Surface runoff: Rapid
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and

loamy in the lower part and are in landscape positions similar to those of the Grattan soil
• The gravelly Boyer soils in landscape positions similar to those of the Grattan soil

Similar inclusions:
• Soils with a darker subsoil
• Soils with a lighter colored subsoil
• Soils with bands of loamy sand in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—none

Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality

Management measures:
• Logging methods that do not disturb the layer of forest litter help to control erosion.
• 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.
• Because of the erosion hazard, skid roads and skid trails should be established on the contour and water should be removed by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Seeding skid roads, logging roads, and landings after the trees are logged helps to control erosion. Some areas require mulch.
• Planting when the soil is moist can reduce the seedling mortality rate.

Buildings

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

Septic tank absorption fields

Major management concerns: Slope
• Because of the slope, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 9R
Michigan soil management group: 5.3a

58B—Covert sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains and lake plains
Position on the landform: Nearly level areas, low ridges, and low knolls
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 8 inches—pinkish gray sand

Subsoil:
8 to 10 inches—dark reddish brown sand
10 to 24 inches—strong brown sand
24 to 36 inches—yellowish brown, mottled sand

Substratum:
36 to 60 inches—light yellowish brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: At a depth of 2.0 to 3.5 feet from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Pipestone soils in the lower landscape positions
• The poorly drained Kingsville soils in depressions

Similar inclusions:
• Soils with a loamy substratum
• Soils that have no mottles
• Soils with a cemented subsoil
• Soils with a lighter colored subsoil

Use and Management

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

Woodland

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

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting seedlings that can withstand droughty

conditions lowers the seedling mortality rate. Replanting is needed in some areas.
• 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.

Cropland

Major management concerns: Soil blowing, available water capacity, low organic matter content

Management measures:
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface conserve soil moisture and help to control soil blowing.
• Regular additions of organic material increase the organic matter content and the available water capacity.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• To protect ground water, the level of nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.

Buildings

Major management concerns: Seasonal wetness, unstable cutbanks

Management measures:
• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Seasonal wetness, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

59B—Pipestone fine sand, 0 to 4 percent slopes

Setting

Landform: Lake plains and outwash plains
Position on the landform: Nearly level areas and shallow depressions
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

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

Subsurface layer:
4 to 11 inches—light brownish gray, mottled fine sand

Subsoil:
11 to 14 inches—dark reddish brown, mottled fine sand
14 to 40 inches—strong brown, mottled sand

Substratum:
40 to 60 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 0.5 foot to 1.5 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Kingsville soils in the slightly lower landscape positions
• The moderately well drained Covert soils on low ridges
• The well drained Grattan soils on knolls

Similar inclusions:
• Soils with a loamy substratum
• Soils with a lighter colored subsoil
• Soils with a cemented subsoil

Use and Management

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

Woodland

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

Management measures:

• Equipment should be used only when the soil is nearly dry.
• The 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.
• 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.

Cropland

Major management concerns: Wetness, soil blowing, seasonal droughtiness, low organic matter content

Management measures:

• Subsurface or surface drains can reduce the wetness if a suitable outlet is available.
• Field windbreaks, vegetative barriers, crop residue management, and cover crops, such as rye, help to control soil blowing and conserve soil moisture.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• To protect ground water, the level of nutrients in manure and fertilizer applications should not exceed the plant nutrient requirements.

Buildings

Major management concerns: Seasonal wetness, unstable cutbanks

Management measures:

• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Seasonal wetness, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)

Management measures:

• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 3W
Michigan soil management group: 5b

60—Kingsville mucky sand

Setting

Landform: Outwash plains, lake plains, and till plains
Position on the landform: Swales and depressions
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Surface layer:
0 to 6 inches—black mucky sand

Subsoil:
6 to 25 inches—gray fine sand

Substratum:
25 to 60 inches—light brownish gray fine sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from November through May
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:

• Sickles soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Kingsville soil
• The moderately well drained Covert soils in the higher landscape positions

• The somewhat poorly drained Pipestone soils in the slightly higher landscape positions
• The very poorly drained Adrian soils in landscape positions similar to those of the Kingsville soil

Similar inclusions:
• Soils with a loamy substratum at a depth of more than 40 inches
• Soils with a thicker surface layer
• Soils with a surface layer of muck

Use and Management

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

Woodland

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

Management measures:
• Equipment should be used only during dry summer months and during periods in winter when the soil is frozen.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Cropland

Major management concerns: Seasonal wetness, soil blowing, low available water capacity

Management measures:
• A drainage system can lower the water table, but in some areas improving drainage is difficult because adequate subsurface outlets are not available.
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.
• Leaving crop residue on the surface and adding other organic material conserve soil moisture.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.

Buildings

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

Septic tank absorption fields

Major management concerns: Ponding
• Because of ponding, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 4W
Michigan soil management group: 5c

62D—Nordhouse fine sand, 3 to 18 percent slopes

Setting

Landform: Dunes
Position on the landform: Knolls, ridges, and hill slopes
Shape of areas: Linear
Size of areas: 20 to 200 acres

Typical Profile

Surface layer:
0 to 6 inches—black and very dark gray fine sand

Subsurface layer:
6 to 18 inches—light brownish gray fine sand

Subsoil:
18 to 25 inches—brownish yellow fine sand
25 to 49 inches—yellowish brown fine sand

Substratum:
49 to 72 inches—light yellowish brown fine 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
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Kingsville soils in shallow depressions
• The somewhat poorly drained Pipestone soils in the slightly lower landscape positions

Similar inclusions:
• Areas of medium sand
• Soils with a darker subsoil

Use and Management

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

Buildings

Major management concerns: Slope, unstable cutbanks, regulations

Management measures:
• State and local laws restrict the selection of building sites and the types of buildings on this soil.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• Some land grading may be needed.

Septic tank absorption fields

Major management concerns: Rapid permeability (which causes poor filtering and a hazard of ground-water pollution), slope

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard 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: VIIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.7a

62F—Nordhouse fine sand, 18 to 70 percent slopes

Setting

Landform: Dunes
Position on the landform: Hill slopes, ridges, and crests
Shape of areas: Irregular
Size of areas: 5 to 2,000 acres

Typical Profile

Surface layer:
0 to 6 inches—black and very dark gray fine sand

Subsurface layer:
6 to 18 inches—light brownish gray fine sand

Subsoil:
18 to 25 inches—brownish yellow fine sand
25 to 49 inches—yellowish brown fine sand

Substratum:
49 to 72 inches—light yellowish brown fine 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
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Kingsville soils in depressions
• The somewhat poorly drained Pipestone soils on foot slopes

Similar inclusions:
• Areas of medium sand
• Soils with a darker subsoil

Use and Management

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

Buildings

Major management concerns: Slope, unstable cutbanks, regulations

Management measures:
• State and local laws restrict the selection of building sites and the types of buildings on this soil.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• 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 (which causes poor filtering and a hazard of ground-water pollution), slope

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard 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: VIIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.7a

63B—Coloma sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Nearly level areas and low ridges
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown sand

Subsurface layer:
7 to 41 inches—yellowish brown sand

Subsoil:
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy 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
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Coloma soil
• The somewhat poorly drained Pipestone soils in the lower landscape positions

Similar inclusions:
• Soils with no bands of loamy sand in the subsoil
• Soils with a darker subsoil
• Soils in which the subsoil has bands of sandy loam that total more than 6 inches in thickness

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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. Replanting is needed in some areas.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness

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

Cropland

Major management concerns: Soil blowing, low available water capacity, low organic matter content, seasonal droughtiness

Management measures:
• Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing and conserve soil moisture.
• Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content.

Buildings

Major management concerns: Unstable cutbanks

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Rapid permeability, which causes poor filtering and a hazard of ground-water pollution

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

63C—Coloma sand, 6 to 12 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Low ridges and knolls
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown sand

Subsurface layer:
7 to 41 inches—yellowish brown sand

Subsoil:
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy 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
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Coloma soil
• The somewhat poorly drained Pipestone soils in the lower landscape positions

Similar inclusions:
• Soils with no bands of loamy sand in the subsoil
• Soils with a lighter colored subsoil
• Soils in which the subsoil has bands of sandy loam that total more than 6 inches in thickness

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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. Replanting is needed in some areas.

Cropland

Major management concerns: Soil blowing, low available water capacity, low organic matter content, seasonal droughtiness

Management measures:
• Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing and conserve soil moisture.
• Drought-tolerant crops should be selected for planting.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness

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

Buildings

Major management concerns: Slope, unstable cutbanks

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

Septic tank absorption fields

Major management concerns: Slope, rapid permeability

(which causes poor filtering and a hazard of ground-water pollution)

Management measures:
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

63D—Coloma sand, 12 to 18 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Knolls, ridges, and hill slopes
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown sand

Subsurface layer:
7 to 41 inches—yellowish brown sand

Subsoil:
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy 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
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Coloma soil

Similar inclusions:
• Soils with no bands of loamy sand in the subsoil
• Soils with a lighter colored subsoil
• Soils in which the subsoil has bands of sandy loam that total more than 6 inches in thickness

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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. Replanting is needed in some areas.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness

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

Buildings

Major management concerns: Slope, unstable cutbanks

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

Septic tank absorption fields

Major management concerns: Slope, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)

Management measures:
• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system,

and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

63E—Coloma sand, 18 to 40 percent slopes

Setting

Landform: Moraines
Position on the landform: Knolls, ridges, hills, and crests
Shape of areas: Irregular
Size of areas: 20 to 150 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown sand
Subsurface layer:
7 to 41 inches—yellowish brown sand
Subsoil:
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy 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
Surface runoff: Medium
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Coloma soil

Similar inclusions:
• Soils with no bands of loamy sand in the subsoil
• Soils that have a darker subsoil
• Soils in which the subsoil has bands of sandy loam that total more than 6 inches in thickness

Use and Management

Land use: Dominant use—woodland; other uses—none

Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality
Management measures:
• Because of the erosion hazard, skid roads and skid trails should be established on the contour and water should be removed by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• 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, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Replanting is needed in some areas.

Buildings

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

Septic tank absorption fields

Major management concerns: Slope, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)
• Because of the slope, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 2R
Michigan soil management group: 5a

64B—Benona sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, lake plains, and moraines
Position on the landform: Nearly level areas and low ridges
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Typical Profile

Surface layer:
0 to 6 inches—very dark gray sand
Subsurface layer:
6 to 7 inches—pinkish gray sand

Subsoil:
7 to 18 inches—brown sand
18 to 30 inches—strong brown sand
30 to 47 inches—brownish yellow sand
47 to 60 inches—very pale brown sand that has bands of brown loamy 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
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Benona soil
• The somewhat poorly drained Pipestone soils in the lower landscape positions

Similar inclusions:
• Soils with no bands of loamy sand in the subsoil
• Soils with a lighter colored subsoil
• Soils in which the subsoil has bands of sandy loam that total more than 6 inches in thickness

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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. Replanting is needed in some areas.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness

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

Cropland

Major management concerns: Soil blowing, low available water capacity, low organic matter content, seasonal droughtiness

Management measures:
• Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing and conserve soil moisture.
• Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content.

Buildings

Major management concerns: Unstable cutbanks

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Rapid permeability, which causes poor filtering and a hazard of ground-water pollution

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

64C—Benona sand, 6 to 12 percent slopes

Setting

Landform: Outwash plains, lake plains, and moraines
Position on the landform: Low ridges and knolls
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Typical Profile

Surface layer:
0 to 6 inches—very dark gray sand

Subsurface layer:
6 to 7 inches—pinkish gray sand

Subsoil:
7 to 18 inches—brown sand
18 to 30 inches—strong brown sand
30 to 47 inches—brownish yellow sand
47 to 60 inches—very pale brown sand that has bands of brown loamy 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
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Benona soil
• The moderately well drained Covert soils in the lower landscape positions

Similar inclusions:
• Soils with no bands of loamy sand in the subsoil
• Soils with a lighter colored subsoil
• Soils in which the subsoil has bands of sandy loam that total more than 6 inches in thickness

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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. Replanting is needed in some areas.

Cropland

Major management concerns: Soil blowing, low available water capacity, low organic matter content, seasonal droughtiness

Management measures:
• Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing and conserve soil moisture.
• Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness

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

Buildings

Major management concerns: Unstable cutbanks, slope

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• 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 (which causes poor filtering and a hazard of ground-water pollution), slope

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

Interpretive Groups

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

64D—Benona sand, 12 to 18 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Knolls, ridges, and hill slopes
Shape of areas: Irregular
Size of areas: 10 to 20 acres

Typical Profile

Surface layer:
0 to 6 inches—very dark gray sand

Subsurface layer:
6 to 7 inches—pinkish gray sand

Subsoil:
7 to 18 inches—brown sand
18 to 30 inches—strong brown sand
30 to 47 inches—brownish yellow sand
47 to 60 inches—very pale brown sand that has bands of brown loamy 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
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Benona soil
• The moderately well drained Covert soils in the lower landscape positions

Similar inclusions:
• Soils with no bands of loamy sand in the subsoil
• Soils with a lighter colored subsoil
• Soils in which the subsoil has bands of sandy loam that total more than 6 inches in thickness

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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. Replanting is needed in some areas.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness

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

Buildings

Major management concerns: Slope, unstable cutbanks

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

Septic tank absorption fields

Major management concerns: Slope, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)

Management measures:
• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

65B—Chelsea fine sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains and lake plains

Position on the landform: Nearly level areas and low ridges
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown fine sand

Subsurface layer:
9 to 13 inches—dark yellowish brown fine sand
13 to 30 inches—yellowish brown fine sand

Subsoil:
30 to 38 inches—yellowish brown fine sand that has bands of dark yellowish brown loamy fine sand
38 to 60 inches—pale brown fine sand that has bands of strong brown loamy fine 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
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Chelsea soil
• The somewhat poorly drained Thetford soils in the lower landscape positions
• The well drained Arkport soils, which are stratified in the subsoil and are in landscape positions similar to those of the Chelsea soil

Similar inclusions:
• Soils with no bands of loamy fine sand in the subsoil
• Soils with a darker subsoil

Use and Management

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

Cropland

Major management concerns: Soil blowing, low available water capacity, low organic matter content, seasonal droughtiness

Management measures:
• Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing and conserve soil moisture.
• Drought-tolerant crops should be selected for planting, or the soil should be irrigated.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness

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

Woodland

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

Management measures:
• 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.
• Competing vegetation generally can be controlled by mechanical means.

Buildings

Major management concerns: Unstable cutbanks

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Rapid permeability, which causes poor filtering and a hazard of ground-water pollution

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: IVs

Woodland ordination symbol: 5S
Michigan soil management group: 5a

65C—Chelsea fine sand, 6 to 12 percent slopes

Setting

Landform: Outwash plains, lake plains, and moraines
Position on the landform: Low ridges and knolls
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown fine sand

Subsurface layer:
9 to 13 inches—dark yellowish brown fine sand
13 to 30 inches—yellowish brown fine sand

Subsoil:
30 to 38 inches—yellowish brown fine sand that has bands of dark yellowish brown loamy fine sand
38 to 60 inches—pale brown fine sand that has bands of strong brown loamy fine 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
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Fern soils in landscape positions similar to those of the Chelsea soil
• The somewhat poorly drained Thetford soils in the lower landscape positions
• The well drained Arkport soils, which are stratified in the subsoil and are in landscape positions similar to those of the Chelsea soil

Similar inclusions:
• Soils with no bands of loamy fine sand in the subsoil
• Soils with a darker subsoil

Use and Management

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

Cropland

Major management concerns: Soil blowing, water erosion, low available water capacity, low organic matter content, seasonal droughtiness

Management measures:
• Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing and conserve soil moisture.
• Crop rotations that include grasses and legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness

Management measures:
• Proper stocking rates and short-duration grazing during the summer help to control soil blowing and water erosion, maintain plant density and hardiness, and keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests ensures the maximum growth of plants, especially legumes.

Woodland

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

Management measures:
• 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.

Buildings

Major management concerns: Unstable cutbanks, slope

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• 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, which causes poor filtering and a hazard of ground-water pollution

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

67B—Plainfield sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Nearly level and undulating areas
Shape of areas: Irregular
Size of areas: 10 to 1,000 acres

Typical Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsoil:
3 to 27 inches—brown sand

Substratum:
27 to 60 inches—light yellowish brown and very pale 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
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Plainfield soil
• The somewhat poorly drained Pipestone soils in the lower landscape positions
• The moderately well drained Covert soils in the lower landscape positions

Similar inclusions:
• Soils with bands in the subsoil
• Soils with a darker subsoil
• Areas of fine sand

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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.

Buildings

Major management concerns: Unstable cutbanks

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Rapid permeability, which causes poor filtering and a hazard of ground-water pollution

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 8S
Michigan soil management group: 5.3a

67C—Plainfield sand, 6 to 12 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Low knolls and low ridges
Shape of areas: Irregular
Size of areas: 10 to 400 acres

Typical Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsoil:
3 to 27 inches—brown sand

Substratum:
27 to 60 inches—light yellowish brown and very pale 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
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Plainfield soil
• The moderately well drained Covert soils in the lower landscape positions

Similar inclusions:
• Soils with bands in the subsoil
• Soils with a darker subsoil
• Areas of fine sand

Use and Management

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

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• 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.

Buildings

Major management concerns: Unstable cutbanks, slope

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• 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 (which causes poor filtering and a hazard of ground-water pollution), slope

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.
• Some land grading may be needed.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 8S
Michigan soil management group: 5.3a

67E—Plainfield sand, 12 to 30 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Knolls, ridges, and hill slopes
Shape of areas: Irregular
Size of areas: 10 to 400 acres

Typical Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsoil:
3 to 27 inches—brown sand

Substratum:
27 to 60 inches—light yellowish brown and very pale 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
Surface runoff: Medium
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Plainfield soil
• The moderately well drained Covert soils in the lower landscape positions

Similar inclusions:
• Soils with bands in the subsoil
• Soils with a darker subsoil
• Areas of fine sand

Use and Management

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

Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality

Management measures:
• 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 loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• The risk of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Planting when the soil is moist can reduce the seedling mortality rate.

Buildings

Major management concerns: Slope, unstable cutbanks

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

Septic tank absorption fields

Major management concerns: Slope, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)

Management measures:
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 8R
Michigan soil management group: 5.3a

72—Glendora mucky silt loam, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Nearly level areas
Slope: 0 to 2 percent
Shape of areas: Elongated
Size of areas: 40 to 200 acres

Typical Profile

Surface layer:
0 to 9 inches—black mucky silt loam

Substratum:
9 to 21 inches—grayish brown, mottled sand
21 to 52 inches—light brownish gray sand
52 to 60 inches—gray sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from November through June
Surface runoff: Very slow or ponded
Flooding: Frequent
Organic matter content: High
Hazard of water erosion: None
Hazard of soil blowing: None
Shrink-swell potential: None

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Pipestone soils in the slightly higher landscape positions
• The moderately well drained Covert soils in the higher landscape positions
• Soils on steep side slopes adjacent to the uplands

Similar inclusions:
• Areas of muck
• Soils that have a lower water table

Use and Management

Land use: Dominant use—woodland; other uses—none

Woodland

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

Management measures:

• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 3W
Michigan soil management group: L-4c

76—Houghton muck

Setting

Landform: Till plains, moraines, and outwash plains
Position on the landform: Depressions
Slope: 0 to 2 percent
Shape of areas: Oval or irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 9 inches—black muck

Substratum:
9 to 38 inches—dark reddish brown muck
38 to 60 inches—black muck

Soil Properties and Qualities

Permeability: Moderately slow to moderately rapid
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from September through June
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate

Composition

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

Inclusions

Contrasting inclusions:

• The poorly drained, sandy Kingsville soils in landscape positions similar to those of the Houghton soil

Similar inclusions:

• Soils with sandy material at a depth of more than 16 inches
• Soils with loamy or clayey material at a depth of more than 16 inches
• Soils with a higher content of fiber in the substratum

Use and Management

Land use: Dominant use—woodland; other uses—none

Woodland

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

Management measures:

• 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.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• Special harvest methods may be needed to control undesirable plants.

Buildings

Major management concerns: Ponding

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

Septic tank absorption fields

Major management concerns: Ponding

• Because of ponding, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

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

77—Adrian muck

Setting

Landform: Outwash plains, lake plains, moraines, and flood plains
Position on the landform: Closed depressions
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 70 acres

Typical Profile

Surface layer:
0 to 9 inches—black muck

Subsoil:
9 to 26 inches—black muck

Substratum:
26 to 60 inches—light brownish gray, mottled sand

Soil Properties and Qualities

Permeability: Moderately slow to moderately rapid in the upper part of the profile and rapid in the lower part
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from November through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained, sandy Kingsville soils in landscape positions similar to those of the Adrian soil

Similar inclusions:
• Soils in which the organic material is less than 16 inches thick
• Soils in which the organic material is more than 50 inches thick

Use and Management

Land use: Dominant use—woodland; other uses—none

Woodland

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

Management measures:
• 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.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• Special harvest methods may be needed to control undesirable plants.

Buildings

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

Septic tank absorption fields

Major management concerns: Ponding
• Because of ponding, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 2W
Michigan soil management group: M/4c

78—Willette muck

Setting

Landform: Till plains and moraines
Position on the landform: Closed depressions
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 45 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray muck

Subsoil:
7 to 19 inches—black muck

Substratum:
19 to 60 inches—gray, mottled silty clay

Soil Properties and Qualities

Permeability: Moderately slow to moderately rapid in the upper part of the profile and slow in the lower part
Available water capacity: Very high
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from November through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: High

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained, clayey Ziegenfuss soils in landscape positions similar to those of the Willette soil

Similar inclusions:
• Soils in which the organic material is less than 16 inches thick
• Soils in which the organic material is more than 50 inches thick

Use and Management

Land use: Dominant use—woodland; other uses—none

Woodland

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

Management measures:

• 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.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• Special harvest methods may be needed to control undesirable plants.

Buildings

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

Septic tank absorption fields

Major management concerns: Ponding
• Because of ponding, this soil is generally unsuitable as a site for septic tank absorption fields.

Interpretive Groups

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

79—Edwards and Martisco mucks

Setting

Landform: Outwash plains and moraines
Position on the landform: Nearly level areas and depressions
Slope: 0 to 2 percent slopes
Shape of areas: Irregular
Size of areas: 5 to 180 acres

Typical Profile

Edwards

Surface layer:
0 to 18 inches—black muck

Substratum:
18 to 39 inches—light gray marl
39 to 50 inches—dark gray sand
50 to 60 inches—pinkish gray sand

Martisco

Surface layer:
0 to 8 inches—black muck

Substratum:
8 to 60 inches—gray marl

Soil Properties and Qualities

Permeability: Edwards—moderately slow to moderately rapid; Martisco—moderate or moderately rapid
Available water capacity: Very high
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from September through June
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: Very high
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

Edwards soil and similar soils: 0 to 100 percent
Martisco soil and similar soils: 0 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The poorly drained, sandy Kingsville soils in landscape positions similar to those of the Edwards and Martisco soils

Similar inclusions:
• Soils with marl at the surface
• Soils in which the marl in the substratum is stratified with sand or gravelly sand
• Soils in which the muck is more than 50 inches thick

Use and Management

Land use: Dominant use—woodland; other uses—none

Woodland

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

Management measures:

• 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.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

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

Septic tank absorption fields

Major management concerns: Ponding
• Because of ponding, these soils are generally unsuitable as sites for septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 2W
Michigan soil management group: M/mc

81—Loxley and Dawson soils

Setting

Landform: Outwash plains and moraines
Position on the landform: Closed depressions
Slope: 0 to 2 percent
Shape of areas: Oval or irregular
Size of areas: 3 to 160 acres

Typical Profile

Loxley

Surface layer:
0 to 12 inches—black muck

Substratum:
12 to 70 inches—black muck

Dawson

Surface layer:
0 to 10 inches—dark reddish brown mucky peat

Subsurface layer:
10 to 28 inches—very dusky red muck

Substratum:
28 to 60 inches—brown sand

Soil Properties and Qualities

Permeability: Loxley—moderately slow to moderately rapid; Dawson—moderately slow to moderately rapid in the upper part of the profile and rapid in the lower part
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from September through June
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: Very high
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

Loxley soil and similar soils: 0 to 100 percent
Dawson soil and similar soils: 0 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The poorly drained, sandy Kinross soils in landscape positions similar to those of the Loxley and Dawson soils
• The somewhat poorly drained, sandy Saugatuck and poorly drained, sandy Jebavy soils in the slightly higher landscape positions

Similar inclusions:
• Soils with less than 16 inches of muck
• Soils with a loamy substratum
• Soils with a surface layer or subsoil of peat

Use and Management

Land use: Dominant uses—sparse woodland, wildlife habitat; other uses—none

Woodland

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

Management measures:
• 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.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Buildings

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

Septic tank absorption fields

Major management concerns: Ponding
• Because of ponding, these soils are generally unsuitable as sites for septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: 2W
Michigan soil management group: Loxley—Mc-a; Dawson—M/4c-a

83—Histosols and Aquents, ponded

Setting

Landform: Outwash plains, lake plains, till plains, and moraines
Position on the landform: Depressions
Slope: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to 100 acres

Typical Profile

Histosols
0 to 60 inches—black muck

Aquents
0 to 60 inches—variable but dominantly sandy

Soil Properties and Qualities

Permeability: Variable
Available water capacity: Variable
Drainage class: Very poorly drained
Seasonal high water table: At the surface to more than 1 foot above the surface most of the year
Surface runoff: Ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

Histosols: 50 to 70 percent
Aquents: 30 to 40 percent
Contrasting inclusions: 0 to 10 percent

Contrasting Inclusions

• Small areas of somewhat poorly drained soils at the edges of the unit
• Small areas of open water

Use and Management

Land use: Wetland wildlife habitat
• Onsite investigation is needed to determine the suitability for specific uses

Interpretive Groups

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

86F—Dune land-Quartzipsamments complex, hilly to very steep

Setting

Landform: Dunes
Position on the landform: Side slopes, hill slopes, ridges, and crests
Distinctive landscape features: Vegetated areas are Quartzipsamments; bare areas are Dune land.
Slope: 25 to 70 percent
Shape of areas: Elongated
Size of areas: 20 to 4,000 acres

Typical Profile

Dune land
0 to 60 inches—pale brown fine sand

Quartzipsamments
0 to 60 inches—pale brown fine 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
Surface runoff: Very slow
Flooding: None
Organic matter content: Very low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Composition

Dune land: 50 to 60 percent
Quartzipsamments: 40 to 50 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• Depressional areas with a high water table

Use and Management

Land use: Current use—recreation; other uses—none
• Use of this unit is limited by state regulation of the Dune land. Onsite investigation is needed.

Interpretive Groups

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

87F—Dune land-Quartzipsamments-Psammaquents complex, nearly level to very steep

Setting

Landform: Dunes
Position on the landform: Side slopes, hill slopes, ridges, and depressions
Distinctive landscape features: Vegetated areas are Quartzipsamments or Psammaquents; bare areas are Dune land (fig. 7).

Figure 7.—Typical area of Dune land-Quartzipsamments-Psammaquents complex, nearly level to very steep.

Slope: 0 to 50 percent
Shape of areas: Elongated
Size of areas: 20 to 1,000 acres

Typical Profile

Dune land
0 to 60 inches—pale brown fine sand

Quartzipsamments
0 to 60 inches—pale brown fine sand

Psammaquents
0 to 60 inches—light brownish gray fine sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Dune land and Quartzipsamments—excessively drained; Psammaquents—very poorly drained
Seasonal high water table: Dune land and Quartzipsamments—at a depth of more than 6 feet; Psammaquents—1 foot above to 1 foot below the surface from October through May
Surface runoff: Dune land and Quartzipsamments—very slow; Psammaquents—very slow or ponded
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Composition

Dune land: 40 to 50 percent
Quartzipsamments: 30 to 40 percent
Psammaquents: 20 to 30 percent

Use and Management

Land use: Current use—recreation; other uses—none
• Use of this unit is limited by state regulation of the Dune land. Onsite investigation is needed.

Interpretive Groups

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

88B—Udipsamments, nearly level and gently sloping

Setting

Landform: Lake plains and outwash plains
Position on the landform: Broad, nearly level areas that have been filled with sand and excavated areas that have been reshaped
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

0 to 60 inches—yellowish brown sand and fine 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
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Composition

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

Inclusions

Contrasting inclusions:
• Unexcavated sandy soils in the higher landscape positions

Use and Management

Land use: Former uses—woodland, cropland; current uses—building site development, recreation

Management measures:
• Onsite investigation is needed to determine the suitability for specific uses.
• In most areas vegetation is needed to protect the surface against soil blowing.

Interpretive Groups

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

89D—Udorthents, loamy, nearly level to rolling

Setting

Landform: Till plains
Position on the landform: Broad areas that have been excavated for borrow material and then filled or reshaped
Slope: 0 to 18 percent
Shape of areas: Irregular
Size of areas: 10 to 200 acres

Typical Profile

0 to 60 inches—variable but dominantly sandy loam to clay loam

Soil Properties and Qualities

Permeability: Variable
Available water capacity: Moderate or high
Drainage class: Somewhat poorly drained to well drained
Seasonal high water table: At a depth of 1 to more than 6 feet
Surface runoff: Slow or medium
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight

Composition

Udorthents and similar soils: 100 percent

Use and Management

Land use: Former use—farmland; current uses—none

Management measures:
• Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

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

89F—Udorthents, loamy, very steep

Setting

Landform: A manmade escarpment
Position on the landform: An embankment around the Ludington Pump Storage Project
Slope: 35 to 50 percent
Shape of areas: Elongated
Size of areas: 400 acres

Typical Profile

0 to 60 inches—variable but dominantly fine sandy loam and clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High

Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very rapid
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Severe
Hazard of soil blowing: Slight

Composition

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

Inclusions

Contrasting inclusions:
• Undisturbed areas of the well drained Remus and Fern soils

Use and Management

Land use: Earthen dike around the Ludington storage reservoir

Management measures:
• A plant cover helps to prevent excessive erosion.

Interpretive Groups

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

90B—Epworth fine sand, 0 to 6 percent slopes

Setting

Landform: Lake plains, beach ridges, outwash plains, and moraines
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 20 to 300 acres

Typical Profile

Surface layer:
0 to 3 inches—black fine sand

Subsurface layer:
3 to 6 inches—grayish brown fine sand

Subsoil:
6 to 30 inches—strong brown fine sand

Substratum:
30 to 50 inches—brownish yellow fine sand
50 to 60 inches—yellow fine sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Pipestone soils in the lower landscape positions
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Epworth soil

Similar inclusions:
• Areas of medium sand
• Soils with a lighter colored subsoil
• Soils with stratified very fine sand and silt 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 measures:
• 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.

Buildings

Major management concerns: Unstable cutbanks

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Rapid permeability, which causes poor filtering and a hazard of ground-water pollution

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

90C—Epworth fine sand, 6 to 12 percent slopes

Setting

Landform: Lake plains, beach ridges, outwash plains, and moraines
Position on the landform: Ridges and low knolls
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Typical Profile

Surface layer:
0 to 3 inches—black fine sand

Subsurface layer:
3 to 6 inches—grayish brown fine sand

Subsoil:
6 to 30 inches—strong brown fine sand

Substratum:
30 to 50 inches—brownish yellow fine sand
50 to 60 inches—yellow fine sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Epworth soil

Similar inclusions:
• Areas of medium sand
• Soils with a lighter colored subsoil
• Soils with stratified very fine sand and silt in the lower part of the subsoil and 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 measures:
• 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.

Buildings

Major management concerns: Unstable cutbanks, slope

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• 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, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)

Management measures:
• Land shaping and installing the distribution lines on the contour help to overcome the slope.
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

90D—Epworth fine sand, 12 to 18 percent slopes

Setting

Landform: Beach ridges and moraines
Position on the landform: Ridges and knolls in the uplands
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Typical Profile

Surface layer:
0 to 3 inches—black fine sand

Subsurface layer:
3 to 6 inches—grayish brown fine sand

Subsoil:
6 to 30 inches—strong brown fine sand
Substratum:
30 to 50 inches—brownish yellow fine sand
50 to 60 inches—yellow fine sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Epworth soil
Similar inclusions:
• Areas of medium sand
• Soils with a lighter colored subsoil
• Soils with stratified very fine sand and silt in the lower part of the subsoil and 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 measures:
• 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.

Buildings

Major management concerns: Unstable cutbanks, slope
Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• 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, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)
Management measures:
• Land shaping and installing the distribution lines on the contour help to overcome the slope.
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

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

91—Pits, gravel and sand

Setting

Landform: Outwash plains, lake plains, and moraines
Position on the landform: Knolls and ridges that have been excavated
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Composition

Pits: 100 percent

Use and Management

Land use: Source of gravel and sand
Management measures:
• Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

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

93B—Tuscola silt loam, 0 to 6 percent slopes

Setting

Landform: Lake plains and water-worked till plains
Position on the landform: Nearly level areas and low ridges
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

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

Subsoil:
9 to 18 inches—dark brown silty clay loam
18 to 30 inches—yellowish brown, mottled silty clay loam

Substratum:
30 to 49 inches—yellowish brown and light olive brown, mottled, stratified silt loam, very fine sand, and fine sand
49 to 60 inches—strong brown, mottled silt loam

Soil Properties and Qualities

Permeability: Moderate
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: At a depth of 2.0 to 3.5 feet from November through April
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate in the upper part of the profile and low in the lower part

Composition

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

Inclusions

Contrasting inclusions:
• Wixom soils, which are sandy in the upper part and loamy in the lower part and are in the slightly lower landscape positions
• The poorly drained Bono soils in depressions and along drainageways
• The somewhat poorly drained Kibbie soils in the slightly lower landscape positions

Similar inclusions:
• Soils with more clay in the subsoil
• Soils that are sandy in the substratum
• Soils with less clay in the subsoil

Use and Management

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

Cropland

Major management concerns: Water erosion, seasonal wetness, tilth in the surface layer, compaction

Management measures:
• 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.
• A drainage system can lower the water table.
• Conservation tillage, cover crops, and crop residue management improve tilth.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Properly managing crop residue, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Pasture

Major management concerns: Seasonal wetness, compaction

Management measures:
• The only hay and pasture plants that should be seeded are those that can withstand seasonal wetness.
• Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Plant competition

Management measures:
• 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.

Buildings

Major management concerns: Seasonal wetness

Management measures:
• A surface or subsurface drainage system helps to lower the water table.
• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.
• Adding well compacted fill material can raise the building site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Moderately slow permeability, seasonal wetness

Management measures:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Increasing the size of the absorption area helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 5A
Michigan soil management group: 2.5a-s

94B—Coloma-Scalley complex, 2 to 6 percent slopes

Setting

Landform: Moraines
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Coloma

Surface layer:
0 to 7 inches—dark brown sand

Subsurface layer:
7 to 41 inches—yellowish brown sand

Subsoil:
41 to 60 inches—light yellowish brown sand that has bands of strong brown loamy sand

Scalley

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

Subsoil:
6 to 9 inches—strong brown clay loam and pale brown fine sandy loam
9 to 18 inches—strong brown clay loam
18 to 23 inches—dark brown clay loam

Substratum:
23 to 60 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Coloma—rapid; Scalley—moderately slow in the upper part of the profile and rapid in the lower part
Available water capacity: Coloma—low; Scalley—moderate
Drainage class: Coloma—excessively drained; Scalley—well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Coloma—very slow; Scalley—medium
Flooding: None
Organic matter content: Coloma—low; Scalley—moderate
Hazard of water erosion: Coloma—slight; Scalley—moderate
Hazard of soil blowing: Coloma—severe; Scalley—moderate
Shrink-swell potential: Low

Composition

Coloma soil and similar soils: 40 to 55 percent
Scalley soil and similar soils: 30 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The well drained Fern soils in landscape positions similar to those of the Coloma and Scalley soils
• The somewhat poorly drained Wixom soils in the lower landscape positions

Similar inclusions:
• Sandy soils with no bands of loamy sand in the subsoil
• Loamy soils with more clay in the subsoil
• Loamy soils with a loamy subsoil extending to a depth of 60 inches

Use and Management

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

Cropland

Major management concerns: Soil blowing on both soils, seasonal droughtiness and low organic matter content in the Coloma soil, water erosion on the Scalley soil

Management measures:
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soils to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.
• Crop rotations that include grasses and legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.
• Leaving crop residue on the surface or regularly adding other organic material increases the rate of water infiltration and minimizes crusting.

Woodland

Major management concerns: Equipment limitation and seedling mortality on the Coloma soil, plant competition on the Scalley soil

Management measures:
• Planting when the soil is moist can reduce the seedling mortality rate.
• Because loose sand can interfere with the traction of

wheeled equipment, logging roads should be stabilized.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.

Buildings

Major management concerns: Unstable cutbanks

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Rapid permeability, which causes poor filtering and a hazard of ground-water pollution

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: Coloma—2S; Scalley—3A
Michigan soil management group: Coloma—5a; Scalley—3/5a

94C—Coloma-Scalley complex, 6 to 12 percent slopes

Setting

Landform: Moraines
Position on the landform: Low ridges and low knolls
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Coloma

Surface layer:
0 to 7 inches—dark brown sand

Subsurface layer:
7 to 41 inches—yellowish brown sand

Subsoil:
41 to 60 inches—light yellowish brown fine sand that has bands of strong brown loamy sand

Scalley

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

Subsoil:
6 to 9 inches—strong brown clay loam and pale brown fine sandy loam
9 to 18 inches—strong brown clay loam
18 to 23 inches—dark brown clay loam

Substratum:
23 to 60 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Coloma—rapid; Scalley—moderately slow in the upper part of the profile and rapid in the lower part
Available water capacity: Coloma—low; Scalley—moderate
Drainage class: Coloma—excessively drained; Scalley—well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Coloma—very slow; Scalley—medium
Flooding: None
Organic matter content: Coloma—low; Scalley—moderate
Hazard of water erosion: Coloma—slight; Scalley—moderate
Hazard of soil blowing: Coloma—severe; Scalley—moderate
Shrink-swell potential: Low

Composition

Coloma soil and similar soils: 40 to 55 percent
Scalley soil and similar soils: 30 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The well drained Fern soils in landscape positions similar to those of the Coloma and Scalley soils
• The somewhat poorly drained Wixom soils in the lower landscape positions

Similar inclusions:
• Sandy soils with no bands of loamy sand in the subsoil
• Loamy soils with more clay in the subsoil
• Loamy soils with a loamy subsoil extending to a depth of 60 inches

Use and Management

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

Cropland

Major management concerns: Soil blowing on both soils, seasonal droughtiness and low organic matter content in the Coloma soil, water erosion on the Scalley soil

Management measures:
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Timing fertilizer applications so that they meet crop

nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soils to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.
• Crop rotations that include grasses and legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.
• Leaving crop residue on the surface or regularly adding other organic material increases the rate of water infiltration and minimizes crusting.

Woodland

Major management concerns: Equipment limitation and seedling mortality on the Coloma soil, plant competition on the Scalley soil

Management measures:
• Planting when the soil is moist can reduce the seedling mortality rate.
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.

Buildings

Major management concerns: Unstable cutbanks, slope

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• 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 (which causes poor filtering and a hazard of ground-water pollution), slope

Management measures:
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard 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: VIs
Woodland ordination symbol: Coloma—2S; Scalley—3A
Michigan soil management group: Coloma—5a; Scalley—3/5a

94D—Coloma-Scalley complex, 12 to 18 percent slopes

Setting

Landform: Moraines
Position on the landform: Ridges and knolls
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Coloma

Surface layer:
0 to 7 inches—dark brown sand

Subsurface layer:
7 to 41 inches—yellowish brown sand

Subsoil:
41 to 60 inches—light yellowish brown fine sand that has bands of strong brown loamy sand

Scalley

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

Subsoil:
6 to 9 inches—strong brown clay loam and pale brown fine sandy loam
9 to 18 inches—strong brown clay loam
18 to 23 inches—dark brown clay loam

Substratum:
23 to 60 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Coloma—rapid; Scalley—moderately slow in the upper part of the profile and rapid in the lower part
Available water capacity: Coloma—low; Scalley—moderate
Drainage class: Coloma—excessively drained; Scalley—well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Coloma—slow; Scalley—rapid
Flooding: None
Organic matter content: Coloma—low; Scalley—moderate
Hazard of water erosion: Coloma—slight; Scalley—severe
Hazard of soil blowing: Coloma—severe; Scalley—moderate
Shrink-swell potential: Low

Composition

Coloma soil and similar soils: 45 to 55 percent
Scalley soil and similar soils: 30 to 45 percent
Contrasting inclusions: 0 to 20 percent

Inclusions

Contrasting inclusions:
• The well drained Fern soils in landscape positions similar to those of the Coloma and Scalley soils
Similar inclusions:
• Sandy soils with no bands of loamy sand in the subsoil
• Loamy soils with more clay in the subsoil
• Loamy soils with a loamy subsoil extending to a depth of more than 60 inches

Use and Management

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

Cropland

Major management concerns: Soil blowing and water erosion on both soils, seasonal droughtiness and low organic matter content in the Coloma soil
Management measures:
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Timing fertilizer applications so that they meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands can reduce the risk of nutrient leaching.
• Increasing the organic matter content in the root zone can improve the ability of the soils to hold water, nutrients, and pesticides and reduce the risk of ground-water pollution.
• Conservation tillage and additions of organic material increase the organic matter content and the available water capacity.
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• Leaving crop residue on the surface or regularly adding other organic material increases the rate of water infiltration and minimizes crusting.

Woodland

Major management concerns: Equipment limitation and seedling mortality on the Coloma soil, plant competition on the Scalley soil
Management measures:
• Planting when the soil is moist can reduce the seedling mortality rate.
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.

Buildings

Major management concerns: Unstable cutbanks, slope
Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.
• 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, rapid permeability (which causes poor filtering and a hazard of ground-water pollution)
Management measures:
• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to overcome the slope.
• Large lots, an absorption system of shallow trenches, shrubbery planted around the perimeter of the system, and low, uniform application rates minimize the hazard of ground-water pollution.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: Coloma—2S; Scalley—3A
Michigan soil management group: Coloma—5a; Scalley—3/5a

95A—Ithaca-Arkona complex, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains
Position on the landform: Nearly level and gently sloping areas in the uplands
Shape of areas: Irregular
Size of areas: 20 to 1,000 acres

Typical Profile

Ithaca

Surface layer:
0 to 10 inches—very dark grayish brown loam
Subsoil:
10 to 15 inches—yellowish brown clay loam and pale brown fine sandy loam
15 to 24 inches—reddish brown, mottled clay
24 to 60 inches—brown, mottled clay loam

Arkona

Surface layer:
0 to 9 inches—black loamy sand

Subsurface layer:
9 to 12 inches—grayish brown, mottled sand

Subsoil:
12 to 16 inches—dark brown, mottled sand
16 to 25 inches—strong brown, mottled sand
25 to 33 inches—yellowish brown, mottled sand
33 to 37 inches—dark brown silty clay and light brownish gray loamy sand
37 to 60 inches—brown, mottled silty clay

Soil Properties and Qualities

Permeability: Ithaca—slow; Arkona—rapid in the upper part of the profile and very slow in the lower part
Available water capacity: Ithaca—high; Arkona—moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 1 to 2 feet from October through May
Surface runoff: Ithaca—slow or medium; Arkona—very slow
Flooding: None
Organic matter content: Ithaca—moderate; Arkona—low
Hazard of water erosion: Slight
Hazard of soil blowing: Ithaca—slight; Arkona—severe
Shrink-swell potential: Low in the upper part of the profile and moderate in the lower part

Composition

Ithaca soil and similar soils: 30 to 50 percent
Arkona soil and similar soils: 30 to 50 percent
Contrasting inclusions: 0 to 20 percent

Inclusions

Contrasting inclusions:
• The well drained Perrinton soils on knolls
• The sandy, moderately well drained Covert soils on low knolls and low ridges

Similar inclusions:
• Sandy soils with less clay in the substratum
• Sandy soils with a lighter colored subsoil
• Loamy soils with less clay in the subsoil
• Soils with a surface layer of sandy loam

Use and Management

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

Cropland

Major management concerns: Seasonal wetness in both soils; soil blowing, seasonal droughtiness, and low organic matter content in areas of the Arkona soil; tilth in the surface layer and compaction in areas of the Ithaca soil

Management measures:
• Surface and subsurface drainage systems are needed to reduce the wetness.
• Shallow surface ditches help to remove surface water after heavy rains.
• 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.
• Field windbreaks, vegetative barriers, crop residue management, and cover crops, such as rye, help to control soil blowing.
• Leaving crop residue on the surface reduces the hazard of soil blowing and conserves soil moisture.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the organic matter content.
• 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

Management measures:
• The quality and quantity of forage can be maintained by rotation grazing, restriction of grazing to the drier periods, clipping, weed control, and annual applications of fertilizer.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Equipment limitation and plant competition on both soils, seedling mortality on the Arkona soil

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen.
• The trees that can withstand seasonal wetness should be selected for planting.
• 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.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.

Buildings

Major management concerns: Seasonal wetness, the shrink-swell potential

Management measures:
• A surface or subsurface drainage system helps to lower the water table.
• Wetness in basements and crawl spaces can be reduced by a drainage system around the structure.
• Adding well compacted fill material can raise the building 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: Seasonal wetness, slow or very slow permeability

Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: Ithaca—4W; Arkona—2W
Michigan soil management group: Ithaca—1.5b; Arkona—4/1b

97B—Urban land-Epworth complex, 0 to 8 percent slopes

Setting

Landform: Lake plains
Position on the landform: Nearly level areas and low knolls
Shape of areas: Irregular
Size of areas: 2,300 acres

Typical Profile

Epworth

Surface layer:
0 to 3 inches—black fine sand

Subsurface layer:
3 to 6 inches—grayish brown fine sand

Subsoil:
6 to 12 inches—strong brown fine sand
12 to 30 inches—strong brown fine sand

Substratum:
30 to 50 inches—brownish yellow fine sand
50 to 60 inches—yellow fine sand

Soil Properties and Qualities

Epworth

Permeability: Rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Urban land: 50 to 70 percent
Epworth soil and similar soils: 30 to 50 percent
Contrasting inclusions: 0 to 20 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Pipestone soils in the lower landscape positions

Similar inclusions:
• Areas of medium sand
• Soils with a lighter colored subsoil
• Soils with stratified very fine sand and silt in the substratum

Use and Management

Land use: Urban land—streets, parking lots, buildings, and other structures; Epworth—gardens, lawns, building site development

Gardens, lawns, and environmental plantings

Major management concerns: Epworth—low available water capacity, soil blowing

Management measures:
• Irrigation may be needed to maintain lawns and gardens.
• The perennial plants that can withstand droughtiness should be selected for planting.
• A good plant cover and mulch can help to control soil blowing.

Buildings

Major management concerns: Epworth—unstable cutbanks

Management measures:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced or sloped.

Septic tank absorption fields

Major management concerns: Epworth—rapid permeability, which causes poor filtering and a hazard of ground-water pollution

Management measures:
• Sanitary systems should be connected to public sewers and sewage treatment facilities if possible.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: Urban land—none assigned; Epworth—4S
Michigan soil management group: None assigned

98F—Udorthents-Fluvaquents complex, nearly level to very steep

Setting

Landform: Lake plains and flood plains
Position on the landform: Udorthents—steep side slopes; Fluvaquents—narrow flood plains
Slope: 0 to 60 percent
Shape of areas: Elongated
Size of areas: 20 to 100 acres

Typical Profile

Udorthents
0 to 60 inches—variable but dominantly loamy

Fluvaquents
0 to 60 inches—variable but dominantly sandy

Soil Properties and Qualities

Permeability: Udorthents—moderately slow; Fluvaquents—rapid
Available water capacity: Udorthents—high; Fluvaquents—low
Drainage class: Udorthents—well drained; Fluvaquents—poorly drained
Seasonal high water table: Udorthents—at a depth of more than 6 feet; Fluvaquents—1 foot above to 1 foot below the surface from October through June
Surface runoff: Udorthents—very rapid; Fluvaquents—very slow or ponded
Flooding: Udorthents—none; Fluvaquents—frequent
Organic matter content: Udorthents—moderate; Fluvaquents—high
Hazard of water erosion: Udorthents—severe; Fluvaquents—slight
Hazard of soil blowing: Slight

Composition

Udorthents and similar soils: 50 to 70 percent
Fluvaquents and similar soils: 30 to 50 percent
Contrasting inclusions: 0 to 20 percent

Inclusions

Contrasting inclusions:
- The sandy Grattan soils on steep side slopes
- The loamy Perrinton soils on steep side slopes
- The mucky Carlisle soils on flood plains

Similar inclusions:
- Steep soils that do not have a surface layer or subsoil
- Areas on flood plains where sandy material is stratified with organic material

Use and Management

Land use: Wildlife habitat
- These soils are unsuitable for most other uses because of flooding and the slope. Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

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

99B—Tekenink loamy fine sand, 2 to 6 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Undulating areas, low knolls, and low ridges
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

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

Subsurface layer:
4 to 17 inches—yellowish brown loamy fine sand

Subsoil:
17 to 45 inches—pinkish gray loamy sand and reddish brown sandy loam
45 to 62 inches—reddish brown sandy loam and pale brown loamy sand
62 to 72 inches—brown loam

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
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The sandy, excessively drained Coloma soils in landscape positions similar to those of the Tekenink soil
• The somewhat poorly drained Wixom soils, which are sandy in the upper part and loamy in the lower part and are in the lower landscape positions
• Fern soils, which are sandy in the upper part and loamy in the lower part and are in landscape positions similar to those of the Tekenink soil
• The sandy Grattan soils in landscape positions similar to those of the Tekenink soil

Similar inclusions:
• Soils with more clay in the subsoil
• Soils with less clay in the subsoil

Use and Management

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

Cropland

Major management concerns: Water erosion, soil blowing, seasonal droughtiness

Management measures:
• Crop rotations that include grasses and legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.
• Leaving crop residue on the surface or regularly adding other organic material increases the rate of water infiltration and minimizes crusting.
• Field windbreaks, vegetative barriers, crop residue management, and cover crops, such as rye, help to control soil blowing.
• Cover crops and green manure crops protect the surface. They use nutrients that otherwise would be lost from the root zone of most plants.
• Leaving crop residue on the surface and adding other organic material conserve soil moisture.

Pasture

Major management concerns: None

Management measures:
• Applying lime and fertilizer according to the results of soil tests ensures the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Plant competition

Management measures:
• 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.

Buildings

Major management concerns: None

Septic tank absorption fields

Major management concerns: None

Interpretive Groups

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

99C—Tekenink loamy fine sand, 6 to 12 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Knolls and low ridges
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

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

Subsurface layer:
4 to 17 inches—yellowish brown loamy fine sand

Subsoil:
17 to 45 inches—pinkish gray loamy sand and reddish brown sandy loam
45 to 62 inches—reddish brown sandy loam and pale brown loamy sand
62 to 72 inches—brown loam

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
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The sandy, excessively drained Coloma soils in landscape positions similar to those of the Tekenink soil
• The somewhat poorly drained Wixom soils, which are sandy in the upper part and loamy in the lower part and are in the lower landscape positions

• The sandy Grattan soils in landscape positions similar to those of the Tekenink soil

Similar inclusions:
• Soils with more clay in the subsoil
• Soils with less clay in the subsoil

Use and Management

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

Cropland

Major management concerns: Water erosion, soil blowing, seasonal droughtiness

Management measures:
• Crop rotations that include grasses and legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.
• Leaving crop residue on the surface or regularly adding other organic material increases the rate of water infiltration and minimizes crusting.
• Field windbreaks, vegetative barriers, crop residue management, and cover crops, such as rye, help to control soil blowing.
• Cover crops and green manure crops protect the surface. They use nutrients that otherwise would be lost from the root zone of most plants.
• Leaving crop residue on the surface and adding other organic material conserve soil moisture.

Pasture

Major management concerns: None

Management measures:
• Applying lime and fertilizer according to the results of soil tests ensures the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Plant competition

Management measures:
• 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.

Buildings

Major management concerns: Slope

Management measures:
• 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 measures:
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

Interpretive Groups

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

99D—Tekenink loamy fine sand, 12 to 18 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Head slopes, hill slopes, nose slopes, and back slopes
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

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

Subsurface layer:
4 to 17 inches—yellowish brown loamy fine sand

Subsoil:
17 to 45 inches—pinkish gray loamy sand and reddish brown sandy loam
45 to 62 inches—reddish brown sandy loam and pale brown loamy sand
62 to 72 inches—brown loam

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
Surface runoff: Rapid
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The well drained Spinks soils in landscape positions similar to those of the Tekenink soil
• The somewhat poorly drained Wixom soils in the lower landscape positions

Similar inclusions:
• Soils with more clay in the subsoil

Use and Management

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

Woodland

Major management concerns: Plant competition

Management measures:
• 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.

Cropland

Major management concerns: Water erosion, soil blowing, seasonal droughtiness

Management measures:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• Grassed waterways, diversions, and grade stabilization structures help to prevent gully erosion.
• Leaving crop residue on the surface or regularly adding other organic material increases the rate of water infiltration and minimizes crusting.
• Field windbreaks, vegetative barriers, crop residue management, and cover crops, such as rye, help to control soil blowing.
• Cover crops and green manure crops protect the surface. They use nutrients that otherwise would be lost from the root zone of most plants.
• Leaving crop residue on the surface and adding other organic material conserve soil moisture.

Pasture

Major management concerns: Water erosion

Management measures:
• Proper stocking rates and short-duration grazing during the summer help to control soil blowing and water erosion, maintain plant density and hardiness, and keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests ensures the maximum growth of plants, especially legumes.

Buildings

Major management concerns: Slope

Management measures:
• 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 measures:
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

Interpretive Groups

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

210B—Typic Udipsamments, nearly level and undulating

Setting

Landform: Outwash plains
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 80 to 600 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsoil:
2 to 22 inches—dark yellowish brown sand
22 to 40 inches—yellowish brown sand

Substratum:
40 to 180 inches—light 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 15 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Typic Haplaquods, and dysic Medisaprists in depressions

Similar inclusions:
• Sandy soils that have a banded substratum
• Sandy soils that have a leached subsurface layer
• Sandy soils that are moderately well drained

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 2S
Michigan soil management group: 5.7a
Primary plant association: Black oak-white oak-blueberry

210C—Typic Udipsamments, rolling

Setting

Landform: Outwash plains and overwashed moraines
Position on the landform: Rolling areas
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsoil:
2 to 22 inches—dark yellowish brown sand
22 to 40 inches—yellowish brown sand

Substratum:
40 to 180 inches—light 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 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The more fertile Alfic Haplorthods and Entic Haplorthods, sandy, loamy substratum, in landscape positions similar to those of the Typic Udipsamments

Similar inclusions:
• Sandy soils that are deep to bands
• Sandy soils that have a leached subsurface layer
• Sandy soils that are moderately well drained

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 2S
Michigan soil management group: 5.3a
Primary plant association: Black oak-white oak-blueberry

210D—Typic Udipsamments, hilly

Setting

Landform: Ice-contact and overwashed, sandy moraines
Position on the landform: Hilly areas
Slope: 18 to 30 percent
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsoil:
2 to 22 inches—dark yellowish brown sand
22 to 40 inches—yellowish brown sand

Substratum:
40 to 180 inches—light 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 15 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The more fertile Alfic Haplorthods and Entic Haplorthods, sandy, loamy substratum, in landscape positions similar to those of the Typic Udipsamments

Similar inclusions:
• Sandy soils that are deep to bands
• Sandy soils that have a leached subsurface layer
• Sandy soils that are moderately well drained

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.
• Sandy, steep slopes are susceptible to erosion. Use of logging and road construction equipment should be avoided in the steeper areas if possible.
• The risk of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 2R
Michigan soil management group: 5.3a
Primary plant association: Black oak-white oak-blueberry

211B—Typic Udipsamments, banded substratum, nearly level and undulating

Setting

Landform: Outwash plains and overwashed, sandy moraines
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 80 to 600 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsoil:
2 to 20 inches—dark yellowish brown sand
20 to 30 inches—yellowish brown sand

Substratum:
30 to 45 inches—light yellowish brown sand
45 to 65 inches—light yellowish brown sand that has bands of yellowish brown loamy sand
65 to 180 inches—light yellowish brown sand that has strata of fine sand, coarse sand, and loamy 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 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Typic Udipsamments and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Typic Haplaquods, and dysic Medisaprists in depressions
• Entic Haplorthods with a fine textured substratum
• Entic Haplorthods with a dark subsoil

Similar inclusions:
• Sandy soils that are not banded
• Sandy soils with a leached subsurface layer
• Sandy soils that are moderately well drained

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Dry, loose sand can be easily displaced by heavy

equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3S
Michigan soil management group: 5.3a
Primary plant association: Black oak-white oak-blueberry

211C—Typic Udipsamments, banded substratum, rolling

Setting

Landform: Ice-contact and overwashed, sandy moraines
Position on the landform: Gently rolling and rolling areas
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 80 to 130 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsoil:
2 to 20 inches—dark yellowish brown sand
20 to 30 inches—yellowish brown sand

Substratum:
30 to 45 inches—light yellowish brown sand
45 to 65 inches—light yellowish brown sand that has bands of yellowish brown loamy sand
65 to 180 inches—light yellowish brown sand that has strata of fine sand, coarse sand, and loamy 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 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Typic Udipsamments and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Typic Haplaquods, and dysic Medisaprists in depressions
• Entic Haplorthods that have a fine textured substratum
• Entic Haplorthods that have a dark subsoil

Similar inclusions:
• Sandy soils that are not banded
• Sandy soils with a leached subsurface layer
• Sandy soils that are moderately well drained
• Sandy soils that are steeper

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 3S
Michigan soil management group: 5.3a
Primary plant association: Black oak-white oak-blueberry

212B—Typic Udipsamments, very deep water table, nearly level and undulating

Setting

Landform: Outwash plains
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 80 to 600 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsoil:
3 to 8 inches—brown sand
8 to 20 inches—strong brown sand
20 to 25 inches—yellowish brown sand

Substratum:
25 to 60 inches—light yellowish brown sand
60 to 180 inches—yellowish brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low

Drainage class: Excessively drained
Seasonal high water table: At a depth of 5 to 15 feet throughout the year
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Typic Haplaquods, and dysic Medisaprists in depressions

Similar inclusions:
• Sandy soils that are deep to bands
• Sandy soils with a leached subsurface layer
• Sandy soils that are moderately well drained

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3S
Michigan soil management group: 5.3a
Primary plant association: Black oak-white oak-blueberry

213B—Alfic Udipsamments, nearly level and undulating

Setting

Landform: Outwash plains and overwashed moraines
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 80 to 400 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark grayish brown sand

Subsoil:
3 to 20 inches—dark yellowish brown sand
20 to 30 inches—yellowish brown sand
30 to 100 inches—light yellowish brown sand that has bands of strong brown loamy 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 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Alfic Udipsamments and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Typic Haplaquods, and dysic Medisaprists in depressions

Similar inclusions:
• Sandy soils with a leached subsurface layer
• Sandy soils that are moderately well drained

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 6S
Michigan soil management group: 5a
Primary plant association: Black oak-white oak-blueberry

214B—Typic Udipsamments, deep water table, nearly level and gently undulating

Setting

Landform: Outwash plains
Position on the landform: Nearly level and undulating areas
Slope: 0 to 4 percent
Shape of areas: Irregular
Size of areas: 80 to 200 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsoil:
2 to 37 inches—dark yellowish brown sand
37 to 45 inches—yellowish brown, mottled sand

Substratum:
45 to 60 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: At a depth of 3 to 5 feet throughout the year
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Typic Haplaquods, and dysic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that are deep to bands
• Sandy soils with a leached subsurface layer
• Soils that have a surface layer of loamy sand

Use and Management

Land use: Woodland

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

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.
• Competing vegetation generally can be controlled by mechanical means.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 2S
Michigan soil management group: 5a
Primary plant association: Black oak-white oak-blueberry

220B—Entic Haplorthods, sandy, nearly level and undulating

Setting

Landform: Outwash plains, overwashed moraines, and sandy moraines
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 600 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—pinkish gray sand

Subsoil:
5 to 20 inches—strong brown sand
20 to 35 inches—reddish yellow sand

Substratum:
35 to 180 inches—light 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 15 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Aquic Udipsamments, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways
Similar inclusions:
• Sandy soils that are moderately well drained
• Sandy soils that have a fine textured substratum
• Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.3a
Primary plant association: Mixed oak-red maple-starflower

220C—Entic Haplorthods, sandy, rolling

Setting

Landform: Overwashed moraines and sandy moraines
Position on the landform: Gently rolling and rolling areas
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 600 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand
Subsurface layer:
3 to 5 inches—pinkish gray sand
Subsoil:
5 to 20 inches—strong brown sand
20 to 35 inches—reddish yellow sand
Substratum:
35 to 180 inches—light 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 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Aquic Udipsamments, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways
Similar inclusions:
• Sandy soils that are moderately well drained
• Sandy soils that have a fine textured substratum
• Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.3a
Primary plant association: Mixed oak-red maple-starflower

220D—Entic Haplorthods, sandy, hilly

Setting

Landform: Overwashed moraines and sandy moraines
Position on the landform: Hilly and steep areas
Slope: 18 to 30 percent
Shape of areas: Irregular
Size of areas: 40 to 400 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—pinkish gray sand

Subsoil:
5 to 20 inches—strong brown sand
20 to 35 inches—reddish yellow sand

Substratum:
35 to 180 inches—light 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 15 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Alfic Haplorthods and Entic Haplorthods, loamy substratum, in landscape positions similar to those of the Entic Haplorthods, sandy, hilly

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard; equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• 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 risk of erosion can be reduced by seeding logging roads and landings and by installing water bars and culverts.
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.3a
Primary plant association: Mixed oak-red maple-starflower

220E—Entic Haplorthods, sandy, steep and very steep

Setting

Landform: Overwashed moraines, sandy moraines, and dissected sandy moraines
Position on the landform: Steep and very steep areas
Slope: 30 to 50 percent
Shape of areas: Irregular
Size of areas: 20 to 300 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—pinkish gray sand

Subsoil:
5 to 20 inches—strong brown sand
20 to 35 inches—reddish yellow sand

Substratum:
35 to 180 inches—light 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 15 feet
Surface runoff: Rapid
Flooding: None
Organic matter content: Low
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• Alfic Haplorthods and Entic Haplorthods, loamy

substratum, in landscape positions similar to those of the Entic Haplorthods, sandy, steep and very steep

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Sandy soils that have a lighter colored subsoil
• Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard; equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Avoiding practices that disturb the surface can help to prevent excessive erosion.
• 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 when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.3a
Primary plant association: Mixed oak-red maple-starflower

221B—Entic Haplorthods, sandy, banded substratum, nearly level and undulating

Setting

Landform: Overwashed moraines and sandy moraines
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 600 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 4 inches—grayish brown sand

Subsoil:
4 to 15 inches—dark brown sand
15 to 30 inches—strong brown sand

Substratum:
30 to 60 inches—light yellowish brown sand
60 to 75 inches—light yellowish brown sand that has bands of dark yellowish brown loamy sand
75 to 85 inches—brown loamy sand
85 to 180 inches—light 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 15 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Aquic Udipsamments, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that are moderately well drained
• Sandy soils that have a fine textured, banded substratum
• Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.3a
Primary plant association: Mixed oak-red maple-starflower

221C—Entic Haplorthods, sandy, banded substratum, rolling

Setting

Landform: Overwashed moraines and sandy moraines
Position on the landform: Gently rolling and rolling areas
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 600 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 4 inches—grayish brown sand

Subsoil:
4 to 15 inches—dark brown sand
15 to 30 inches—strong brown sand

Substratum:
30 to 60 inches—light yellowish brown sand
60 to 75 inches—light yellowish brown sand that has bands of dark yellowish brown loamy sand
75 to 85 inches—brown loamy sand
85 to 180 inches—light 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 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aquic Udipsamments, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that are moderately well drained
• Sandy soils that have a fine textured, banded substratum
• Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.3a
Primary plant association: Mixed oak-red maple-starflower

221D—Entic Haplorthods, sandy, banded substratum, hilly

Setting

Landform: Overwashed moraines and sandy moraines
Position on the landform: Hilly and steep areas
Slope: 18 to 30 percent
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 4 inches—grayish brown sand

Subsoil:
4 to 15 inches—dark brown sand
15 to 30 inches—strong brown sand

Substratum:
30 to 60 inches—light yellowish brown sand
60 to 75 inches—light yellowish brown sand that has bands of dark yellowish brown loamy sand
75 to 85 inches—brown loamy sand
85 to 180 inches—light 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 15 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Low

Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
- Alfic Haplorthods and Entic Haplorthods, sandy, loamy substratum, in landscape positions similar to those of the Entic Haplorthods, banded, sandy substratum, hilly

Similar inclusions:
- Sandy soils that have a fine textured, banded substratum
- Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard; equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
- The risk of erosion can be reduced by seeding logging roads and landings and by installing water bars and culverts.
- 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.
- Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
- Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.3a
Primary plant association: Mixed oak-red maple-starflower

222B—Entic Haplorthods, sandy, very deep water table, nearly level and undulating

Setting

Landform: Outwash plains
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—grayish brown sand

Subsoil:
5 to 12 inches—dark brown sand
12 to 18 inches—strong brown sand
18 to 35 inches—yellowish brown sand

Substratum:
35 to 65 inches—light yellowish brown sand
65 to 80 inches—light yellowish brown, mottled sand
80 to 90 inches—yellowish brown, mottled sand
90 to 100 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 5 to 15 feet throughout the year
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat poorly drained or poorly drained Aeric Haplaquods, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways

Similar inclusions:
- Sandy soils that have a fine textured substratum
- Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
- Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.

• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.3a
Primary plant association: Mixed oak-red maple-starflower

224B—Entic Haplorthods, sandy, deep water table, nearly level and gently undulating

Setting

Landform: Outwash plains
Position on the landform: Nearly level and undulating areas
Slope: 0 to 4 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Reference Profile

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

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 11 inches—dark brown sand
11 to 18 inches—strong brown sand
18 to 30 inches—dark yellowish brown sand

Substratum:
30 to 40 inches—yellowish brown sand
40 to 55 inches—brownish yellow, mottled sand
55 to 70 inches—yellowish brown, saturated sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: At a depth of 3 to 5 feet throughout the year
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Typic Haplaquods and dysic Medisaprists in depressions and drainageways

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

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 4S
Michigan soil management group: 5a
Primary plant association: Mixed oak-red maple-starflower

225B—Entic Haplorthods, sandy, loamy substratum, nearly level and undulating

Setting

Landform: Overwashed moraines
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 4 inches—grayish brown sand

Subsoil:
4 to 10 inches—dark brown sand
10 to 35 inches—yellowish brown sand

Substratum:
35 to 55 inches—strong brown sand
55 to 65 inches—reddish brown sandy clay loam

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained

Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low in the upper part of the profile and moderate in the substratum

Composition

Entic Haplorthods and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Aquic Udipsamments, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways
• Alfic Haplorthods and Haplic Glossudalfs in landscape positions similar to those of the Entic Haplorthods

Similar inclusions:
• Soils that are moderately well drained
• Soils that have a coarse textured substratum
• Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.3a
Primary plant association: Mixed oak-red maple-starflower

225C—Entic Haplorthods, sandy, loamy substratum, rolling

Setting

Landform: Overwashed end moraines and ground moraines
Position on the landform: Gently rolling and rolling areas
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 300 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 4 inches—grayish brown sand

Subsoil:
4 to 10 inches—dark brown sand
10 to 35 inches—yellowish brown sand

Substratum:
35 to 55 inches—strong brown sand
55 to 65 inches—reddish brown sandy clay loam

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low in the upper part of the profile and moderate in the substratum

Composition

Entic Haplorthods and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aquic Udipsamments, Mollic Psammaquents, Typic Haplaquods, and dysic Medisaprists in depressions and drainageways
• Haplic Glossudalfs and Alfic Haplorthods in landscape positions similar to those of the Entic Haplorthods

Similar inclusions:
• Soils that are moderately well drained
• Sandy soils that have a coarse textured substratum
• Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Dry, loose sand can be easily displaced by heavy

equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4S
Michigan soil management group: 5/2a
Primary plant association: Mixed oak-red maple-starflower

231B—Entic Haplorthods, sandy-Alfic Haplorthods, sandy over loamy complex, nearly level and undulating

Setting

Landform: Sandy moraines
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Reference Profile

Entic Haplorthods, sandy

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—pinkish gray sand

Subsoil:
5 to 20 inches—strong brown sand
20 to 35 inches—reddish yellow sand

Substratum:
35 to 180 inches—light yellowish brown sand

Alfic Haplorthods, sandy over loamy

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—grayish brown sand

Subsoil:
5 to 10 inches—dark brown loamy sand
10 to 20 inches—strong brown sand
20 to 36 inches—yellowish brown sand
36 to 50 inches—brown sandy clay loam

Substratum:
50 to 65 inches—yellowish brown loamy sand

Soil Properties and Qualities

Permeability: Entic Haplorthods, sandy—rapid; Alfic Haplorthods, sandy over loamy—rapid in the upper part of the profile and moderate or moderately slow in the lower part
Available water capacity: Low
Drainage class: Entic Haplorthods, sandy—excessively drained; Alfic Haplorthods, sandy over loamy—well drained
Seasonal high water table: Below a depth of 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Entic Haplorthods, sandy—low; Alfic Haplorthods, sandy over loamy—low in the sandy part and moderate in the loamy part

Composition

Entic Haplorthods and similar soils: 40 to 70 percent
Alfic Haplorthods and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 30 percent

Inclusions

Contrasting inclusions:
• The poorly drained Mollic Psammaquents, Aquic Udipsamments, and dysic or euic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that have a dark subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: Entic Haplorthods, sandy—4S; Alfic Haplorthods, sandy over loamy—5S
Michigan soil management group: Entic Haplorthods, sandy—5.3a; Alfic Haplorthods, sandy over loamy—5/2a
Primary plant association: Mixed oak-red maple-starflower
Secondary plant association: Northern red oak-red maple-mapleleaf viburnum

231C—Entic Haplorthods, sandy-Alfic Haplorthods, sandy over loamy complex, rolling

Setting

Landform: Overwashed moraines and sandy moraines
Position on the landform: Gently rolling and rolling areas
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Reference Profile

Entic Haplorthods, sandy

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—pinkish gray sand

Subsoil:
5 to 20 inches—strong brown sand
20 to 35 inches—reddish yellow sand

Substratum:
35 to 180 inches—light yellowish brown sand

Alfic Haplorthods, sandy over loamy

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—grayish brown sand

Subsoil:
5 to 10 inches—dark brown loamy sand
10 to 20 inches—strong brown sand
20 to 36 inches—yellowish brown sand
36 to 50 inches—brown sandy clay loam

Substratum:
50 to 65 inches—yellowish brown loamy sand

Soil Properties and Qualities

Permeability: Entic Haplorthods, sandy—rapid; Alfic Haplorthods, sandy over loamy—rapid in the upper part of the profile and moderate or moderately slow in the lower part
Available water capacity: Low
Drainage class: Entic Haplorthods, sandy—excessively drained; Alfic Haplorthods, sandy over loamy—well drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Entic Haplorthods, sandy—low; Alfic Haplorthods, sandy over loamy—low in the sandy part and moderate in the loamy part

Composition

Entic Haplorthods and similar soils: 40 to 70 percent
Alfic Haplorthods and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 30 percent

Inclusions

Contrasting inclusions:
• The poorly drained Mollic Psammaquents, Aquic Udipsamments, and dysic or euic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that have a dark subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: Entic Haplorthods, sandy—4S; Alfic Haplorthods, sandy over loamy—5S
Michigan soil management group: Entic Haplorthods, sandy—5.3a; Alfic Haplorthods, sandy over loamy—5/2a
Primary plant association: Mixed oak-red maple-starflower
Secondary plant association: Northern red oak-red maple-mapleleaf viburnum

231D—Entic Haplorthods, sandy-Alfic Haplorthods, sandy over loamy complex, hilly

Setting

Landform: Overwashed moraines and sandy moraines
Position on the landform: Rolling areas
Slope: 18 to 30 percent
Shape of areas: Irregular
Size of areas: 20 to 180 acres

Reference Profile

Entic Haplorthods, sandy

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—pinkish gray sand

Subsoil:
5 to 20 inches—strong brown sand
20 to 35 inches—reddish yellow sand

Substratum:
35 to 180 inches—light yellowish brown sand

Alfic Haplorthods, sandy over loamy

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—grayish brown sand

Subsoil:
5 to 10 inches—dark brown loamy sand
10 to 20 inches—strong brown sand
20 to 36 inches—yellowish brown sand
36 to 50 inches—brown sandy clay loam

Substratum:
50 to 65 inches—yellowish brown loamy sand

Soil Properties and Qualities

Permeability: Entic Haplorthods, sandy—rapid; Alfic Haplorthods, sandy over loamy—rapid in the upper part of the profile and moderate or moderately slow in the lower part
Available water capacity: Low
Drainage class: Entic Haplorthods, sandy—excessively drained; Alfic Haplorthods, sandy over loamy—well drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Entic Haplorthods, sandy—low; Alfic Haplorthods, sandy over loamy—low in the sandy part and moderate in the loamy part

Composition

Entic Haplorthods and similar soils: 40 to 70 percent
Alfic Haplorthods and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 30 percent

Inclusions

Contrasting inclusions:
• The poorly drained Mollic Psammaquents, Aquic Udipsamments, and dysic or euic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that have a dark subsoil

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard; equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Because of the erosion hazard, skid roads and skid trails should be established on the contour and water should be removed by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Soil disturbance should be limited in the steeper areas. Special care is needed in selecting sites for roads and trails.
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: Entic Haplorthods, sandy—4R; Alfic Haplorthods, sandy over loamy—5R
Michigan soil management group: Entic Haplorthods, sandy—5.3a; Alfic Haplorthods, sandy over loamy—5/2a
Primary plant association: Mixed oak-red maple-starflower
Secondary plant association: Northern red oak-red maple-mapleleaf viburnum

231E—Entic Haplorthods, sandy-Alfic Haplorthods, sandy over loamy complex, steep and very steep

Setting

Landform: Overwashed moraines and sandy moraines
Position on the landform: Rolling areas
Slope: 30 to 60 percent
Shape of areas: Irregular
Size of areas: 20 to 125 acres

Reference Profile

Entic Haplorthods, sandy

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—pinkish gray sand

Subsoil:
5 to 20 inches—strong brown sand
20 to 35 inches—reddish yellow sand

Substratum:
35 to 180 inches—light yellowish brown sand

Alfic Haplorthods, sandy over loamy

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—grayish brown sand

Subsoil:
5 to 10 inches—dark brown loamy sand
10 to 20 inches—strong brown sand
20 to 36 inches—yellowish brown sand
36 to 50 inches—brown sandy clay loam

Substratum:
50 to 65 inches—yellowish brown loamy sand

Soil Properties and Qualities

Permeability: Entic Haplorthods, sandy—rapid; Alfic Haplorthods, sandy over loamy—rapid in the upper part of the profile and moderate or moderately slow in the lower part
Available water capacity: Low
Drainage class: Entic Haplorthods, sandy—excessively drained; Alfic Haplorthods, sandy over loamy—well drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Low
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Entic Haplorthods, sandy—low; Alfic Haplorthods, sandy over loamy—low in the sandy part and moderate in the loamy part

Composition

Entic Haplorthods and similar soils: 40 to 70 percent
Alfic Haplorthods and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 30 percent

Inclusions

Contrasting inclusions:
• The poorly drained Mollic Psammaquents, Aquic Udipsamments, and dysic or euic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that have a dark subsoil

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard; equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• 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.
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Soil disturbance should be limited in the steeper areas. Special care is needed in selecting sites for roads and trails.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: Entic Haplorthods, sandy—4R; Alfic Haplorthods, sandy over loamy—5R
Michigan soil management group: Entic Haplorthods, sandy—5.3a; Alfic Haplorthods, sandy over loamy—5/2a
Primary plant association: Mixed oak-red maple-starflower
Secondary plant association: Northern red oak-red maple-mapleleaf viburnum

233B—Alfic Haplorthods, sandy over loamy-Entic Haplorthods, sandy complex, nearly level and undulating

Setting

Landform: Sandy moraines
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Reference Profile

Alfic Haplorthods, sandy over loamy

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—grayish brown sand

Subsoil:
5 to 10 inches—dark brown loamy sand
10 to 20 inches—strong brown sand
20 to 36 inches—yellowish brown sand
36 to 50 inches—brown sandy clay loam

Substratum:
50 to 65 inches—yellowish brown loamy sand

Entic Haplorthods, sandy

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—pinkish gray sand

Subsoil:
5 to 20 inches—strong brown sand
20 to 35 inches—reddish yellow sand

Substratum:
35 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Alfic Haplorthods, sandy over loamy—rapid in the upper part of the profile and moderate or moderately slow in the lower part; Entic Haplorthods, sandy—rapid
Available water capacity: Low
Drainage class: Alfic Haplorthods, sandy over loamy—well drained; Entic Haplorthods, sandy—excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Alfic Haplorthods, sandy over loamy—low in the sandy part and moderate in loamy part; Entic Haplorthods, sandy—low

Composition

Alfic Haplorthods and similar soils: 40 to 70 percent
Entic Haplorthods and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The poorly drained Mollic Psammaquents, Aquic Udipsamments, and dysic or euic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that have a dark subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Alfic Haplorthods, sandy over loamy—5S; Entic Haplorthods, sandy—4S
Michigan soil management group: Alfic Haplorthods, sandy over loamy—5/2a; Entic Haplorthods, sandy—5.3a
Primary plant association: Northern red oak-red maple-mapleleaf viburnum
Secondary plant association: Mixed oak-red maple-starflower

235B—Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy complex, nearly level and undulating

Setting

Landform: Sandy moraines
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Reference Profile

Alfic Haplorthods, sandy over loamy

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—grayish brown sand

Subsoil:
5 to 10 inches—dark brown loamy sand
10 to 20 inches—strong brown sand
20 to 36 inches—yellowish brown sand
36 to 50 inches—brown sandy clay loam

Substratum:
50 to 65 inches—yellowish brown loamy sand

Alfic Haplorthods, sandy

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

Subsurface layer:
3 to 4 inches—light gray sand

Subsoil:
4 to 42 inches—strong brown, dark yellowish brown, and yellowish brown sand
42 to 50 inches—dark brown sandy loam

Substratum:
50 to 180 inches—light yellowish brown and yellowish brown sand and loamy sand

Soil Properties and Qualities

Permeability: Alfic Haplorthods, sandy over loamy—rapid in the upper part of the profile and moderate or moderately slow in the lower part; Alfic Haplorthods, sandy—rapid
Available water capacity: Low
Drainage class: Alfic Haplorthods, sandy over loamy—well drained; Alfic Haplorthods, sandy—excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Alfic Haplorthods, sandy over loamy—low in the sandy part and moderate in loamy part; Alfic Haplorthods, sandy—low

Composition

Alfic Haplorthods, sandy over loamy, and similar soils: 40 to 70 percent
Alfic Haplorthods, sandy, and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The poorly drained Mollic Psammaquents, Aquic Udipsamments, and dysic or euic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that have a dark subsoil
• Sandy soils that are weakly developed and do not have loamy material

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: Alfic Haplorthods, sandy over loamy—5S; Alfic Haplorthods, sandy—3S
Michigan soil management group: Alfic Haplorthods, sandy over loamy—5/2a; Alfic Haplorthods, sandy—5.3a
Primary plant association: Northern red oak-red maple-mapleleaf viburnum

235C—Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy complex, rolling

Setting

Landform: Overwashed moraines and sandy moraines
Position on the landform: Gently rolling and rolling areas
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Reference Profile

Alfic Haplorthods, sandy over loamy

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—grayish brown sand

Subsoil:
5 to 10 inches—dark brown loamy sand
10 to 20 inches—strong brown sand
20 to 36 inches—yellowish brown sand
36 to 50 inches—brown sandy clay loam

Substratum:
50 to 65 inches—yellowish brown loamy sand

Alfic Haplorthods, sandy

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

Subsurface layer:
3 to 4 inches—light gray sand

Subsoil:
4 to 42 inches—strong brown, dark yellowish brown, and yellowish brown sand
42 to 50 inches—dark brown sandy loam

Substratum:
50 to 180 inches—light yellowish brown and yellowish brown sand and loamy sand

Soil Properties and Qualities

Permeability: Alfic Haplorthods, sandy over loamy—rapid in the upper part of the profile and moderate or moderately slow in the lower part; Alfic Haplorthods, sandy—rapid
Available water capacity: Low
Drainage class: Alfic Haplorthods, sandy over loamy—well drained; Alfic Haplorthods, sandy—excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Alfic Haplorthods, sandy over loamy—low in the sandy part and moderate in loamy part; Alfic Haplorthods, sandy—low

Composition

Alfic Haplorthods, sandy over loamy, and similar soils: 40 to 70 percent
Alfic Haplorthods, sandy, and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The poorly drained Mollic Psammaquents, Aquic Udipsamments, and dysic or euic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that have a dark subsoil
• Sandy soils that are weakly developed and do not have loamy material

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: Alfic Haplorthods, sandy over loamy—5S; Alfic Haplorthods, sandy—3S
Michigan soil management group: Alfic Haplorthods, sandy over loamy—5/2a; Alfic Haplorthods, sandy—5.3a
Primary plant association: Northern red oak-red maple-mapleleaf viburnum

235D—Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy complex, hilly

Setting

Landform: Overwashed moraines and sandy moraines
Position on the landform: Hilly areas
Slope: 18 to 30 percent
Shape of areas: Irregular
Size of areas: 20 to 70 acres

Reference Profile

Alfic Haplorthods, sandy over loamy

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 5 inches—grayish brown sand

Subsoil:
5 to 10 inches—dark brown loamy sand
10 to 20 inches—strong brown sand
20 to 36 inches—yellowish brown sand
36 to 50 inches—brown sandy clay loam

Substratum:
50 to 65 inches—yellowish brown loamy sand

Alfic Haplorthods, sandy

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

Subsurface layer:
3 to 4 inches—light gray sand

Subsoil:
4 to 42 inches—strong brown, dark yellowish brown, and yellowish brown sand
42 to 50 inches—dark brown sandy loam

Substratum:
50 to 180 inches—light yellowish brown and yellowish brown sand and loamy sand

Soil Properties and Qualities

Permeability: Alfic Haplorthods, sandy over loamy—rapid in the upper part of the profile and moderate or moderately slow in the lower part; Alfic Haplorthods, sandy—rapid
Available water capacity: Low
Drainage class: Alfic Haplorthods, sandy over loamy—well drained; Alfic Haplorthods, sandy—excessively drained
Seasonal high water table: At a depth of more than 15 feet

Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Alfic Haplorthods, sandy over loamy—low in the sandy part and moderate in loamy part; Alfic Haplorthods, sandy—low

Composition

Alfic Haplorthods, sandy over loamy, and similar soils: 40 to 70 percent
Alfic Haplorthods, sandy, and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The poorly drained Mollic Psammaquents, Aquic Udipsamments, and dysic or euic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that have a dark subsoil
• Sandy soils that have a water table at a depth of more than 6 feet
• Sandy soils that are weakly developed and do not have loamy material

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard; equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Because of the erosion hazard, skid roads and skid trails should be established on the contour and water should be removed by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Soil disturbance should be limited in the steeper areas. Special care is needed in selecting sites for roads and trails.
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Alfic Haplorthods, sandy over loamy—5R; Alfic Haplorthods, sandy—3R
Michigan soil management group: Alfic Haplorthods, sandy over loamy—5/2a; Alfic Haplorthods, sandy—5.3a
Primary plant association: Northern red oak-red maple-mapleleaf viburnum

236B—Entic Haplorthods, sandy, low potential evaporation, nearly level and undulating

Setting

Landform: Outwash plains
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 300 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 6 inches—pinkish gray sand

Subsoil:
6 to 20 inches—strong brown sand
20 to 36 inches—brownish yellow sand

Substratum:
36 to 180 inches—light 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 15 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Aquic Udipsamments, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways

Similar inclusions:
• Soils that are moderately well drained
• Soils that have a dark subsoil

• Soils that have a surface layer of loamy sand or fine sand
• Soils that have a subsoil and substratum of fine sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.3a
Primary plant association: Mixed oak-red maple-starflower

236C—Entic Haplorthods, sandy, low potential evaporation, rolling

Setting

Landform: Dunes
Position on the landform: Rolling areas
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 80 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 6 inches—pinkish gray sand

Subsoil:
6 to 20 inches—strong brown sand
20 to 36 inches—brownish yellow sand

Substratum:
36 to 180 inches—light 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 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aquic Udipsamments, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways

Similar inclusions:
• Soils that are moderately well drained
• Soils that have a dark subsoil
• Soils that have a surface layer of loamy sand or fine sand
• Soils that have a subsoil and substratum of fine sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.3a
Primary plant association: Mixed oak-red maple-starflower

236D—Entic Haplorthods, sandy, low potential evaporation, hilly

Setting

Landform: Dunes
Position on the landform: Hilly areas
Slope: 18 to 30 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 6 inches—pinkish gray sand

Subsoil:
6 to 20 inches—strong brown sand
20 to 36 inches—brownish yellow sand

Substratum:
36 to 180 inches—light 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 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aquic Udipsamments, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways

Similar inclusions:
• Soils that have a dark subsoil
• Soils that have a surface layer of loamy sand or fine sand
• Soils that have a subsoil and substratum of fine sand

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard; equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Because of the erosion hazard, special care is needed when logging roads are constructed, water bars are needed, and landings and bare areas should be seeded.
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.3a
Primary plant association: Mixed oak-red maple-starflower

236E—Entic Haplorthods, sandy, low potential evaporation, steep and very steep

Setting

Landform: Dunes
Position on the landform: Steep and very steep areas
Slope: 30 to 70 percent
Shape of areas: Irregular
Size of areas: 20 to 90 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 6 inches—pinkish gray sand

Subsoil:
6 to 20 inches—yellowish brown sand
20 to 36 inches—brownish yellow sand

Substratum:
36 to 180 inches—light 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 15 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Low
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aquic Udipsamments, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways

Similar inclusions:
• Soils that have a dark subsoil
• Soils that have a surface layer of loamy sand or fine sand
• Soils that have a subsoil and substratum of fine sand

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard; equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:

• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Because of the 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.
• Dry, loose sand can be easily displaced by equipment and foot traffic. Trails and roads may require a special design to limit surface disturbance.
• Use of steep slopes should be avoided. Trails and paths should be established on the contour.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.3a
Primary plant association: Mixed oak-red maple-starflower

237B—Haplic Glossudalfs, fine-loamy, nearly level and undulating

Setting

Landform: Ground moraines and end moraines
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Reference Profile

Surface layer:
0 to 4 inches—black sandy loam

Subsoil:
4 to 10 inches—pale brown sandy loam
10 to 20 inches—pale brown sandy loam and yellowish brown loam
20 to 45 inches—reddish brown sandy clay loam

Substratum:
45 to 60 inches—brown sandy clay loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the upper part of the profile and moderate in the lower part

Composition

Haplic Glossudalfs and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:

• The well drained Entic Haplorthods, sandy, in landscape positions similar to those of the Haplic Glossudalfs
• The poorly drained Typic Haplaquolls, Mollic Psammaquents, and euic Medisaprists in depressions and drainageways

Similar inclusions:

• Soils that are moderately well drained
• Soils that have a dark subsoil
• Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland

Major management concerns: Compaction, plant competition

Management measures:

• Heavy equipment may compact soils that have a loamy surface layer. Operating the equipment during dry periods or during winter reduces the risk of compaction.
• Special harvest methods may be needed to control undesirable plants.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 6A
Michigan soil management group: 3a
Primary plant association: Northern red oak-red maple-trefoil

237C—Haplic Glossudalfs, fine-loamy, rolling

Setting

Landform: Ground moraines and end moraines
Position on the landform: Rolling areas
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 10 to 150 acres

Reference Profile

Surface layer:
0 to 4 inches—black sandy loam
Subsoil:
4 to 10 inches—pale brown sandy loam
10 to 20 inches—pale brown sandy loam and yellowish brown loam
20 to 45 inches—reddish brown sandy clay loam
Substratum:
45 to 60 inches—brown sandy clay loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the upper part of the profile and moderate in the lower part

Composition

Haplic Glossudalfs and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
• The well drained Entic Haplorthods, sandy, in landscape positions similar to those of the Haplic Glossudalfs
• The poorly drained Typic Haplaquolls, Mollic Psammaquents, and euic Medisaprists in depressions and drainageways
Similar inclusions:
• Soils that are moderately well drained
• Soils that have a dark subsoil
• Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland
Major management concerns: Compaction, plant competition
Management measures:
• Heavy equipment may compact soils that have a loamy surface layer. Operating the equipment during dry periods or during winter reduces risk of compaction.
• Special harvest methods may be needed to control undesirable plants.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 6A
Michigan soil management group: 3a
Primary plant association: Northern red oak-red maple-trefoil

237D—Haplic Glossudalfs, fine-loamy, hilly

Setting

Landform: Ground moraines and end moraines
Position on the landform: Hilly areas
Slope: 18 to 30 percent
Shape of areas: Irregular
Size of areas: 20 to 70 acres

Reference Profile

Surface layer:
0 to 4 inches—black sandy loam
Subsoil:
4 to 10 inches—pale brown sandy loam
10 to 20 inches—pale brown sandy loam and yellowish brown loam
20 to 45 inches—reddish brown sandy clay loam
Substratum:
45 to 60 inches—brown sandy clay loam

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
Surface runoff: Rapid
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Low in the upper part of the profile and moderate in the lower part

Composition

Haplic Glossudalfs and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
- The well drained Entic Haplorthods, sandy, in landscape positions similar to those of the Haplic Glossudalfs
- The poorly drained Typic Haplaquolls, Mollic Psammaquents, and euic Medisaprists in depressions and drainageways

Similar inclusions:
- Soils that are moderately well drained
- Soils that have a dark subsoil
- Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland

Major management concerns: Compaction, equipment limitation, erosion hazard, plant competition

Management measures:
- Heavy equipment may compact soils that have a loamy surface layer. Operating the equipment during dry periods or during winter reduces risk of compaction.
- Because of the erosion hazard, skid roads and skid trails should be established on the contour and water should be removed by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
- 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.
- Special harvest methods may be needed to control undesirable plants.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 6R
Michigan soil management group: 3a
Primary plant association: Northern red oak-red maple-trefoil

240B—Entic Haplorthods, sandy, dark subsoil, nearly level and undulating

Setting

Landform: Sandy moraines
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Reference Profile

Surface layer:
0 to 1 inch—very dark gray sand

Subsurface layer:
1 to 2 inches—grayish brown sand

Subsoil:
2 to 4 inches—dark brown sand
4 to 15 inches—brown sand
15 to 30 inches—strong brown sand

Substratum:
30 to 130 inches—light yellowish brown 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 15 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
- The somewhat poorly drained or poorly drained Aeric Haplaquods, Aquic Udipsamments, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways

Similar inclusions:
- Sandy soils that are moderately well drained
- Sandy soils that have a fine textured substratum
- Soils that have a surface layer of loamy sand or fine sand
- Soils that have a lighter colored subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
- Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
- Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 3S
Michigan soil management group: 5a
Primary plant association: Sugar maple-American beech-clubmoss

240C—Entic Haplorthods, sandy, dark subsoil, rolling

Setting

Landform: Sandy moraines
Position on the landform: Gently rolling and rolling areas
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 125 acres

Reference Profile

Surface layer:
0 to 1 inch—very dark gray sand

Subsurface layer:
1 to 2 inches—grayish brown sand

Subsoil:
2 to 4 inches—dark brown sand
4 to 15 inches—brown sand
15 to 30 inches—strong brown sand

Substratum:
30 to 130 inches—light yellowish brown 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 15 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Aquic Udipsamments, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that are moderately well drained
• Sandy soils that have a fine textured substratum
• Soils that have a surface layer of loamy sand or fine sand
• Soils that have a lighter colored subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3S
Michigan soil management group: 5a
Primary plant association: Sugar maple-American beech-clubmoss

240D—Entic Haplorthods, sandy, dark subsoil, hilly

Setting

Landform: Sandy moraines
Position on the landform: Hilly areas
Slope: 18 to 30 percent
Shape of areas: Irregular
Size of areas: 20 to 150 acres

Reference Profile

Surface layer:
0 to 1 inch—very dark gray sand

Subsurface layer:
1 to 2 inches—grayish brown sand

Subsoil:
2 to 4 inches—dark brown sand
4 to 15 inches—brown sand
15 to 30 inches—strong brown sand

Substratum:
30 to 130 inches—light yellowish brown 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 15 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Aquic Udipsamments, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that are moderately well drained
• Sandy soils that have a fine textured substratum
• Soils that have a surface layer of loamy sand or fine sand
• Soils that have a lighter colored subsoil

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard; equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• Because of the erosion hazard, skid roads and skid trails should be established on the contour and water should be removed by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 3R
Michigan soil management group: 5a
Primary plant association: Sugar maple-American beech-clubmoss

240E—Entic Haplorthods, sandy, dark subsoil, steep and very steep

Setting

Landform: Sandy moraines
Position on the landform: Steep and very steep areas
Slope: 30 to 70 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Reference Profile

Surface layer:
0 to 1 inch—very dark gray sand

Subsurface layer:
1 to 2 inches—grayish brown sand

Subsoil:
2 to 4 inches—dark brown sand
4 to 15 inches—brown sand
15 to 30 inches—strong brown sand

Substratum:
30 to 130 inches—light yellowish brown 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 15 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Aquic Udipsamments, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that are moderately well drained
• Sandy soils that have a fine textured substratum
• Soils that have a surface layer of loamy sand or fine sand
• Soils that have a lighter colored subsoil

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard; equipment limitation; seedling mortality, especially on some south-facing slopes

Management measures:
• 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.
• Logging methods that do not disturb the layer of forest litter help to control erosion.
• Ordinary crawler tractors and rubber-tired skidders cannot be operated safely on these slopes. Special logging methods may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 3R
Michigan soil management group: 5a
Primary plant association: Sugar maple-American beech-clubmoss

245B—Entic Haplorthods, sandy, dark subsoil, loamy substratum, nearly level and undulating

Setting

Landform: Sandy moraines
Position on the landform: Nearly level areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 110 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 3 inches—brown sand

Subsoil:
3 to 10 inches—dark brown sand
10 to 30 inches—strong brown sand
30 to 40 inches—light yellowish brown sand

Substratum:
40 to 45 inches—yellowish brown loamy sand
45 to 60 inches—yellowish red sandy clay loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low in the sandy part and moderate in the loamy part

Composition

Entic Haplorthods and similar soils: 70 to 90 percent
Contrasting inclusions: 5 to 25 percent

Inclusions

Contrasting inclusions:
• The poorly drained Mollic Psammaquents, Aquic Udipsamments, and dysic or euic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that have a lighter colored subsoil
• Sandy soils that have a lighter colored subsoil and do not have loamy material
• Soils that are finer textured in the surface layer, subsurface layer, and subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, plant competition

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• If trees are planted, site preparation by mechanical or chemical means is needed to control competing vegetation. Subsequent control of the invasion of hardwoods may be needed.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 3S
Michigan soil management group: 5/2a
Primary plant association: Sugar maple-American beech-clubmoss

245C—Entic Haplorthods, sandy, dark subsoil, loamy substratum, rolling

Setting

Landform: Sandy moraines
Position on the landform: Rolling areas
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 270 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 3 inches—brown sand

Subsoil:
3 to 10 inches—dark brown sand
10 to 30 inches—strong brown sand
30 to 40 inches—light yellowish brown sand

Substratum:
40 to 45 inches—yellowish brown loamy sand
45 to 60 inches—yellowish red sandy clay loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low in the sandy part and moderate in the loamy part

Composition

Entic Haplorthods and similar soils: 70 to 90 percent
Contrasting inclusions: 5 to 25 percent

Inclusions

Contrasting inclusions:
• The poorly drained Mollic Psammaquents, Aquic Udipsamments, and dysic or euic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that have a lighter colored subsoil
• Sandy soils that have a lighter colored subsoil and do not have loamy material
• Soils that are finer textured in the surface layer, subsurface layer, and subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, plant competition

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• If trees are planted, site preparation by mechanical or chemical means is needed to control competing vegetation. Subsequent control of the invasion of hardwoods may be needed.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3S
Michigan soil management group: 5/2a
Primary plant association: Sugar maple-American beech-clubmoss

245D—Entic Haplorthods, sandy, dark subsoil, loamy substratum, hilly

Setting

Landform: Sandy moraines
Position on the landform: Hilly areas
Slope: 18 to 30 percent
Shape of areas: Irregular
Size of areas: 10 to 150 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 3 inches—brown sand

Subsoil:
3 to 10 inches—dark brown sand
10 to 30 inches—strong brown sand
30 to 40 inches—light yellowish brown sand

Substratum:
40 to 45 inches—yellowish brown loamy sand
45 to 60 inches—yellowish red sandy clay loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Moderate
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low in the sandy part and moderate in the loamy part

Composition

Entic Haplorthods and similar soils: 70 to 90 percent
Contrasting inclusions: 5 to 25 percent

Inclusions

Contrasting inclusions:
• The poorly drained Mollic Psammaquents, Aquic Udipsamments, and dysic or euic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that have a lighter colored subsoil
• Sandy soils that have a lighter colored subsoil and do not have loamy material
• Soils that are finer textured in the surface layer, subsurface layer, and subsoil

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, plant competition, equipment limitation

Management measures:
• 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 of the erosion hazard, skid roads and skid trails should be established on the contour and water should be removed by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• If trees are planted, site preparation by mechanical or chemical means is needed to control competing vegetation. Subsequent control of the invasion of hardwoods may be needed.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 3R
Michigan soil management group: 5/2a
Primary plant association: Sugar maple-American beech-clubmoss

250—Mollic Psammaquents-Aquic Udipsamments-Medisaprists, euic complex, frequently flooded

Setting

Landform: Outwash plains
Position on the landform: Nearly level areas
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 200 acres

Reference Profile

Mollic Psammaquents

Surface layer:
0 to 3 inches—black muck

Subsurface layer:
3 to 6 inches—black fine sandy loam

Substratum:
6 to 9 inches—light brownish gray, mottled sandy loam
9 to 18 inches—brown sand
18 to 60 inches—dark yellowish brown sand

Aquic Udipsamments

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 7 inches—brown sand

Subsoil:
7 to 25 inches—dark yellowish brown sand
25 to 45 inches—yellowish brown, mottled sand

Substratum:
45 to 60 inches—yellowish brown sand

Medisaprists, euic

Surface layer:
0 to 9 inches—black muck

Substratum:
9 to 38 inches—dark reddish brown muck
38 to 60 inches—black muck

Soil Properties and Qualities

Permeability: Mollic Psammaquents and Aquic Udipsamments—rapid; Medisaprists—moderately rapid to moderately slow
Available water capacity: Mollic Psammaquents and Aquic Udipsamments—low; Medisaprists—high
Drainage class: Mollic Psammaquents—poorly drained; Aquic Udipsamments—moderately well drained; Medisaprists—very poorly drained
Seasonal high water table: Mollic Psammaquents and Medisaprists—1 foot above to 1 foot below the surface from September through June; Aquic Udipsamments—1.5 to 3.5 feet from November through May
Surface runoff: Very slow
Flooding: Frequent
Organic matter content: Mollic Psammaquents and Medisaprists—high; Aquic Udipsamments—low
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low

Composition

Mollic Psammaquents and similar soils: 40 to 50 percent
Aquic Udipsamments and similar soils: 30 to 50 percent
Medisaprists and similar soils: 5 to 20 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
- The poorly drained, dysic Medisaprists in depressions
- The well drained Entic Haplorthods, sandy, on uplands

Similar inclusions:
- Sandy soils that have a fine textured substratum

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation; seedling mortality, especially on some south-facing slopes; windthrow hazard, plant competition

Management measures:
- The seasonal high water table restricts the use of equipment on the Mollic Psammaquents and Medisaprists to midsummer, when the soils are dry, or midwinter, when the soils are frozen.
- Skidders should not be used during wet periods.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Mollic Psammaquents and Medisaprists.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
- After trees are cut, controlling the competition from brush improves the regeneration of desired species.
- Dry, loose sand in areas of the Aquic Udipsamments can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: None assigned
Michigan soil management group: Mollic Psammaquents—5c; Aquic Udipsamments—5b; Medisaprists—Mc
Primary plant association: Mollic Psammaquents and Aquic Udipsamments—red maple-balsam fir-bunchberry dogwood; Medisaprists—northern whitecedar-eastern hemlock-Canada violet

251A—Aeric Haplaquods, sandy-Typic Haplaquods, sandy complex, nearly level

Setting

Landform: Outwash plains
Position on the landform: Nearly level and undulating areas
Slope: 0 to 4 percent
Shape of areas: Irregular
Size of areas: 10 to 250 acres

Reference Profile

Aeric Haplaquods

Surface layer:
0 to 3 inches—very dark grayish brown sand

Subsurface layer:
3 to 8 inches—light brownish gray, mottled sand

Subsoil:
8 to 12 inches—dark reddish brown, mottled, cemented sand
12 to 20 inches—dark brown, mottled, cemented sand
20 to 30 inches—yellowish brown, mottled sand

Substratum:
30 to 60 inches—yellowish brown sand

Typic Haplaquods

Surface layer:
0 to 4 inches—black mucky sand

Subsurface layer:
4 to 7 inches—grayish brown, mottled sand

Subsoil:
7 to 9 inches—dark reddish brown sand
9 to 25 inches—dark brown sand

Substratum:
25 to 60 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Aeric Haplaquods—moderate in the cemented layers and rapid in the rest of the profile; Typic Haplaquods—rapid
Available water capacity: Low
Drainage class: Aeric Haplaquods—somewhat poorly drained; Typic Haplaquods—very poorly drained
Seasonal high water table: Aeric Haplaquods—at a depth of 0.5 foot to 2.5 feet from October through June; Typic Haplaquods—at a depth of 1.0 to 1.5 feet from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low

Composition

Aeric Haplaquods and similar soils: 40 to 50 percent
Typic Haplaquods and similar soils: 30 to 50 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
- The poorly drained, dysic Medisaprists in depressions
- The well drained Entic Haplorthods, sandy, on uplands

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Soils that have a high organic matter content in the surface layer

Use and Management

Land use: Woodland

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

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soils are dry, or midwinter, when the soils are frozen.
• Skidders should not be used during wet periods.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: Aeric Haplaquods—4W; Typic Haplaquods—none assigned
Michigan soil management group: Aeric Haplaquods—5b-h; Typic Haplaquods—5c
Primary plant association: Northern red oak-red maple-leatherleaf-blueberry

252—Typic Haplaquods, sandy-Medisaprists, dysic complex

Setting

Landform: Outwash plains
Position on the landform: Nearly level and gently undulating areas
Slope: 0 to 4 percent
Shape of areas: Irregular
Size of areas: 10 to 200 acres

Reference Profile

Typic Haplaquods

Surface layer:
0 to 4 inches—black mucky sand

Subsurface layer:
4 to 7 inches—grayish brown, mottled sand

Subsoil:
7 to 9 inches—dark reddish brown sand
9 to 25 inches—dark brown sand

Substratum:
25 to 60 inches—yellowish brown sand

Medisaprists

Surface layer:
0 to 12 inches—black muck

Substratum:
12 to 33 inches—black muck
33 to 60 inches—gray sand

Soil Properties and Qualities

Permeability: Typic Haplaquods—rapid; Medisaprists—moderately slow to moderately rapid in the upper part of the profile and rapid in the lower part
Available water capacity: Typic Haplaquods—low; Medisaprists—high
Drainage class: Very poorly drained
Seasonal high water table: 1.0 foot above to 1.5 feet below the surface from September through June
Surface runoff: Very slow
Flooding: None
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Typic Haplaquods—low; Medisaprists—not rated

Composition

Typic Haplaquods and similar soils: 50 to 70 percent
Medisaprists and similar soils: 15 to 40 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The well drained Entic Haplorthods, sandy, on uplands

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Soils that have a finer textured surface layer

Use and Management

Land use: Woodland

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

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soils are dry, or midwinter, when the soils are frozen.
• Skidders should not be used during wet periods.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

• After trees are cut, controlling the competition from brush improves the regeneration of desired species.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: None assigned
Michigan soil management group: Typic Haplaquods—5b-h; Medisaprists—Mc
Primary plant association: Typic Haplaquods—northern red oak-red maple-leatherleaf-blueberry; Medisaprists—black spruce-tamarack-Labrador tea

253A—Aeric Haplaquods, sandy, ortstein-Aquic Udipsamments complex, nearly level

Setting

Landform: Outwash plains
Position on the landform: Nearly level and undulating areas
Slope: 0 to 4 percent
Shape of areas: Irregular
Size of areas: 10 to 250 acres

Reference Profile

Aeric Haplaquods

Surface layer:
0 to 3 inches—very dark grayish brown sand

Subsurface layer:
3 to 8 inches—light brownish gray, mottled sand

Subsoil:
8 to 12 inches—dark reddish brown, mottled, cemented sand
12 to 20 inches—dark brown, mottled, cemented sand
20 to 30 inches—yellowish brown, mottled sand

Substratum:
30 to 60 inches—yellowish brown sand

Aquic Udipsamments

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 7 inches—brown sand

Subsoil:
7 to 25 inches—dark yellowish brown sand
25 to 45 inches—yellowish brown, mottled sand

Substratum:
45 to 60 inches—yellowish brown, mottled sand

Soil Properties and Qualities

Permeability: Aeric Haplaquods—moderate in the cemented layer and rapid in the rest of the profile; Aquic Udipsamments—rapid
Available water capacity: Low
Drainage class: Aeric Haplaquods—somewhat poorly drained; Aquic Udipsamments—moderately well drained
Seasonal high water table: Aeric Haplaquods—at a depth of 0.5 foot to 2.5 feet from October through June; Aquic Udipsamments—at a depth of 1.5 to 3.5 feet from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low

Composition

Aeric Haplaquods and similar soils: 40 to 70 percent;
Aquic Udipsamments and similar soils: 40 to 50 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The well drained Entic Haplorthods, sandy, on uplands
• The poorly drained, dysic Medisaprists in depressions

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Soils that have a finer textured surface layer

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation on both soils, windthrow hazard and plant competition on the Aeric Haplaquods

Management measures:
• The seasonal high water table in the Aeric Haplaquods restricts the use of equipment to midsummer, when the soils are dry, or midwinter, when the soils are frozen.
• Skidders should not be used during wet periods.
• The 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.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.
• Loose sand in areas of the Aquic Udipsamments can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: Aeric Haplaquods, sandy, ortstein—4W; Aquic Udipsamments—none assigned

Michigan soil management group: Aeric Haplaquods—5b-h; Aquic Udipsamments—5.3a
Primary plant association: Aeric Haplaquods—northern red oak-red maple-leatherleaf-blueberry; Aquic Udipsamments—red maple-balsam fir-bunchberry dogwood

255B—Aquic Udipsamments-Entic Haplorthods, sandy, deep water table complex, nearly level and undulating

Setting

Landform: Outwash plains
Position on the landform: Nearly level and undulating areas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Reference Profile

Aquic Udipsamments

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 7 inches—pale brown sand

Subsoil:
7 to 25 inches—dark yellowish brown sand
25 to 45 inches—yellowish brown, mottled sand

Substratum:
45 to 60 inches—yellowish brown, mottled sand

Entic Haplorthods

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

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 11 inches—dark brown sand
11 to 18 inches—strong brown sand
18 to 30 inches—dark yellowish brown sand

Substratum:
30 to 40 inches—yellowish brown sand
40 to 55 inches—brownish yellow, mottled sand
55 to 70 inches—yellowish brown, saturated sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Aquic Udipsamments—at a depth of 1.5 to 3.5 feet from November through May; Entic Haplorthods—at a depth of 3.0 to 5.0 feet throughout the year
Surface runoff: Very slow
Flooding: None
Organic matter content: Aquic Udipsamments—moderate; Entic Haplorthods—low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Aquic Udipsamments and similar soils: 50 to 70 percent
Entic Haplorthods and similar soils: 30 to 50 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained or poorly drained Aeric Haplaquods, Typic Haplaquods, Mollic Psammaquents, and dysic Medisaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Soils that have a surface layer of loamy sand or fine sand
• Soils that have a water table between depths of 5 and 15 feet

Use and Management

Land use: Woodland

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

Management measures:
• Dry, loose sand can be easily displaced by heavy equipment. As a result, stabilization of logging roads may be needed.
• Planting when the soils are moist can reduce the seedling mortality rate.
• Competing vegetation generally can be controlled by mechanical means.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: Aquic Udipsamments—none assigned; Entic Haplorthods—4S
Michigan soil management group: 5a
Primary plant association: Aquic Udipsamments—red maple-balsam fir-bunchberry dogwood; Entic Haplorthods—mixed oak-red maple-starflower

256—Medisaprists, euic-Mollic Psammaquents complex

Setting

Landform: Outwash plains and lake plains
Position on the landform: Nearly level areas and depressions
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 400 acres

Reference Profile

Medisaprists

Surface layer:
0 to 9 inches—black muck

Substratum:
9 to 38 inches—dark reddish brown muck
38 to 60 inches—black muck

Mollic Psammaquents

Surface layer:
0 to 3 inches—black muck

Subsurface layer:
3 to 6 inches—black fine sandy loam

Substratum:
6 to 9 inches—light brownish gray sandy loam
9 to 18 inches—brown sand
18 to 60 inches—dark yellowish brown sand

Soil Properties and Qualities

Permeability: Medisaprists—moderately rapid to moderately slow; Mollic Psammaquents—rapid
Available water capacity: Medisaprists—high; Mollic Psammaquents—low
Drainage class: Medisaprists—very poorly drained; Mollic Psammaquents—poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from September through June
Surface runoff: Very slow
Flooding: Occasional
Organic matter content: Medisaprists—high; Mollic Psammaquents—moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Medisaprists—not rated; Mollic Psammaquents—low

Composition

Medisaprists and similar soils: 50 to 75 percent
Mollic Psammaquents and similar soils: 25 to 50 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
• The poorly drained, dysic Medisaprists in depressions
• The moderately well drained Entic Haplorthods, sandy, on uplands

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Soils that have a finer textured surface layer

Use and Management

Land use: Woodland

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

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soils are dry, or midwinter, when the soils are frozen.
• Skidders should not be used during wet periods.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: None assigned
Michigan soil management group: Medisaprists—Mc; Mollic Psammaquents—5c
Primary plant association: Medisaprists—northern whitecedar-eastern hemlock-Canada violet; Mollic Psammaquents—red maple-balsam fir-bunchberry dogwood

262A—Aeric Haplaquods, sandy, ortstein, nearly level

Setting

Landform: Outwash plains
Position on the landform: Nearly level and undulating areas
Slope: 0 to 4 percent
Shape of areas: Irregular
Size of areas: 20 to 300 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark grayish brown sand

Subsurface layer:
3 to 8 inches—light brownish gray, mottled sand

Subsoil:
8 to 12 inches—dark reddish brown, mottled, cemented sand
12 to 20 inches—dark brown, mottled, cemented sand
20 to 30 inches—yellowish brown, mottled sand

Substratum:
30 to 60 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Moderate in the cemented layers and rapid in the rest of the profile
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: At a depth of 0.5 foot to 2.5 feet from October through June
Surface runoff: Very slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low

Composition

Aeric Haplaquods and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Entic Haplorthods, sandy, on knolls
• The poorly drained, dysic Medisaprists in depressions

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Soils that have an accumulation of organic material on the surface
• Soils in which the subsoil is not cemented

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soils are dry, or midwinter, when the soils are frozen.
• Skidders should not be used during wet periods.
• The 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.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 4W
Michigan soil management group: 5b-h
Primary plant association: Northern red oak-red maple-leatherleaf-blueberry

263A—Aquic Udipsamments, nearly level

Setting

Landform: Outwash plains
Position on the landform: Nearly level and undulating areas
Slope: 0 to 4 percent
Shape of areas: Irregular
Size of areas: 20 to 300 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 7 inches—pale brown sand

Subsoil:
7 to 25 inches—dark yellowish brown sand
25 to 45 inches—yellowish brown, mottled sand

Substratum:
45 to 60 inches—yellowish brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: At a depth of 1.5 to 3.5 feet from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Aquic Udipsamments and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Entic Haplorthods, sandy, on knolls
• The poorly drained, dysic Medisaprists in depressions

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Soils that have an accumulation of organic material on the surface
• Soils that have a cemented subsoil

Use and Management

Land use: Woodland

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

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soils are moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: None assigned
Michigan soil management group: 5a
Primary plant association: Red maple-balsam fir-bunchberry dogwood

272—Typic Haplaquods, sandy

Setting

Landform: Outwash plains and lake plains
Position on the landform: Nearly level and undulating areas
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Reference Profile

Surface layer:
0 to 4 inches—black mucky sand

Subsurface layer:
4 to 7 inches—grayish brown, mottled sand

Subsoil:
7 to 9 inches—dark reddish brown sand
9 to 25 inches—dark brown sand

Substratum:
25 to 60 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Very poorly drained
Seasonal high water table: 1.0 foot above to 1.5 feet below the surface from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Composition

Typic Haplaquods and similar soils: 70 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Entic Haplorthods, sandy, on knolls
• The poorly drained, dysic Medisaprists in depressions

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Soils that have a thicker organic surface layer
• Soils that have a finer textured surface layer
• Soils that have a cemented subsoil

Use and Management

Land use: Woodland

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

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soils are dry, or midwinter, when the soils are frozen.
• Skidders should not be used during wet periods.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: None assigned
Michigan soil management group: 5c
Primary plant association: Northern red oak-red maple-leatherleaf-blueberry

273—Mollic Psammaquents

Setting

Landform: Outwash plains
Position on the landform: Nearly level areas
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 350 acres

Reference Profile

Surface layer:
0 to 3 inches—black muck

Subsurface layer:
3 to 6 inches—black fine sandy loam

Substratum:
6 to 9 inches—light brownish gray sandy loam
9 to 18 inches—dark brown sand
18 to 60 inches—dark yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low

Composition

Mollic Psammaquents and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Entic Haplorthods, sandy, on knolls
• The poorly drained, dysic Medisaprists in depressions

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Soils that have a thicker organic surface layer
• Soils that have a finer textured surface layer

Use and Management

Land use: Woodland

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

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soils are dry, or midwinter, when the soils are frozen.
• Skidders should not be used during wet periods.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: None assigned
Michigan soil management group: 5c
Primary plant association: Red maple-balsam fir-bunchberry dogwood

274—Typic Haplaquolls, sandy over loamy

Setting

Landform: Outwash plains, lake plains, and flood plains
Position on the landform: Nearly level areas
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 200 acres

Reference Profile

Surface layer:
0 to 4 inches—black muck

Subsurface layer:
4 to 14 inches—black loamy fine sand

Subsoil:
14 to 19 inches—reddish gray, mottled fine sand

Substratum:
19 to 29 inches—grayish brown fine sand
29 to 44 inches—brown silt loam
44 to 60 inches—grayish brown silty clay loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from November through May
Surface runoff: Very slow or ponded
Flooding: Occasional
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: None
Shrink-swell potential: Low in the sandy part and moderate in the loamy part

Composition

Typic Haplaquolls and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Entic Haplorthods, sandy, on knolls
• The poorly drained, dysic Medisaprists in depressions

Similar inclusions:
• The poorly drained Mollic Psammaquents

Use and Management

Land use: Woodland

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

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soils are dry, or midwinter, when the soils are frozen.
• Skidders should not be used during wet periods.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: None assigned
Michigan soil management group: 4/2c
Primary plant association: Mixed ash-American basswood-downy yellow violet

280—Aquents and Histosols, ponded

Setting

Landform: Outwash plains and moraines
Position on the landform: Depressions
Slope: 0 to 2 percent
Shape of areas: Oval
Size of areas: 5 to 100 acres

Reference Profile

Aquents
0 to 60 inches—variable but dominantly sandy

Histosols
0 to 60 inches—black muck

Soil Properties and Qualities

Permeability: Variable
Available water capacity: Variable
Drainage class: Very poorly drained
Seasonal high water table: At the surface to more than 1 foot above the surface most of the year
Surface runoff: Ponded
Flooding: None
Organic matter content: High
Hazard of water erosion: None
Hazard of soil blowing: None
Shrink-swell potential: Not rated

Composition

Aquents and similar soils: 50 to 70 percent
Histosols and similar soils: 30 to 40 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• Small areas of somewhat poorly drained soils on the edges of the unit
• Small areas of open water

Use and Management

Land use: Wetland wildlife habitat
• Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

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

281—Medisaprists, dysic

Setting

Landform: Outwash plains and flood plains
Position on the landform: Depressions
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Reference Profile

Surface layer:
0 to 12 inches—black muck

Substratum:
12 to 33 inches—black muck
33 to 60 inches—gray sand

Soil Properties and Qualities

Permeability: Moderately slow to moderately rapid in the upper part of the profile and rapid in the lower part
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from September through June
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Not rated

Composition

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

Inclusions

Contrasting inclusions:
• Poorly drained, sandy soils on knolls and ridges

Similar inclusions:
• Soils in which the organic material is less than 16 inches thick
• Soils in which the organic material is more than 50 inches thick

Use and Management

Land use: Woodland

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

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soils are dry, or midwinter, when the soils are frozen.
• Skidders should not be used during wet periods.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: None assigned
Michigan soil management group: M/5c-a
Primary plant association: Black spruce-tamarack-Labrador tea

282—Medisaprists, euic

Setting

Landform: Outwash plains and moraines
Position on the landform: Depressions
Slope: 0 to 6 percent
Shape of areas: Oval or irregular
Size of areas: 5 to 150 acres

Reference Profile

Surface layer:
0 to 9 inches—black muck

Substratum:
9 to 38 inches—dark reddish brown muck
38 to 51 inches—black muck

Soil Properties and Qualities

Permeability: Moderately slow to moderately rapid
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from September through June
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Not rated

Composition

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

Inclusions

Contrasting inclusions:
• Poorly drained, sandy soils on knolls and ridges

Similar inclusions:
• Soils that have sandy material at a depth of more than 16 inches
• Soils that have loamy or clayey material at a depth of more than 16 inches
• Soils that have a higher content of fiber in the subsoil

Use and Management

Land use: Woodland

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

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soils are dry, or midwinter, when the soils are frozen.
• Skidders should not be used during wet periods.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After trees are cut, controlling the competition from brush improves the regeneration of desired species.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: None assigned
Michigan soil management group: Mc
Primary plant association: Northern whitecedar-eastern hemlock-Canada violet

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 the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no stones and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use in some parts of the county 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 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify for prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

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 woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the 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 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 crops best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Natural Resources Conservation Service is explained; and the estimated yields of the main crops are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

In 1990, about 57,000 acres in Mason County, or more than 17 percent of the total acreage, was farmland. About 12,970 acres was used for row crops, 5,200 acres for orchards, 22,500 acres for hay or small grain, and 6,600 acres for vegetables *(11)*. The acreage used for field crops fluctuates from year to year because of anticipated market prices, weather conditions, and the wide range of crops suited to the soils.

The most common field crops suited to the soils and climate in the county are corn, wheat, rye, barley, and oats. Alfalfa, alone or in mixtures with clover and grasses, is the most common hay crop.

Many soil-related management concerns are common on a large number of different soils. The following paragraphs describe the concerns in managing the cropland and pasture in Mason County.

Water erosion and *soil blowing* are major management concerns on most of the cropland in the county. Loss of the surface layer through erosion is especially damaging on soils that have a moderately fine textured or fine textured subsoil, such as Perrinton, Marlette, and Remus soils, and on soils that tend to be droughty, such as Spinks and Grattan soils. Erosion on cropland results in the sedimentation of streams and ditches. Controlling erosion minimizes this sedimentation and improves the quality of water for municipal and recreational uses and for fish and wildlife.

Water erosion is a serious hazard on all loamy soils that have slopes of 4 percent or more. Preparing a good seedbed is difficult on some of the soils because the friable surface layer has been eroded in places.

Erosion-control practices provide a protective cover, reduce the runoff rate, and increase the rate of water infiltration. A cropping system that keeps a plant cover on the surface for extended periods reduces the susceptibility to erosion and preserves the productive capacity of the soil. On livestock farms, where pasture and hay are needed, including forage crops of grasses and legumes in the cropping sequence helps to control erosion on the more sloping land, provides nitrogen for subsequent crops, and improves tilth. Conservation tillage helps to control runoff and erosion by leaving protective amounts of crop residue on the surface. Cover crops, diversions, and grassed waterways also help to control erosion.

Soil blowing is a hazard on sandy soils. An adequate plant cover, surface mulch, buffer strips, field windbreaks, and tillage methods that leave crop residue on the surface help to control soil blowing.

No-till farming, which is becoming more common in the county, helps to control water erosion and soil blowing by leaving crop residue on the surface. No-till helps to maintain the productive capacity of the soils. It is suited to most of the soils in the county, especially to those in eroding areas that otherwise are only marginally productive. In areas where no-till farming is used, different methods of planting and of controlling insects and weeds are needed. The proper time for planting, the selection of herbicides that are suited to the existing vegetation, an adequate supply of plant nutrients, and the selection of tillage systems based on soil characteristics are important management requirements.

Much of the permanent pasture in the county is in areas where erosion is a hazard. Control of erosion is particularly important when the pasture is seeded. Forage production and the extent to which the plant cover protects the surface of the soil are influenced by the number of livestock that the pasture supports, the length of time that they graze, and the distribution of rainfall. Good pasture management includes stocking rates that maintain the key forage species, weed control, applications of lime and fertilizer, rotation grazing, timely deferment of grazing, and strategic location of water supplies for livestock.

Information about the design and application of erosion-control practices on the different soils in the county can be obtained from the Mason County Soil Conservation District.

Seasonal wetness is a major management concern in many areas used for crops and pasture. Draining cropland improves the air-water relationship in the root zone. In areas where drainage is poor, spring planting, spraying, and harvesting are delayed and controlling weeds is difficult. Properly designed subsurface drainage systems or surface drainage systems, or both, can be used to remove excess water.

Unless drained, some soils are naturally so wet that they cannot be used for the crops commonly grown in the county. Unless drained, the very poorly drained, poorly drained, and somewhat poorly drained soils in the county are so wet that crops are damaged in most years. Ziegenfuss, Ithaca, Capac, Kingsville, Parkhill, and Lamson soils are examples of poorly drained or somewhat poorly drained soils. Natural drainage is good in Marlette, Perrinton, and Remus soils most of the year, but these soils tend to dry slowly after rains. Small areas of wetter soils along drainageways and in swales are commonly included in some areas of these soils, especially where slopes are 2 to 6 percent. A drainage system can reduce the wetness in some of these wetter areas.

The design of surface and subsurface drainage systems varies with the kind of soil. A combination of surface drains and subsurface drains is needed in most areas of poorly drained soils that are intensively row cropped. The drains should be more closely spaced in slowly permeable or very slowly permeable soils than in the more rapidly permeable soils. Adequate outlets for subsurface drainage systems are not readily available in many areas of Kingsville, Ziegenfuss, and Parkhill soils. Diversions can be used to remove excess surface runoff. Good soil tilth and an ample supply of organic matter also improve drainage.

Drainage of some designated wetlands is a violation of local laws and regulations. Information about these areas and about the design of drainage systems for each kind of soil is available in the local office of the Natural Resources Conservation Service.

Droughtiness during dry periods is a concern in managing Benona, Spinks, Grattan, Fern, Pipestone, and Arkona soils. Moisture can be conserved by no-till farming and other kinds of conservation tillage, which leave all or part of the crop residue on the surface. Increasing the organic matter content improves the available water capacity, and irrigation improves productivity. The droughty soils and many other soils in the county are suited to irrigation if they are properly managed.

Soil tilth affects the germination of seeds and the infiltration of water into the soils. Some of the soils used for crops have a loamy surface layer. Generally, the structure of such soils is weak. A crust forms on the surface of these soils during periods of intensive rainfall. The crust hinders the emergence of plant seedlings, decreases the rate of water infiltration, and increases the runoff rate. Regular additions of crop residue, manure, and other organic material improve tilth and help to prevent surface crusting.

Maintaining good tilth is difficult in the finer textured soils, such as Bono, Del Rey, Ziegenfuss, and Ithaca soils, because these soils stay wet until late in spring. If the soils are plowed when wet, they tend to be very cloddy when dry and are compacted. As a result, preparing a good seedbed is difficult.

Cover crops, manure and green manure crops, proper management of crop residue, and conservation tillage help to maintain or improve tilth and increase the organic matter content. Fall plowing and chisel plowing when the soil is at the proper moisture content can help to prevent deterioration of tilth in nearly level, poorly drained or somewhat poorly drained soils. These practices also allow the soils to be tilled earlier during the following spring. Fall plowing is not suitable, however, on sloping soils or on soils that are subject to soil blowing.

Grazing when medium textured or fine textured soils are wet results in compaction and poor tilth and thus retards the growth of pasture plants. Proper harvesting methods, such as those for hay or silage, help to prevent compaction and improve plant growth.

Soil fertility is naturally medium or high in loamy soils and low in most sandy soils on uplands. Many sandy soils naturally range from strongly acid to slightly acid. If lime has never been applied on these soils, applications of ground limestone are needed to raise the pH level sufficiently for the production of alfalfa and other crops that grow well only on nearly neutral soils. Available phosphorus and potash levels are naturally low or medium in most of the sandy soils. On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields *(12)*.

Specialty Crops

Mason County has the variety of soils, topography, and climatic conditions suitable for the production of a wide variety of vegetable and fruit crops. In 1990, the county was the State's leading producer of green beans. Other vegetable crops include asparagus, squash, sweet corn, cucumbers, peppers, cauliflower, and carrots.

Certain parts of the county, mainly the western part, are especially well suited to fruit trees (fig. 8). Some sites are better suited than others, mainly because of variations in elevation and air drainage. The proximity of an area to Lake Michigan and its moderating effects on air temperature also affect the suitability for fruit crops.

Soil properties affect management practices, tree growth, and productivity in orchards. Local climatic conditions affect fruit-set, pollination by bees, the number of blossoms per tree, and frost damage to woody parts of the trees.

The latest information about growing specialty crops in the county can be obtained from local offices of the Cooperative Extension Service and the Natural Resources Conservation Service.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. 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 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 are also 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 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the 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 *(15)*. 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

Figure 8.—Tart cherries in an area of Spinks-Coloma sands, 6 to 12 percent slopes.

of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of the map units is given in the section "Detailed Soil Map Units" and in the yields table.

At the end of each map unit description under the heading "Detailed Soil Map Units," the Michigan soil management group is listed. The soils in each map unit are assigned to a group according to the dominant texture, the drainage class, and the main management concerns *(13)*.

Woodland Management and Productivity

Mason County originally was covered with virgin forests of pine and hardwoods. The entire area was logged, and the slash was burned. Many areas were cleared. Most of the current woodland supports second-growth timber, and much of the cleared land has been replanted to pine. The current woodland stands are smaller than the original stands but are still an important and valuable resource in the county.

About 163,000 acres in Mason County, or nearly 50 percent of the total acreage, is woodland. National forests make up about 59,000 acres of that acreage. Several private companies have large tracts of woodland. The rest of the woodland is in small, individually owned areas.

The number of trees harvested in the county for woodland products has increased each year. The major products are described in the following paragraphs.

Pulpwood.—Most of the pulpwood is taken from small tracts of Federal land or from land owned by paper companies. Aspen and pine are the most common trees cut for pulp.

Lumber.—An increasing amount of timber is harvested for sawlogs in the county. The trees in most wooded areas are relatively young; most are pole or sapling size. Most of the large, high-quality trees have been removed, and most of the remaining larger trees are of poor quality and cannot be used for lumber. Only a few areas support many high-quality trees of sawlog size. Northern hardwood stands generally should be culled or thinned, or both. Most pine plantations should be thinned. Northern red oak, white oak, sugar maple, red maple, white ash, American beech, and red pine are cut mainly for lumber. Aspen is cut for pallet material.

Firewood.—Many homes use firewood as either the main source or a supplementary source of heat. Oak and maple are commonly used as firewood, but most other trees have some value for this use.

Maple syrup.—Northern hardwood stands that include mature sugar maple trees have good potential for the production of maple syrup.

Woodland recreation.—The extensive woodland in the county, particularly the large acreage of public land, provides opportunities for recreation throughout the year.

The Natural Resources Conservation District, the Michigan Department of Natural Resources, and the Cooperative Extension Service can help to determine woodland management needs.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. 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. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 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; and *F*, a high content of rock fragments in the soil. 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, and F.

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 are also 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.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand. The volume was determined through the use of standard yield tables *(20)*.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Plant Associations

The Huron-Manistee National Forest Ecological Classification System (ECS) was developed to meet the information needs of the National Forest System *(18)*. These needs are met by delineating land units for planning analyses, predicting vegetative structure and the distribution of wildlife habitat, planning desired future conditions within and across geologic regions for conservation of biological diversity, and evaluating ecological processes, such as forest succession or soil productivity. The overall purpose of the ECS is to provide an ecological framework for integrated resource planning and management.

The ECS is an ecological approach to defining the biological potential of the National Forest land base. Multiple ecological factors were used to define and classify the map units. Data on climate, landforms, soils, and vegetation were integrated before the map units were described and delineated. Data on vegetation and soils were used predominantly to delineate map units in the field.

Plant associations are used in the mapping process to help identify local map units. The associations are combinations of late successional overstories and groups of associated understory and ground flora species. Species groups are associated with the map unit. Species composition may vary, however, within the map units, and any given species may be absent from a species group at a particular site. In some instances the plant association does not reflect soil characteristics and potential. In areas that have no diagnostic plant communities because of natural variability or disturbance, soil and landform variables alone serve as differentiating map unit criteria.

Plant associations have been determined for the map units in the National Forest part of the survey area. The primary plant association, specified at the end of the description of these map units in the section "Detailed Soil Map Units," is the most diagnostic association for the landforms and soils of the map unit.

The following paragraphs describe the plant associations in the survey area. The paragraphs specify the landform and soil type for each association, the potential late successional overstory and diagnostic understory, and the ground flora species characteristic of the association.

Black oak (*Quercus velutina*)-white oak (*Quercus alba*)-blueberry (*Vaccinium angustifolium*).—This plant association is characteristic of dry, nutrient-poor areas of sandy soils. The potential late successional vegetation includes species suited to harsh conditions and frequent fires. The representative overstory species are black oak (*Quercus velutina*), white oak (*Quercus alba*), and northern pin oak (*Quercus ellipsoidalis*). The distinguishing ground flora and understory species are blueberry (*Vaccinium angustifolium*), cowwheat (*Melampyrum*), trailing arbutus (*Epigaea repens*), huckleberry (*Gaylussacia baccata*), brackenfern (*Pteridium aquilinum*), red maple (*Acer rubrum*) seedlings, and oak (*Quercus spp.*) seedlings.

Mixed oak (*Quercus spp.*)-red maple (*Acer rubrum*)-starflower (*Trientalis borealis*).—This plant association is primarily on sandy soils that exhibit weak spodic development. The potential late successional overstory species are black oak (*Quercus velutina*), white oak (*Quercus alba*), northern red oak (*Quercus rubra*), red maple (*Acer rubrum*), red pine (*Pinus resinosa*), and eastern white pine (*Pinus strobus*). The distinguishing ground flora and understory species are mapleleaf viburnum (*Viburnum acerifolium*), brackenfern (*Pteridium aquilinum*), wintergreen (*Gaultheria procumbens*), starflower (*Trientalis borealis*), blueberry (*Vaccinium angustifolium*), red maple (*Acer rubrum*) seedlings and saplings, and juneberry (*Amelanchier spp.*).

Northern red oak (*Quercus rubra*)-red maple (*Acer rubrum*)-mapleleaf viburnum (*Viburnum acerifolium*).—This association is primarily in sandy morainal areas and in areas of well developed soils on lake plains. The potential late successional overstory species are northern red oak (*Quercus rubra*), red maple (*Acer rubrum*), and eastern white pine (*Pinus strobus*). The distinguishing ground flora and understory species are high mapleleaf viburnum (*Viburnum acerifolium*), wild sarsaparilla (*Aralia nudicaulis*), wild lily of the valley (*Maianthemum canadense*), bigleaf aster (*Aster macrophyllus*), squawroot (*Conopholis americana*), red maple (*Acer rubrum*) seedlings and saplings, and witchhazel (*Hammamelis virginiana*).

Northern red oak (*Quercus rubra*)-red maple (*Acer rubrum*)-trefoil (*Desmodium spp.*).—This plant association is primarily on moraines and lakebed landforms that have deposits of sand over fine-loamy material. The potential late successional overstory species are northern red oak (*Quercus rubra*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), black cherry (*Prunus serotina*), and white ash (*Fraxinus americana*). The distinguishing ground flora and understory species are trefoil (*Desmodium spp.*), downy yellow violet (*Viola pubescens*), flowering dogwood (*Cornus florida*), black cherry (*Prunus serotina*) seedlings, sugar maple (*Acer saccharum*) seedlings, mapleleaf viburnum (*Viburnum acerifolium*), and red maple (*Acer rubrum*) seedlings.

Sugar maple (*Acer saccharum*)-American beech (*Fagus grandifolia*)-clubmoss (*Lycopodium obscurum and L. lucidulum*).—This plant association is in areas on sandy moraines and sandy lake plains where the subsoil is dark. The potential late successional overstory species are sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), northern red oak (*Quercus rubra*), and red maple (*Acer rubrum*). The plant association is characterized by low diversity and coverage of ground flora along the forest floor. The distinguishing understory and ground flora species are wild lily of the valley (*Maianthemum canadense*), clubmoss (*Lycopodium obscurum and L. lucidulum*), true Solomons seal (*Polygonatum biflorum*), sedge (*Carex pedunculata*), and sugar maple (*Acer saccharum*) seedlings.

Northern red oak (*Quercus rubra*)-red maple (*Acer rubrum*)-leatherleaf (*Chamaedaphne calyculata*)-blueberry (*Vaccinium angustifolium*).—This plant association is in areas of poorly drained, acidic sand on outwash plains and lake plains. The potential late successional overstory species are northern red oak (*Quercus rubra*), black oak (*Quercus velutina*), white oak (*Quercus alba*), red maple (*Acer rubrum*), and eastern white pine (*Pinus strobus*). The characteristic species are suited to soils that are acidic and frequently anaerobic. The distinguishing understory and ground flora species are leatherleaf (*Chamaedaphne calyculata*), blueberry (*Vaccinium angustifolium*), Labrador tea (*Ledum groenlandicum*), wintergreen (*Gaultheria procumbens*), dewberry (*Rubus spp.*), brackenfern (*Pteridium aquilinum*), and speckled alder (*Alnus rugosa*).

Red maple (*Acer rubrum*)-balsam fir (*Abies balsamea*)-bunchberry dogwood (*Cornus canadensis*).—This plant association is in areas of slightly acid to alkaline, sandy soils on outwash plains, flood plains, and lake plains. The potential late successional overstory species are red maple (*Acer rubrum*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), balsam fir (*Abies balsamea*), and eastern white pine (*Pinus strobus*). The distinguishing understory and ground flora species are wild lily of the valley (*Maianthemum canadense*), bunchberry dogwood (*Cornus canadensis*), goldthread (*Coptis groenlandica*), wintergreen (*Gaultheria procumbens*), and shield fern (*Dryopteris spinulosa*).

Mixed ash (*Fraxinus spp.*)-American basswood (*Tilia americana*)-downy yellow violet (*Viola pubescens*).—This plant association is on poorly drained, nutrient-rich, loamy soils and shallow, organic soils. It is on lakebeds, till plains, and flood plains. The potential late successional overstory species are American basswood (*Tilia americana*), eastern hemlock (*Tsuga canadensis*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), and northern whitecedar (*Thuja occidentalis*). The distinguishing understory and ground flora species are downy yellow violet (*Viola pubescens*), maidenhair fern *Adiantum pedatum*), cinnamon fern (*Osmunda cinnamomea*), Jack in the pulpit (*Arisamea triphyllum*), and bellwort (*Uvularia perfoliata*).

Black spruce (*Picea mariana*)-tamarack (*Larix laricina*)-Labrador tea (*Ledum groenlandicum*).—This plant association is on deep, poorly drained, dysic, organic soils in acidic bogs on outwash plains and lake plains. The overstory is sparse. Black spruce (*Picea mariana*) and tamarack (*Larix laricina*) are the dominant species. The distinguishing understory and ground flora species are Labrador tea (*Ledum groenlandicum*), leatherleaf (*Chamaedaphne calyculata*), sphagnum species, and speckled alder (*Alnus rugosa*).

Northern whitecedar (*Thuja occidentalis*)-eastern hemlock (*Tsuga canadensis*)-Canada violet (*Viola canadensis*).—This plant association is on deep, poorly drained, euic, organic soils on flood plains, till plains, and lakebeds. The potential late successional overstory species are northern whitecedar (*Thuja occidentalis*), eastern hemlock (*Tsuga canadensis*), white spruce (*Picea glauca*), and black ash (*Fraxinus nigra*). The distinguishing understory and ground flora species are Canada violet (*Viola canadensis*), maidenhair fern (*Adiantum pedatum*), bedstraw (*Galium spp.*), and wild lily of the valley (*Maianthemum canadense*).

Windbreaks and Environmental Plantings

Philip Dakin, forester, Natural Resources Conservation Service, helped prepare this section.

Soil blowing is a hazard on 52 percent of the cropland in Mason County. The hazard is especially severe where row crops are grown on sandy soils. Individual windstorms during April and May often erode as much as 15 tons of soil. Further, the windblown soil "sand blasts" snap beans, asparagus, and other plants.

A windbreak of trees and shrubs is one of the conservation measures used to control soil blowing. Other conservation measures, such as annual and perennial vegetative barriers, stripcropping, crop residue management, and cover crops, can be used with the windbreaks to provide a complete system of protection against soil blowing.

A windbreak shelters a downwind area equal to about 10 times the height of the windbreak. The sheltering effect reduces soil loss, the extent of crop damage, the evapotranspiration rate, livestock exposure, farmstead damage, and home heating costs and keeps snow on the fields and away from dwellings. In addition, the windbreak itself provides shelter, food, and nesting areas for wildlife.

Windbreaks have esthetic value; help to screen houses, buildings, and livestock enterprises; control odors on sites for the livestock enterprises; abate noise from farming activities, highways, and industrial areas; and increase the value of land (fig. 9).

A planted windbreak consists of broadleaf and coniferous trees and shrubs, the spacing and number of which depend on the purpose of the windbreak. Each windbreak is designed for the specific site conditions, resource problems, and landowner objectives. To ensure plant survival and a viable windbreak, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained through weed control, protection against animals, and replacement of dead or damaged plants.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on suitable soils in the county. The estimates in table 9 are based on measurements and observations of established plantings that have been given adequate care and can be used as a guide in planning windbreaks. Additional information on planning windbreaks and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service.

Recreation

Mason County has many campgrounds and parks along rivers and on the shores of Lake Michigan and many inland lakes. The large sandy beaches and clear

Figure 9.—Windbreaks in an area of Wixom-Capac complex, 0 to 4 percent slopes.

waters attract tourists from several nearby states for sunbathing and swimming.

The lakes and rivers are also suitable for fishing, boating, and canoeing. Lake Michigan, especially near Big Point Sable and the Pere Marquette River, provides habitat for abundant salmon and steelhead. Bluegill, pike, bass, perch, crappies, and walleye are abundant in the numerous inland lakes.

The more than 59,000 acres in the Manistee National Forest, as well as 6,000 acres of State land, provide ample opportunities for hunting, hiking, skiing, camping, and picnicking. Port Ludington provides boaters access not only to Lake Michigan but also to all of the Great Lakes.

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

Lynn Sampson, biologist, Natural Resources Conservation Service, helped prepare this section.

The habitat for wildlife in Mason County is diverse, including open farmland, hardwood forests, and abundant rivers, streams, inland lakes, and wetlands.

Before the county was settled by immigrants, such wildlife species as black bear, mountain lion, lynx, bobcat, elk, and timber wolf were common. The passenger pigeon and the eastern wild turkey were abundant in the forested areas. With agricultural development and forest regeneration following the logging that occurred during the 1800's, the species suited to second-growth forest, brushy edges, and farmland became dominant. The population of white-tailed deer, red fox, coyote, ruffed grouse, snowshoe hare, and cottontail rabbit increased.

The interspersion of farmland with woodland is ideal for the large population of white-tailed deer in the county. Because of the expansion of aspen forest types, ruffed grouse are abundant. The populations of wildlife types fluctuate from year to year. Cottontail rabbits are associated with cropland, farmsteads, and abandoned structures. Swampy areas provide habitat for snowshoe hare. Tree squirrels, both fox and gray, are throughout the hardwood forests in the county.

The streams in areas of woodland and the wetland areas provide habitat for mink, river otter, and beaver. Pine marten and eastern wild turkey have been recently reintroduced into the county.

The diverse wetlands in the county are important habitats for a variety of waterfowl. Flooded areas of timber are good nesting sites for wood duck. Marshy areas provide suitable habitat for mallards, teal, sandhill cranes, blue and green heron, and numerous songbirds.

The rivers, streams, and lakes in the county provide habitat for large populations of northern pike, walleye, largemouth bass, bluegill, sunfish, and crappie. Salmon and trout are seasonally abundant in the rivers and streams.

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 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, rye, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are goldenrod and strawberry.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, aspen, maple, apple, hawthorn, dogwood, raspberry, 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, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, 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 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 pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, raccoon, and deer.

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.

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 and test data in the "Soil Properties" section.

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, 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 kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to a cemented pan or to 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 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 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 a cemented pan, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 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 a cemented pan, and flooding affect absorption of the effluent. Large stones and 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 are less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 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 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 and a cemented pan can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, and soil reaction affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over a cemented pan or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, and rock fragments.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than

15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; 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, 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 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 organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table and the permeability of the aquifer. The content of large stones affects 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 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 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. 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 a cemented pan. The performance of a system is affected by the depth of the root zone and soil reaction.

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 a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

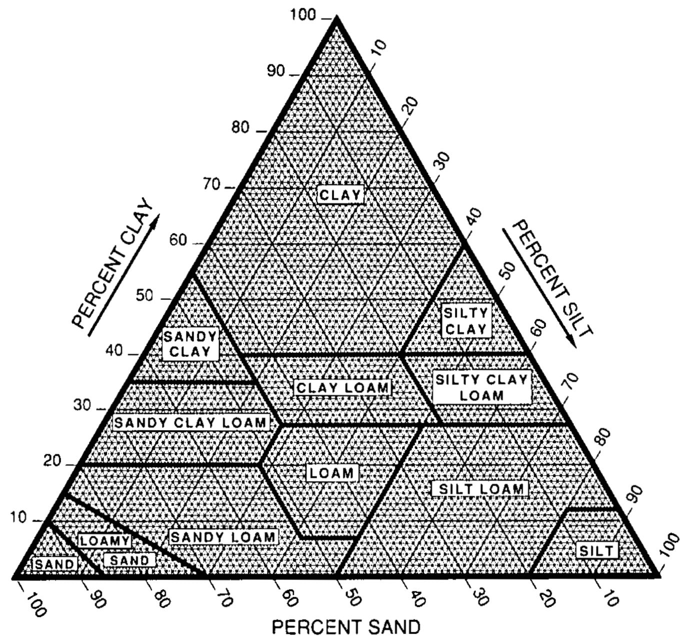

Figure 10.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 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. 10). "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 *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

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 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 and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated content of clay in each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to absorb 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 ⅓-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils 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 permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 18, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

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.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the 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 in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(16)*. 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 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven 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 Mollisol.

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 Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

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; 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 Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic 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 known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is clayey over sandy or sandy-skeletal, mixed, mesic Typic Haplaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

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" *(19)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(16)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Adrian Series

The Adrian series consists of very poorly drained soils in depressions on outwash plains, lake plains, moraines, and flood plains. The soils formed in organic material over sandy glaciofluvial material (fig. 11).

Permeability is moderately slow to moderately rapid in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Adrian muck, 1,848 feet west and 108 feet south of the northeast corner of sec. 1, T. 18 N., R. 15 W., Branch Township:

Oa1—0 to 9 inches; muck, black (10YR 2/1) broken face and rubbed; about 40 percent fiber, less than 10 percent rubbed; weak thick platy structure; very friable; common very fine and fine roots; neutral; abrupt wavy boundary.

Oa2—9 to 26 inches; muck, black (10YR 2/1) broken face and rubbed; about 5 percent fiber, 0 percent rubbed; weak medium granular structure; friable; common very fine and fine roots; neutral; abrupt wavy boundary.

C—26 to 60 inches; light brownish gray (2.5Y 6/2) sand; common fine and medium prominent brownish yellow (10YR 6/6) mottles; single grain; loose; neutral.

Depth to the sandy C horizon ranges from 16 to 45 inches. The surface and subsurface tiers have hue of 10YR or are neutral in hue. They have value of 2 and chroma of 0 or 1. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is sand or fine sand.

Aeric Haplaquods, Sandy

These soils are sandy, mixed, mesic, ortstein Aeric Haplaquods. They are somewhat poorly drained soils on outwash plains and lake plains. The soils formed in sandy outwash and lacustrine material. They have a cemented layer. Permeability is moderate in the cemented layer and rapid in the lower part of the profile. Slopes range from 0 to 4 percent.

Reference pedon of Aeric Haplaquods, sandy, ortstein, nearly level, 1,400 feet north and 600 feet east of the southwest corner of sec. 14, T. 20 N., R. 17 W., Grant Township:

Oi—1 inch to 0; black (10YR 2/1), partially decomposed woody and leaf debris.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) sand, brown (10YR 4/3) dry; weak medium granular structure; very friable; many very fine and fine roots; strongly acid; abrupt smooth boundary.

E—3 to 8 inches; light brownish gray (10YR 6/2) sand; few medium prominent strong brown (7.5YR 5/8) mottles; weak medium granular structure; very friable; strongly acid; abrupt irregular boundary.

Bhsm—8 to 12 inches; dark reddish brown (5YR 2.5/2) sand; few medium prominent yellowish red (5YR 5/8) mottles; massive; moderately cemented ortstein; strongly acid; clear irregular boundary.

Bsm—12 to 20 inches; brown (7.5YR 4/4) sand; common medium distinct reddish yellow (7.5YR 6/8) mottles; massive; moderately cemented ortstein; strongly acid; gradual wavy boundary.

BC—20 to 30 inches; yellowish brown (10YR 5/6) sand; many medium prominent reddish yellow (7.5YR 6/8) mottles; single grain; loose; strongly acid; gradual wavy boundary.

C—30 to 60 inches; yellowish brown (10YR 5/4) sand; single grain; loose; strongly acid.

The thickness of the solum ranges from 20 to 40 inches. The ortstein layer ranges from 2 to 20 inches in thickness. It is weakly cemented to strongly cemented. The content of gravel is 0 to 5 percent throughout the profile.

The A horizon has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 1 to 3. The E horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 2 to 4.

The Bhsm horizon has hue of 5YR or 7.5YR, value of 2 to 4, and chroma of 2 or 3. The cementation in this horizon is discontinuous in some pedons.

The Bsm horizon has hue of 7.5YR, value of 3 or 4, and chroma of 3 to 6. It is weakly cemented or moderately cemented. The cementation is discontinuous in some pedons.

The C horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 4 to 6. In some pedons it has strata of fine sand, coarse sand, or loamy sand at a depth of more than 40 inches.

Alfic Haplorthods, Sandy

These soils are sandy, mixed, mesic Alfic Haplorthods. They are well drained, rapidly permeable soils on end moraines and ground moraines. The soils formed in sandy and loamy glacial till. Slopes range from 0 to 30 percent.

Reference pedon of Alfic Haplorthods, sandy, in an area of Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy complex, nearly level and undulating, 1,700 feet east and 920 feet north of the center of sec. 20, T. 17 N., R. 15 W., Logan Township:

Oe—2 inches to 0; black (10YR 2/1), partially decomposed hardwood leaf litter.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) loamy sand, brown (10YR 4/3) dry; weak fine granular structure; very friable; many very fine and fine roots; moderately acid; clear irregular boundary.

E—3 to 4 inches; light gray (10YR 7/2) sand; weak fine granular structure; very friable; many very fine and fine roots; moderately acid; clear irregular boundary.

Bs1—4 to 7 inches; strong brown (7.5YR 4/6) sand; weak medium subangular blocky structure; friable; moderately acid; gradual wavy boundary.

Bs2—7 to 22 inches; dark yellowish brown (10YR 4/6) sand; weak medium subangular blocky structure; friable; moderately acid; abrupt wavy boundary.

BC—22 to 42 inches; yellowish brown (10YR 5/6) sand; weak fine subangular blocky structure; very friable; moderately acid; clear irregular boundary.

2Bt—42 to 50 inches; dark brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; slightly acid; abrupt wavy boundary.

3C1—50 to 82 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; slightly acid; clear wavy boundary.

3C2—82 to 90 inches; yellowish brown (10YR 5/6) loamy sand; single grain; loose; slightly acid; clear wavy boundary.

3C3—90 to 180 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 20 to 55 inches. The thickness of the loamy deposits ranges from 3 to 20 inches. The content of gravel is 0 to 10 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. It is sand or loamy sand.

The E horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 2 or 3. It sand or loamy sand. Some pedons do not have an E horizon.

The Bs horizon has hue of 5YR to 10YR and value and chroma of 3 to 6. The Bs and BC horizons are sand or loamy sand.

The 2Bt horizon has hue of 7.5YR or 5YR, value of 3 to 5, and chroma of 3 to 6. It is sandy loam, loam, or fine sandy loam.

The 3C horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 4 to 6. It is sand, loamy sand, fine sand, or sandy loam.

Alfic Haplorthods, Sandy Over Loamy

These soils are sandy over loamy, mixed, mesic Alfic Haplorthods. They are well drained soils on ice-contact end moraines and ground moraines. The soils are sandy in the upper part and loamy and sandy in the lower part. They formed in sandy and loamy glacial till. Permeability is rapid in the sandy material and moderate or moderately slow in the loamy material. Slopes range from 0 to 30 percent.

Reference pedon of Alfic Haplorthods, sandy over loamy, in an area of Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy complex, rolling, 1,400 feet north and 2,400 feet east of the southwest corner of sec. 8, T. 18 N., R. 15 W., Branch Township:

Oe—1 inch to 0; black (10YR 2/1), partially decomposed hardwood leaf litter.

A—0 to 3 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; moderately acid; clear irregular boundary.

E—3 to 5 inches; grayish brown (10YR 5/2) loamy sand; weak medium subangular blocky structure; friable; many fine roots; moderately acid; clear irregular boundary.

Bs1—5 to 10 inches; dark brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; friable; moderately acid; clear wavy boundary.

Bs2—10 to 20 inches; strong brown (7.5YR 4/6) sand; weak medium subangular blocky structure; friable; moderately acid; clear wavy boundary.

Bs3—20 to 36 inches; yellowish brown (10YR 5/6) sand; weak medium subangular blocky structure; friable; moderately acid; abrupt irregular boundary.

2Bt—36 to 50 inches; brown (7.5YR 5/4) sandy clay loam; moderate medium angular blocky structure; firm; dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine roots; neutral; abrupt wavy boundary.

3C—50 to 65 inches; yellowish brown (10YR 5/6) loamy sand; single grain; loose; neutral.

The thickness of the solum ranges from 30 to 60 inches. The thickness of the sandy material ranges from 20 to 75 inches. The thickness of the loamy material ranges from 6 to 30 inches. The content of gravel is 0 to 10 percent in the sandy material and 0 to 5 percent in the loamy material.

The A horizon has hue of 10YR, value of 2 to 4, 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 5 to 7, and chroma of 2 or 3. It sand or loamy sand.

The Bs horizon has hue of 5YR to 10YR and value and chroma of 3 to 6. It is sand or loamy sand. Some pedons have a BC horizon. This horizon is as much as 10 inches thick. It is loamy sand or sand.

The 2Bt horizon has hue of 5YR or 7.5YR and value and chroma of 3 to 6. It is sandy clay loam, clay loam, silt loam, or silty clay loam.

The 3C horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 4 to 6. It is dominantly loamy sand but has thin strata of sand to sandy clay loam.

Alfic Udipsamments

These soils are mixed, mesic Alfic Udipsamments. They are excessively drained, rapidly permeable soils on outwash plains, overwash moraines, and sandy till plains. The soils formed in sandy outwash and glacial till. Slopes range from 0 to 18 percent.

Reference pedon of Alfic Udipsamments, nearly level and undulating, 2,300 feet north and 300 feet east of the southwest corner of sec. 26, T. 18 N., R. 15 W., Branch Township:

Oe—1 inch to 0; black (10YR 2/1), partially decomposed hardwood leaf litter; many very fine and fine roots.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; many fine roots; strongly acid; clear wavy boundary.

Bw1—3 to 20 inches; dark yellowish brown (10YR 4/6) sand; weak medium subangular blocky structure; very friable; common fine and medium roots; strongly acid; gradual wavy boundary.

Bw2—20 to 30 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few fine and medium roots; slightly acid; gradual wavy boundary.

E and Bt—30 to 100 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; lamellae of strong brown (7.5YR 4/6) and brown (7.5YR 5/4) loamy sand ¼ to 1 inch thick with a total thickness of less than 6 inches; about 10 percent gravel; slightly acid.

The thickness of the solum ranges from 30 to more than 100 inches. The content of gravel is 0 to 15 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 to 3.

The Bw horizon has hue of 10YR or 7.5YR and value and chroma of 3 to 6. It is sand or coarse sand.

The E part of the E and Bt horizon has hue of 10YR, value of 5 to 7, and chroma of 4 to 6. It is sand or coarse sand. The Bt part consists of lamellae of loamy sand, loamy fine sand, or coarse sandy loam. The lamellae are ¼ inch to 2 inches thick and have a total thickness of less than 6 inches within a depth of 60 inches. They have hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. In some pedons strata of loamy sand to fine sandy loam 1 to 6 inches thick are at a depth of more than 60 inches.

Aquic Udipsamments

These soils are mixed, mesic Aquic Udipsamments. They are moderately well drained, rapidly permeable soils on outwash plains. The soils formed in sandy outwash. Slopes range from 0 to 6 percent.

Reference pedon of Aquic Udipsamments, nearly level, 1,190 feet east of the center of sec. 19, T. 20 N., R. 17 W., Grant Township:

Oe—1 inch to 0; partially decomposed hardwood leaf litter.

A—0 to 2 inches; very dark gray (10YR 3/1) sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; many fine roots; strongly acid; clear wavy boundary.

E—2 to 7 inches; brown (10YR 5/3) sand; weak fine and medium granular structure; very friable; strongly acid; clear wavy boundary.

Bw—7 to 25 inches; dark yellowish brown (10YR 4/6) sand; weak fine subangular blocky structure; friable; strongly acid; gradual wavy boundary.

BC—25 to 45 inches; yellowish brown (10YR 5/4) sand; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; strongly acid; gradual wavy boundary.

C—45 to 60 inches; yellowish brown (10YR 5/4) sand; common medium distinct light brownish gray (10YR 6/2) mottles; single grain; loose; strongly acid.

The thickness of the solum ranges from 25 to 60 inches. The content of gravel is 0 to 10 percent in the solum.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 to 3. It is dominantly sand, but the range includes loamy sand.

The E horizon has hue of 10YR, value of 5 to 7, and chroma of 2 to 4. It is sand or loamy sand.

The Bw horizon has hue of 10YR and value and chroma of 4 to 6.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6. Some pedons have strata of loamy sand to fine sandy loam at a depth of more than 60 inches.

Arkona Series

The Arkona series consists of somewhat poorly drained soils on lake plains and water-worked till plains. These soils formed in sandy material and in the underlying clayey glacial till or glaciolacustrine material. Permeability is rapid in the upper part of the profile and very slow in the lower part. Slopes range from 0 to 4 percent.

Typical pedon of Arkona loamy sand, 0 to 4 percent slopes, 460 feet south and 1,130 feet east of the northwest corner of sec. 30, T. 19 N., R. 16 W., Sheridan Township:

Ap—0 to 9 inches; black (10YR 2/1) loamy sand, very dark grayish brown (10YR 3/2) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

E—9 to 12 inches; grayish brown (10YR 5/2) sand; few fine faint dark grayish brown (10YR 4/2) mottles; single grain; loose; neutral; abrupt wavy boundary.

Bs1—12 to 16 inches; dark brown (7.5YR 3/4) sand; few fine prominent grayish brown (10YR 5/2) mottles; single grain; loose; about 5 percent chunks of ortstein; moderately acid; clear wavy boundary.

Bs2—16 to 25 inches; strong brown (7.5YR 4/6) sand; few fine distinct yellowish brown (10YR 5/6) mottles; single grain; loose; slightly acid; clear wavy boundary.

E′—25 to 33 inches; yellowish brown (10YR 5/4) sand; many medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; single grain; loose; slightly acid; clear wavy boundary.

2B/E—33 to 37 inches; about 80 percent dark brown (7.5YR 4/4) silty clay (Bt) surrounded or penetrated by light brownish gray (10YR 6/2) loamy sand (E); weak medium subangular blocky structure; firm; few strong brown (7.5YR 4/6) clay films on faces of peds; strongly acid; clear wavy boundary.

2Bt—37 to 60 inches; brown (7.5YR 5/4) silty clay; common medium prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few strong brown (7.5YR 4/6) discontinuous clay films on faces of peds; neutral.

Depth to the 2Bt horizon ranges from 20 to 40 inches. The content of gravel is 0 to 2 percent throughout the profile.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly loamy sand, but the range includes sand, loamy fine sand, and fine sand.

The E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2. It is sand or fine sand.

The Bs horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 4 to 6. Some pedons have a Bhs horizon. The Bs and Bhs horizons are sand, fine sand, or loamy fine sand.

The E′ horizon and the E part of the 2B/E horizon have hue of 10YR, value of 5 or 6, and chroma of 3 or 4. They are loamy sand or loamy fine sand. The Bt part of the 2B/E horizon and the 2Bt horizon have hue of 7.5YR, value of 4 or 5, and chroma of 3 or 4. They are clay, silty clay, or silty clay loam.

Some pedons have a 2C horizon. This horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 to 6. It is clay, silty clay, or silty clay loam.

Arkport Series

The Arkport series consists of well drained, moderately rapidly permeable soils on outwash plains and moraines. These soils formed in sandy outwash and glacial till. Slopes range from 0 to 12 percent.

Typical pedon of Arkport loamy fine sand, 0 to 6 percent slopes, 1,500 feet north and 2,560 feet west of the southeast corner of sec. 21, T. 17 N., R. 15 W., Logan Township:

A—0 to 3 inches; black (10YR 2/1) loamy fine sand, grayish brown (10YR 5/2) dry; weak medium granular structure; very friable; many fine and medium roots; moderately acid; abrupt smooth boundary.

E1—3 to 6 inches; brown (10YR 4/3) loamy fine sand; weak coarse granular structure; very friable; common fine and medium and few coarse roots; moderately acid; clear broken boundary.

E2—6 to 11 inches; yellowish brown (10YR 5/6) loamy fine sand; weak coarse subangular blocky structure; very friable; many fine and medium roots; moderately acid; clear wavy boundary.

E3—11 to 22 inches; brownish yellow (10YR 6/6) loamy fine sand; weak coarse subangular blocky structure; very friable; few fine and medium roots; strongly acid; clear wavy boundary.

E and Bt1—22 to 39 inches; very pale brown (10YR 7/3) loamy fine sand (E); lamellae of dark brown (7.5YR 4/4) fine sandy loam (Bt) ⅛ to ¼ inch thick; moderate medium subangular blocky structure; very friable; few faint strong brown (7.5YR 5/6) clay bridges between sand grains; moderately acid; clear wavy boundary.

E and Bt2—39 to 60 inches; light gray (10YR 7/2) loamy very fine sand (E); lamellae of strong brown (7.5YR 5/6) very fine sandy loam (Bt) ½ inch to 2 inches thick; weak medium subangular blocky structure; friable; moderately acid.

Depth to the uppermost lamellae ranges from 20 to 30 inches. The thickness of the solum and the depth to free carbonates range from 36 to more than 60 inches. The content of gravel is 0 to 1 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1. It is dominantly loamy fine sand, but the range includes fine sandy loam.

The E horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6.

The E part of the E and Bt horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. The Bt part has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The lamellae are very fine sandy loam, fine sandy loam, or loamy fine sand. The thickness of the lamellae ranges from ⅛ inch to 3 inches and totals 8 to 10 inches. Some pedons have a C horizon.

Benona Series

The Benona series consists of excessively drained, rapidly permeable soils on moraines, outwash plains, and lake plains. These soils formed in sandy outwash, lacustrine material, and till. Slopes range from 0 to 12 percent.

Typical pedon of Benona sand, 0 to 6 percent slopes, 530 feet west and 1,450 feet north of the southeast corner of sec. 12, T. 19 N., R. 15 W., Sheridan Township:

A—0 to 6 inches; very dark gray (10YR 3/1) sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; strongly acid; irregular wavy boundary.

E—6 to 7 inches; pinkish gray (7.5YR 7/2) sand; weak fine granular structure; very friable; many fine and few medium roots; strongly acid; abrupt wavy boundary.

Bs1—7 to 18 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; few fine roots; strongly acid; clear wavy boundary.

Bs2—18 to 30 inches; strong brown (7.5YR 4/6) sand; weak medium subangular blocky structure; very friable; strongly acid; clear wavy boundary.

Bs3—30 to 47 inches; brownish yellow (10YR 6/6) sand; single grain; loose; moderately acid; clear wavy boundary.

E and Bt—47 to 60 inches; very pale brown (10YR 7/4) sand (E); lamellae of brown (7.5YR 4/4) loamy sand (Bt) ⅛ to ¼ inch thick; single grain; loose; moderately acid.

Depth to the uppermost lamellae ranges from 34 to 50 inches. The thickness of the solum ranges from 50 to more than 60 inches. The content of gravel is 0 to 10 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It 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 3 to 6, and chroma of 4 to 6. It is sand or loamy sand.

The E part of the E and Bt horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. The Bt part consists of lamellae that are ⅛ to ¼ inch thick and have a total thickness of less than 6 inches. The lamellae have hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4 to 6.

Bono Series

The Bono series consists of very poorly drained, slowly permeable soils on lake plains and water-worked till plains. These soils formed in clayey lacustrine material or water-worked till. Slopes range from 0 to 2 percent.

Typical pedon of Bono silty clay loam, 1,475 feet south and 100 feet east of the northwest corner of sec. 24, T. 17 N., R. 15 W., Logan Township:

Ap—0 to 11 inches; very dark gray (N 3/0) silty clay loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; moderately acid; abrupt smooth boundary.

Bg1—11 to 15 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine prominent brown (7.5YR 5/2) and common fine prominent light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; firm; slightly acid; clear wavy boundary.

Bg2—15 to 20 inches; gray (5Y 5/1) silty clay loam; few fine prominent greenish gray (5G 6/1) and many medium prominent light olive brown (2.5Y 5/6) mottles; strong medium angular blocky structure; firm; few white (N 8/0) soft accumulations of calcium carbonate; strongly effervescent; slightly alkaline; clear wavy boundary.

Bg3—20 to 32 inches; gray (5Y 5/1) silty clay; few medium distinct light gray (N 7/0) and many medium prominent light olive brown (2.5Y 5/6) mottles; massive; firm; few white (N 8/0) soft accumulations of calcium carbonate; strongly effervescent; moderately alkaline; clear wavy boundary.

Cg—32 to 48 inches; gray (5Y 6/1) silty clay; common medium prominent olive yellow (2.5Y 6/6) mottles; massive; firm; violently effervescent; moderately alkaline; clear wavy boundary.

C—48 to 60 inches; reddish brown (5YR 5/3) silty clay; many fine prominent gray (N 5/0) mottles; massive; firm; violently effervescent; moderately alkaline.

The solum ranges from 25 to 36 inches in thickness. The depth to carbonates ranges from 15 to 30 inches.

The Ap horizon has hue of 10YR or 2.5Y or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

The Bg horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 or 2. It is silty clay loam, clay, or silty clay.

The C horizon has hue of 5YR to 5Y, value of 4 or 5, and chroma of 1 to 3. It is mainly silty clay or silty clay loam, but in some pedons it is stratified with lenses of very fine sand or silt loam.

Boyer Series

The Boyer series consists of well drained soils on outwash plains and moraines. These soils formed in sandy and loamy outwash and till underlain by gravelly and sandy outwash (fig. 12). Permeability is moderately rapid in the upper part of the profile and very rapid in the lower part. Slopes range from 0 to 12 percent.

The Boyer soils in Mason County are taxadjuncts because they have a darker surface layer than is defined as the range for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Typical pedon of Boyer loamy sand, 0 to 6 percent slopes, 1,400 feet north and 480 feet west of the southeast corner of sec. 25, T. 17 N., R. 18 W., Summit Township:

Ap—0 to 8 inches; very dark brown (10YR 2/2) loamy sand, brown (10YR 4/3) dry; weak medium granular structure; very friable; about 5 percent fine gravel; neutral; abrupt smooth boundary.

E—8 to 18 inches; dark yellowish brown (10YR 4/6) loamy sand; weak fine granular structure; very friable; about 5 percent fine gravel; slightly acid; clear wavy boundary.

Bt—18 to 25 inches; dark brown (10YR 3/3) sandy loam; moderate medium granular structure; friable; clay bridges between sand grains; about 10 percent fine and medium gravel; slightly alkaline; abrupt smooth boundary.

2C1—25 to 33 inches; yellowish brown (10YR 5/6) very gravelly sand; single grain; loose; about 40 percent fine and medium gravel; slightly effervescent; moderately alkaline; clear wavy boundary.

2C2—33 to 60 inches; very pale brown (10YR 7/3) gravelly sand; single grain; loose; about 15 percent fine and medium gravel; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 20 to 40 inches. The content of gravel ranges from 1 to 25 percent in the solum and from 10 to 55 percent in the 2C horizon.

The Ap horizon has hue of 10YR and value and chroma of 2 or 3. The E horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 6.

The Bt horizon has hue of 5YR to 10YR and value and chroma of 3 to 6. It is sandy loam, sandy clay loam, or the gravelly analogs of those textures. Some pedons have a BC horizon.

The 2C horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 to 6. It is sand, coarse sand, gravelly sand, or very gravelly sand.

Capac Series

The Capac series consists of somewhat poorly drained, moderately slowly permeable soils on till plains and moraines. These soils formed in loamy glacial till. Slopes range from 0 to 3 percent.

The Capac soils in Mason County are taxadjuncts because they have tongues of E material in the Bt horizon. This difference, however, does not affect the use or behavior of the soils.

Typical pedon of Capac loam, 0 to 3 percent slopes, 230 feet west and 580 feet south of the northeast corner of sec. 18, T. 19 N., R. 17 W., Victory Township:

Ap—0 to 9 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

B/E—9 to 12 inches; about 60 percent brown (7.5YR 4/4) loam (Bt) surrounded by light gray (10YR 7/1) sandy loam (E); few fine distinct strong brown (7.5YR 4/6) and brown (7.5YR 5/2) mottles; weak medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

Bt—12 to 21 inches; brown (10YR 4/3) clay loam; few fine faint grayish brown (10YR 5/2) and many fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few dark yellowish brown (10YR 4/4) discontinuous clay films on faces of peds; neutral; clear wavy boundary.

Bw1—21 to 30 inches; brown (7.5YR 5/4) clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; firm; common medium prominent light gray (N 7/0) soft masses of calcium carbonate; violently effervescent; slightly alkaline; clear wavy boundary.

Bw2—30 to 60 inches; brown (7.5YR 5/4) clay loam; common medium distinct light yellowish brown (10YR 6/4) mottles; weak medium subangular blocky structure; firm; common prominent light gray (N 7/0) and few prominent white (10YR 8/1) soft masses of calcium carbonate; violently effervescent; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to more than 60 inches. The content of gravel is 0 to 3 percent throughout the profile.

The Ap horizon has hue of 10YR, value of 3, and chroma of 2 or 3.

The E part of the B/E horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 3. It is fine sandy loam or sandy loam. The Bt part of the B/E horizon and the Bt horizon have hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 6.

The Bw horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4.

Carlisle Series

The Carlisle series consists of very poorly drained, moderately slowly permeable to moderately rapidly permeable soils on flood plains. These soils formed in organic material. Slopes range from 0 to 2 percent.

Typical pedon of Carlisle muck, in an area of Kerston-Carlisle-Glendora complex, frequently flooded, 2,550 feet north and 80 feet west of the southeast corner of sec. 14, T. 19 N., R. 18 W., Hamlin Township:

Oa1—0 to 26 inches; muck, black (N 2/0) broken face and rubbed; about 10 percent fiber, 5 percent rubbed; moderate medium granular structure; friable; neutral; gradual smooth boundary.

Oa2—26 to 36 inches; muck, black (5YR 2.5/1) broken face and rubbed; about 10 percent fiber, 5 percent rubbed; moderate medium granular structure; friable; 10 to 20 percent wood fragments ¼ to 1 inch in diameter; neutral; gradual smooth boundary.

Oa3—24 to 60 inches; muck, dark reddish brown (5YR 2.5/2) broken face and rubbed; about 10 percent fiber, 5 percent rubbed; weak coarse granular structure; friable; 10 to 20 percent wood fragments ¼ to 1 inch in diameter; neutral.

The sapric material is more than 51 inches thick. All of the organic layers have hue of 5YR, 7.5YR, or 10YR or are neutral in hue. They have value of 1 to 2.5 and chroma of 0 to 2.

Chelsea Series

The Chelsea series consists of excessively drained, rapidly permeable soils on moraines, outwash plains, and lake plains. These soils formed in sandy eolian material (fig. 13). Slopes range from 0 to 12 percent.

Typical pedon of Chelsea fine sand, 0 to 6 percent slopes, 300 feet north and 1,600 feet west of the southeast corner of sec. 10, T. 19 N., R. 17 W., Victory Township:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sand, brown (10YR 4/3) dry; weak fine granular structure; very friable; common fine and few medium roots; moderately acid; abrupt smooth boundary.

E1—9 to 13 inches; dark yellowish brown (10YR 4/6) fine sand; single grain; loose; strongly acid; clear wavy boundary.

E2—13 to 30 inches; yellowish brown (10YR 5/6) fine sand; single grain; loose; moderately acid; clear wavy boundary.

E and Bt1—30 to 38 inches; yellowish brown (10YR 5/4) fine sand (E); lamellae of dark yellowish brown (10YR 4/4) loamy fine sand (Bt) 1/16 to ¼ inch thick; single grain; loose; slightly acid; clear wavy boundary.

E and Bt2—38 to 60 inches; pale brown (10YR 6/3) fine sand (E); lamellae of strong brown (7.5YR 5/6) loamy fine sand (Bt) ⅛ to ¼ inch thick; single grain; loose; slightly acid.

The solum is more than 4 feet thick. Depth to the uppermost lamellae ranges from 27 to 46 inches.

The Ap or A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. It is dominantly fine sand, but the range includes loamy fine sand.

The E horizon and the E part of the E and Bt horizon have hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. They are fine sand or loamy fine sand. The Bt part of the E and Bt horizon consists of lamellae that are 1/16 to 1 inch thick and have a total thickness of less than 4 inches. The lamellae have hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 to 6. They are loamy fine sand or fine sandy loam.

Coloma Series

The Coloma series consists of excessively drained, rapidly permeable soils on outwash plains and moraines. These soils formed in sandy outwash or till. Slopes range from 0 to 40 percent.

Typical pedon of Coloma sand, in an area of Coloma-Scalley complex, 6 to 12 percent slopes, 800 feet east and 150 feet north of the center of sec. 31, T. 17 N., R. 16 W., Eden Township:

Ap—0 to 7 inches; dark brown (10YR 3/3) sand, light yellowish brown (10YR 6/4) dry; weak fine granular structure; very friable; about 1 percent fine gravel; strongly acid; abrupt smooth boundary.

E1—7 to 25 inches; yellowish brown (10YR 5/4) sand; single grain; loose; about 1 percent fine gravel; strongly acid; clear wavy boundary.

E2—25 to 45 inches; yellowish brown (10YR 5/6) sand; single grain; loose; about 1 percent fine gravel; moderately acid; clear wavy boundary.

E and Bt—45 to 60 inches; light yellowish brown (10YR 6/4) sand (E); lamellae of strong brown (7.5YR 4/6) loamy sand (Bt) ⅛ to ¼ inch thick; single grain; about 1 percent fine gravel; loose; moderately acid.

The content of gravel is 0 to 10 percent in the solum. Depth to the uppermost lamellae ranges from 35 to 50 inches.

The Ap horizon has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 1 to 3. It is dominantly sand, but the range includes loamy sand. The E horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6.

The E part of the E and Bt horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 4 to 6. It is sand, loamy sand, or fine sand. The Bt part has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 to 6. The lamellae are loamy sand or sandy loam. They are 1/16 to 1 inch thick and have a total thickness of less than 6 inches.

Covert Series

The Covert series consists of moderately well drained, rapidly permeable soils on outwash plains and lake plains. These soils formed in sandy outwash or lacustrine material. Slopes range from 0 to 6 percent.

Typical pedon of Covert sand, 0 to 6 percent slopes, 2,500 feet north and 200 feet east of the southwest corner of sec. 5, T. 19 N., R. 17 W., Victory Township:

A—0 to 3 inches; black (N 2/0) sand, dark gray (10YR 4/1) dry; weak medium granular structure; very friable; many fine and medium roots; very strongly acid; abrupt wavy boundary.

E—3 to 8 inches; pinkish gray (7.5YR 6/2) sand; weak fine granular structure; very friable; few fine roots; very strongly acid; abrupt wavy boundary.

Bhs—8 to 10 inches; dark reddish brown (5YR 3/2) sand; weak fine subangular blocky structure; very friable; common fine and medium roots; moderately acid; clear irregular boundary.

Bs1—10 to 24 inches; strong brown (7.5YR 4/6) sand; weak fine subangular blocky structure; very friable; few medium and fine roots; moderately acid; clear wavy boundary.

Bs2—24 to 36 inches; yellowish brown (10YR 5/6) sand; few fine distinct light yellowish brown (10YR 6/4) mottles; weak fine granular structure; very friable; strongly acid; clear wavy boundary.

C—36 to 60 inches; light yellowish brown (10YR 6/4) sand; common fine faint very pale brown (10YR 7/3) mottles; single grain; loose; slightly acid.

The thickness of the solum ranges from 26 to 45 inches.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. Some pedons have an Ap horizon. The E horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 1 to 3.

The Bs horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. Some pedons have a BC horizon.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 8. It is mainly sand or fine sand, but loamy material is at a depth of more than 40 inches in some pedons.

Dawson Series

The Dawson series consists of very poorly drained soils in closed depressions on outwash plains and moraines. These soils formed in organic material over sandy material. Permeability is moderately slow to moderately rapid in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 2 percent.

The Dawson soils in Mason County are taxadjuncts because they have a slightly higher temperature than is defined as the range for the series. This difference, however, does not affect the use or behavior of the soils.

Typical pedon of Dawson mucky peat, in an area of Loxley and Dawson soils, 1,400 feet south and 300 feet east of the northwest corner of sec. 28, T. 20 N., R. 15 W., Meade Township:

Oe—0 to 10 inches; mucky peat, dark reddish brown (5YR 3/2) broken face and rubbed; about 50 percent fiber, 20 percent rubbed; massive; friable; extremely acid; gradual wavy boundary.

Oa—10 to 28 inches; muck, very dusky red (2.5YR 2.5/2) broken face and rubbed; about 50 percent fiber, 5 percent rubbed; massive; friable; extremely acid; abrupt smooth boundary.

C—28 to 60 inches; brown (10YR 5/3) sand; single grain; loose; few discontinuous prominent dark reddish brown (5YR 3/2) iron stains; very strongly acid.

The thickness of the organic material ranges from 16 to 50 inches. The organic layers have hue of 2.5YR, 5YR, or 10YR, value of 2, 2.5, or 3, and chroma of 2 or 3. The surface layer is dominantly mucky peat, but the range includes muck and peat.

The C horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 or 4. It is sand or loamy sand.

Del Rey Series

The Del Rey series consists of somewhat poorly drained, slowly permeable soils on lake plains and water-worked till plains. These soils formed in clayey lacustrine material or water-worked till. Slopes range from 0 to 3 percent.

Typical pedon of Del Rey silty clay loam, 0 to 3 percent slopes, 1,400 feet north and 100 feet west of the southeast corner of sec. 14, T. 17 N., R. 15 W., Logan Township:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure; firm; neutral; abrupt smooth boundary.

Bt1—8 to 14 inches; reddish brown (5YR 5/3) silty clay; common medium prominent strong brown (7.5YR 5/6) mottles; many greenish gray (5GY 6/1) coatings and dark reddish gray (5YR 4/2) clay films on faces of peds; moderate medium angular blocky structure; firm; neutral; abrupt smooth boundary.

Bt2—14 to 18 inches; reddish brown (5YR 5/3) silty clay; grayish brown (2.5Y 5/2) coatings; common medium prominent strong brown (7.5YR 5/6) and common fine prominent greenish gray (5GY 6/1) mottles; moderate medium angular blocky structure; firm; few dark brown (7.5YR 4/2) clay films on faces of peds; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bw1—18 to 38 inches; reddish brown (5YR 5/3) silty clay; common medium prominent strong brown (7.5YR 5/6) and common fine prominent greenish gray (5GY 6/1) mottles; moderate medium angular blocky structure; firm; common fine white (5YR 8/1) platelike soft masses of lime; violently effervescent; slightly alkaline; clear wavy boundary.

Bw2—38 to 60 inches; light reddish brown (5YR 6/3) silty clay loam; weak medium subangular blocky structure; firm; common fine white (5YR 8/1) platelike soft masses of lime; violently effervescent; slightly alkaline.

The thickness of the solum ranges from 25 to more than 60 inches. The depth to carbonates ranges from 14 to 25 inches.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It is dominantly silty clay loam, but the range includes silt loam.

The Bt horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 3 or 4. It is silty clay, clay, or silty clay loam.

The Bw horizon has hue of 5YR, value of 5 or 6, and chroma of 3. It is silty clay or silty clay loam.

The C horizon, if it occurs, has hue of 10YR to 5YR, value of 4 to 6, and chroma of 3 or 4. It is clay loam or silty clay loam.

Edwards Series

The Edwards series consists of very poorly drained soils in depressions on outwash plains and moraines. These soils formed in organic material that is 16 to 50 inches deep over deposits of marl. Permeability is moderately slow to moderately rapid in the organic material. Slopes range from 0 to 2 percent.

Typical pedon of Edwards muck, in an area of Edwards and Martisco mucks, 1,450 feet east and 590 feet north of the southwest corner of sec. 10, T. 19 N., R. 15 W., Sheridan Township:

Oa—0 to 18 inches; muck, black (N 2/0) broken face and rubbed; about 10 percent fiber, 5 percent rubbed; moderate medium and fine granular structure; friable; slightly alkaline; abrupt irregular boundary.

Cg1—18 to 39 inches; light gray (10YR 7/2) marl; moderate thick platy structure; friable; moderately alkaline; violently effervescent; abrupt smooth boundary.

2Cg1—39 to 50 inches; dark gray (N 4/0) sand; single grain; loose; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2Cg2—50 to 60 inches; pinkish gray (7.5YR 6/2) sand; single grain; loose; about 5 percent medium gravel; slightly effervescent; slightly alkaline.

Depth to the Cg horizon ranges from 16 to 50 inches.

The organic layers have hue of 10YR or are neutral in hue. They have value of 2 or 3 and chroma of 0 to 2.

The 2Cg horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 4 to 7 and chroma of 0 to 2.

Entic Haplorthods, Sandy

These soils are sandy, mixed, mesic Entic Haplorthods. They are moderately well drained to excessively drained, rapidly permeable soils on ice-contact and overwashed moraines and on outwash plains. The soils formed in sandy glaciofluvial material. Slopes range from 0 to 70 percent.

Reference pedon of Entic Haplorthods, sandy, rolling, 1,700 feet north and 1,000 feet west of the southeast corner of sec. 13, T. 20 N., R. 16 W., Freesoil Township:

Oa—1 inch to 0; very thin or discontinuous, well decomposed hardwood leaf litter.

A—0 to 3 inches; very dark gray (10YR 3/1) sand, very dark gray (10YR 4/1) dry; weak medium granular structure; very friable; many fine roots; strongly acid; clear wavy boundary.

E—3 to 5 inches; pinkish gray (7.5YR 6/2) sand; weak medium granular structure; very friable; many fine roots; strongly acid; clear irregular boundary.

Bs—5 to 20 inches; strong brown (7.5YR 4/6) sand;

weak medium subangular blocky structure; friable; strongly acid; gradual wavy boundary.

BC—20 to 35 inches; reddish yellow (7.5YR 6/6) sand; weak medium subangular blocky structure; friable; moderately acid; gradual wavy boundary.

C—35 to 180 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; moderately acid.

The solum ranges from 20 to 40 inches in thickness. It is sand, loamy sand, or fine sand. The content of gravel is 0 to 4 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 to 3. It is dominantly sand, but the range includes loamy sand and fine sand.

The E horizon, if it occurs, has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 2 to 4.

The Bs horizon mainly has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 4 to 6. Dark subsoil phases have a Bhs horizon that has hue of 5YR or 7.5YR and value and chroma of 2 or 3 and is less than 3 inches thick.

The BC horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 6.

The C horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 4 to 6. In some pedons bands of loamy sand to sandy loam or bands of sandy clay loam or clay loam are at a depth of more than 60 inches. Some pedons have a seasonal high water table at a depth of more than 3 feet. Some have loamy material at a depth of more than 40 inches.

Epworth Series

The Epworth series consists of well drained and moderately well drained, rapidly permeable soils on lake plains, beach ridges, outwash plains, and moraines. These soils formed in sandy eolian material. Slopes range from 0 to 18 percent.

Typical pedon of Epworth fine sand, 0 to 6 percent slopes, 2,500 feet north and 2,300 feet west of the southeast corner of sec. 11, T. 18 N., R. 18 W., Pere Marquette Township:

Oa—1 inch to 0; very dark grayish brown (10YR 3/2), well decomposed leaf litter; strongly acid; abrupt smooth boundary.

A—0 to 3 inches; black (10YR 2/1) fine sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; common fine and many medium roots; strongly acid; clear wavy boundary.

E—3 to 6 inches; grayish brown (10YR 5/2) fine sand; weak medium subangular blocky structure; very friable; many fine and medium roots; strongly acid; clear wavy boundary.

Bs1—6 to 12 inches; strong brown (7.5YR 4/6) fine sand; weak coarse subangular blocky structure; very friable; many medium roots; moderately acid; clear wavy boundary.

Bs2—12 to 30 inches; strong brown (7.5YR 5/6) fine sand; single grain; loose; few coarse roots; moderately acid; clear wavy boundary.

C1—30 to 50 inches; brownish yellow (10YR 6/6) fine sand; single grain; loose; moderately acid; clear wavy boundary.

C2—50 to 60 inches; yellow (10YR 7/6) fine sand; single grain; loose; moderately acid.

The thickness of the solum ranges from 20 to 32 inches.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. In cultivated areas the Ap horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 or 3. The E horizon has hue of 10YR, value of 5 or 6, and chroma of 2. In most cultivated areas there is no E horizon.

The Bs horizon has hue of 5YR to 10YR, value of 3 to 6, and chroma of 3 to 8.

The C horizon has hue of 10YR, value of 5 to 7, and chroma of 4 to 7.

Fern Series

The Fern series consists of well drained soils on lake plains and moraines. These soils formed in sandy material overlying loamy till. Permeability is rapid in the sandy part of the profile and moderate in the loamy part. Slopes range from 0 to 45 percent.

Typical pedon of Fern fine sand, 0 to 6 percent slopes, 2,600 feet north and 250 feet east of the southwest corner of sec. 28, T. 20 N., R. 15 W., Meade Township:

Ap—0 to 13 inches; dark brown (10YR 3/3) fine sand, brown (10YR 5/3) dry; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

E—13 to 23 inches; pale brown (10YR 6/3) fine sand; single grain; loose; neutral; clear wavy boundary.

2E/B—23 to 33 inches; about 60 percent pale brown (10YR 6/3) loamy fine sand (E) occurring as tongues extending into or surrounding peds of strong brown (7.5YR 4/6) loam (Bt); moderate medium subangular blocky structure; friable; slightly acid; clear wavy boundary.

2B/E—33 to 50 inches; about 85 percent peds of strong brown (7.5YR 4/6) loam (Bt) surrounded by pale brown (10YR 6/3) loamy fine sand; weak medium subangular blocky structure; friable; very few faint dark brown (7.5YR 4/4) discontinuous clay films on faces of peds; neutral; clear wavy boundary.

2Bt—50 to 60 inches; brown (7.5YR 5/4) loam; weak medium subangular blocky structure; friable; very few faint dark brown (7.5YR 4/4) discontinuous clay films on faces of peds; about 2 percent gravel; neutral.

Depth to the loamy material ranges from 20 to 40 inches. The thickness of the solum ranges from 30 to more than 60 inches. The content of gravel is 0 to 10 percent throughout the profile.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Pedons in uncultivated areas have an A horizon, which is 3 to 5 inches thick. The Ap and A horizons are dominantly fine sand, but the range includes sand and loamy fine sand.

The E horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is fine sand, sand, loamy fine sand, or loamy sand.

The E part of the 2E/B and 2B/E horizons has colors and textures similar to those of the E horizon. The Bt part has colors and textures similar to those of the 2Bt horizon.

The 2Bt horizon has value of 4 or 5 and chroma of 4 to 6. It is loam or clay loam. Some pedons have a 2C horizon, which is loam or clay loam.

Freesoil Series

The Freesoil series consists of somewhat poorly drained soils on lake plains and water-worked till plains. These soils formed in stratified sandy and silty lacustrine material or water-worked till. Permeability is moderate in the upper part of the profile and moderate or moderately rapid in the lower part. Slopes range from 0 to 3 percent.

Typical pedon of Freesoil loamy very fine sand, 0 to 3 percent slopes, 2,000 feet west and 50 feet north of the southeast corner of sec. 28, T. 17 N., R. 17 W., Riverton Township:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loamy very fine sand, brown (10YR 4/3) dry; weak medium granular structure; very friable; slightly alkaline; abrupt smooth boundary.

Bw—8 to 50 inches; light yellowish brown (10YR 6/4) very fine sandy loam that every 2 to 4 inches has strata of loamy very fine sand, very fine sand, and silt loam ¼ to 1 inch thick; many medium distinct brownish yellow (10YR 6/6) and few fine distinct light gray (10YR 7/2) mottles; weak medium granular structure; friable; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C—50 to 60 inches; grayish brown (10YR 5/2) very fine sand; few fine distinct yellowish brown (10YR 5/4) mottles; stratum of silty clay loam 2 inches thick; massive; friable; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 40 to 50 inches. The depth to free carbonates ranges from 8 to 32 inches. The content of gravel is less than 1 percent throughout the profile.

The Ap horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is dominantly loamy very fine sand, but the range includes sandy loam and fine sandy loam. Some pedons have an E horizon.

The Bw horizon has hue of 5YR to 10YR, value of 5 or 6, and chroma of 2 to 4. It is stratified very fine sandy loam, very fine sand, loamy very fine sand, silt loam, or fine sand.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. It is stratified fine sand, very fine sand, sand, silt, silt loam, or silty clay loam.

Glendora Series

The Glendora series consists of very poorly drained, rapidly permeable soils on flood plains. These soils formed in sandy alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Glendora mucky silt loam, in an area of Kerston-Carlisle-Glendora complex, frequently flooded, 1,400 feet west and 250 feet south of the northeast corner of sec. 24, T. 19 N., R. 15 W., Sheridan Township:

A—0 to 9 inches; black (N 2/0) mucky silt loam, very dark gray (N 3/0) dry; moderate medium granular structure; friable; slightly alkaline; clear wavy boundary.

Cg1—9 to 21 inches; grayish brown (10YR 5/2) sand; few medium distinct brownish yellow (10YR 6/6) mottles; single grain; loose; neutral; clear wavy boundary.

Cg2—21 to 52 inches; light brownish gray (10YR 6/2) sand; single grain; loose; neutral; clear wavy boundary.

Cg3—52 to 60 inches; gray (10YR 5/1) sand; loose; slightly alkaline.

The content of gravel is 0 to 3 percent throughout the profile. The content of organic carbon decreases irregularly with increasing depth.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is dominantly mucky silt loam, but the range includes mucky sand and mucky sandy loam.

The Cg horizon has hue of 10YR, value of 3 to 6, and chroma of 1 or 2.

Grattan Series

The Grattan series consists of excessively drained, rapidly permeable soils on lake plains, outwash plains, and moraines. These soils formed in sandy glaciofluvial material. Slopes range from 0 to 50 percent.

Typical pedon of Grattan sand, 0 to 6 percent slopes, 500 feet west and 1,400 feet north of the southeast corner of sec. 23, T. 20 N., R. 16 W., Freesoil Township:

A—0 to 1 inch; very dark gray (10YR 3/1) sand, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; very friable; common fine and medium roots; very strongly acid; abrupt smooth boundary.

E—1 to 3 inches; pinkish gray (7.5YR 6/2) sand; weak fine granular structure; very friable; common fine and medium roots; very strongly acid; abrupt wavy boundary.

Bs1—3 to 11 inches; dark brown (7.5YR 4/4) sand; weak fine granular structure; very friable; few fine roots; very strongly acid; clear wavy boundary.

Bs2—11 to 45 inches; strong brown (7.5YR 4/6) sand; weak fine granular structure; very friable; few fine roots; strongly acid; clear wavy boundary.

C1—45 to 54 inches; reddish yellow (7.5YR 6/6) sand; single grain; loose; few fine roots; moderately acid; clear wavy boundary.

C2—54 to 60 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 20 to 50 inches. The content of gravel is 0 to 3 percent throughout the profile. The entire profile is sand.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3. Some pedons have an Ap horizon, which has colors similar to those of the A horizon. The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 or 2.

Some pedons have a Bhs horizon. This horizon is less than 2 inches thick. It has hue of 5YR or 7.5YR and value and chroma of 2 or 3.

The Bs horizon has hue or 7.5YR or 10YR, value of 3 to 5, and chroma of 4 to 6.

The C horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 4 to 6. In some pedons loamy material is at a depth of more than 40 inches.

Haplic Glossudalfs, Fine-Loamy

These soils are fine-loamy, mixed, mesic Haplic Glossudalfs. They are well drained, moderately slowly permeable soils on end moraines and ground moraines. The soils formed in loamy glacial till. Slopes range from 0 to 30 percent.

Reference pedon of Haplic Glossudalfs, fine-loamy, rolling, 1,850 feet north and 530 feet west of the southeast corner of sec. 18, T. 17 N., R. 15 W., Logan Township:

Oi—1 inch to 0; black (10YR 2/1), partially decomposed hardwood leaf litter.

A—0 to 4 inches; black (10YR 2/1) sandy loam, grayish brown (10YR 5/2) dry; weak medium granular structure; very friable; many very fine and fine roots; neutral; abrupt smooth boundary.

E—4 to 10 inches; pale brown (10YR 6/3) sandy loam; moderate medium granular structure; friable; many fine roots; neutral; abrupt wavy boundary.

E/B—10 to 20 inches; about 60 percent pale brown (10YR 6/3) sandy loam (E) surrounding yellowish brown (10YR 5/4) loam (Bt); moderate medium subangular blocky structure; friable; neutral; clear wavy boundary.

Bt—20 to 45 inches; reddish brown (5YR 5/3) sandy clay loam; moderate medium subangular blocky structure; firm; yellowish red (5YR 5/6) clay films on faces of peds; common fine roots; neutral; gradual wavy boundary.

C—45 to 60 inches; brown (7.5YR 5/4) sandy clay loam; moderate medium subangular blocky structure; firm; neutral.

The thickness of the solum ranges from 30 to 50 inches. The depth to fine-loamy material ranges from 10 to 40 inches. The content of gravel and cobblestones is 0 to 15 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The E part of the E/B horizon has hue of 10YR, value of 5 to 7, and chroma of 2 to 4. It is dominantly sandy loam, but the range includes loamy sand and fine sandy loam.

The Bt part of the E/B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma or 3 to 6. It is sandy loam, loam, or fine sandy loam. The Bt horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. It is clay loam, sandy clay loam, silt loam, or silty clay loam.

The C horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. It is sandy loam to clay loam.

Houghton Series

The Houghton series consists of very poorly drained, moderately slowly permeable to moderately rapidly permeable soils in depressions on till plains, moraines, and outwash plains. These soils formed in organic material that is more than 51 inches thick. Slopes range from 0 to 2 percent.

Typical pedon of Houghton muck, 2,200 feet east and 50 feet south of the northwest corner of sec. 22, T. 17 N., R. 16 W., Eden Township:

Oa1—0 to 9 inches; muck, black (10YR 2/1) broken face and rubbed; about 5 percent fiber, 2 percent rubbed; weak medium granular structure; friable; many fine and medium roots; neutral; gradual wavy boundary.

Oa2—9 to 38 inches; muck, dark reddish brown (5YR 2.5/2) broken face and rubbed; about 5 percent fiber, 0 percent rubbed; weak medium granular structure; friable; many fine roots; neutral; gradual wavy boundary.

Oa3—38 to 60 inches; muck, black (5YR 2.5/1) broken faced and rubbed; about 5 percent fiber, 0 percent rubbed; massive; friable; few fine roots; neutral.

The organic material is more than 51 inches thick. It has 0 to 5 percent woody material. It has hue of 5YR to 10YR, value of 2, 2.5, or 3, and chroma of 1 or 2.

Ithaca Series

The Ithaca series consists of somewhat poorly drained, slowly permeable soils on water-worked till plains and moraines. These soils formed in clayey or loamy glacial till. Slopes range from 0 to 3 percent.

Typical pedon of Ithaca loam, 0 to 3 percent slopes, 2,000 feet north and 2,000 feet east of the southwest corner of sec. 9, T. 18 N., R. 16 W., Custer Township:

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, pale brown (10YR 6/3) dry; weak coarse subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

B/E—10 to 15 inches; about 70 percent peds of yellowish brown (10YR 5/8) clay loam (Bt) surrounded by pale brown (10YR 6/3) fine sandy loam (E); weak medium subangular blocky structure; friable; few dark brown (7.5YR 4/4) clay films on faces of peds; about 1 percent fine gravel; slightly acid; gradual broken boundary.

Bt—15 to 24 inches; reddish brown (5YR 4/3) clay; few fine prominent grayish brown (10YR 5/2) and many medium prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; friable; common dark brown (7.5YR 4/4) clay films on faces of peds; about 1 percent fine gravel; slightly alkaline; clear wavy boundary.

Bw—24 to 60 inches; brown (7.5YR 5/4) clay loam; many medium distinct strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; firm; common fine light gray (10YR 7/1) streaks of lime; about 1 percent fine gravel; strongly effervescent; slightly alkaline.

The solum ranges from 20 to more than 60 inches in thickness. The depth to carbonates ranges from 20 to 40 inches. The content of gravel is 1 to 10 percent throughout the profile.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It is dominantly loam, but the range includes fine sandy loam and clay loam. Some pedons have an E horizon.

The E part of the B/E horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. The B part has colors and textures similar to those of the Bt horizon. Thin fingers of the E horizon penetrate the Bt horizon.

The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 3 or 4. It is clay loam, silty clay loam, or clay.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is clay loam or silty clay loam. Some pedons have a Bk horizon.

Jebavy Series

The Jebavy series consists of poorly drained soils on lake plains and outwash plains. These soils formed in sandy glaciofluvial deposits. They have a cemented layer. Permeability is moderate in the cemented layer and rapid in the rest of the profile. Slopes range from 0 to 2 percent.

Typical pedon of Jebavy mucky sand, in an area of Saugatuck-Jebavy complex, 0 to 3 percent slopes, 500 feet south and 100 feet west of the northeast corner of sec. 25, T. 19 N., R. 18 W., Hamlin Township:

A1—0 to 2 inches; black (N 2/0) mucky sand, black (10YR 2/1) dry; weak fine granular structure; very friable; many fine roots; very strongly acid; abrupt smooth boundary.

A2—2 to 4 inches; dark grayish brown (10YR 4/2) sand; single grain; loose; many fine roots; very strongly acid; abrupt smooth boundary.

E1—4 to 10 inches; grayish brown (10YR 5/2) sand; few fine faint light brownish gray (10YR 6/2) mottles; single grain; loose; many fine roots; very strongly acid; abrupt smooth boundary.

E2—10 to 22 inches; light gray (10YR 7/2) sand; few fine faint light gray (10YR 7/1) mottles; single grain; loose; few medium roots; very strongly acid; clear wavy boundary.

Bhsm—22 to 28 inches; dark reddish brown (5YR 2.5/2) sand; many coarse distinct dark brown (7.5YR 3/4) mottles; massive; strongly cemented ortstein; very

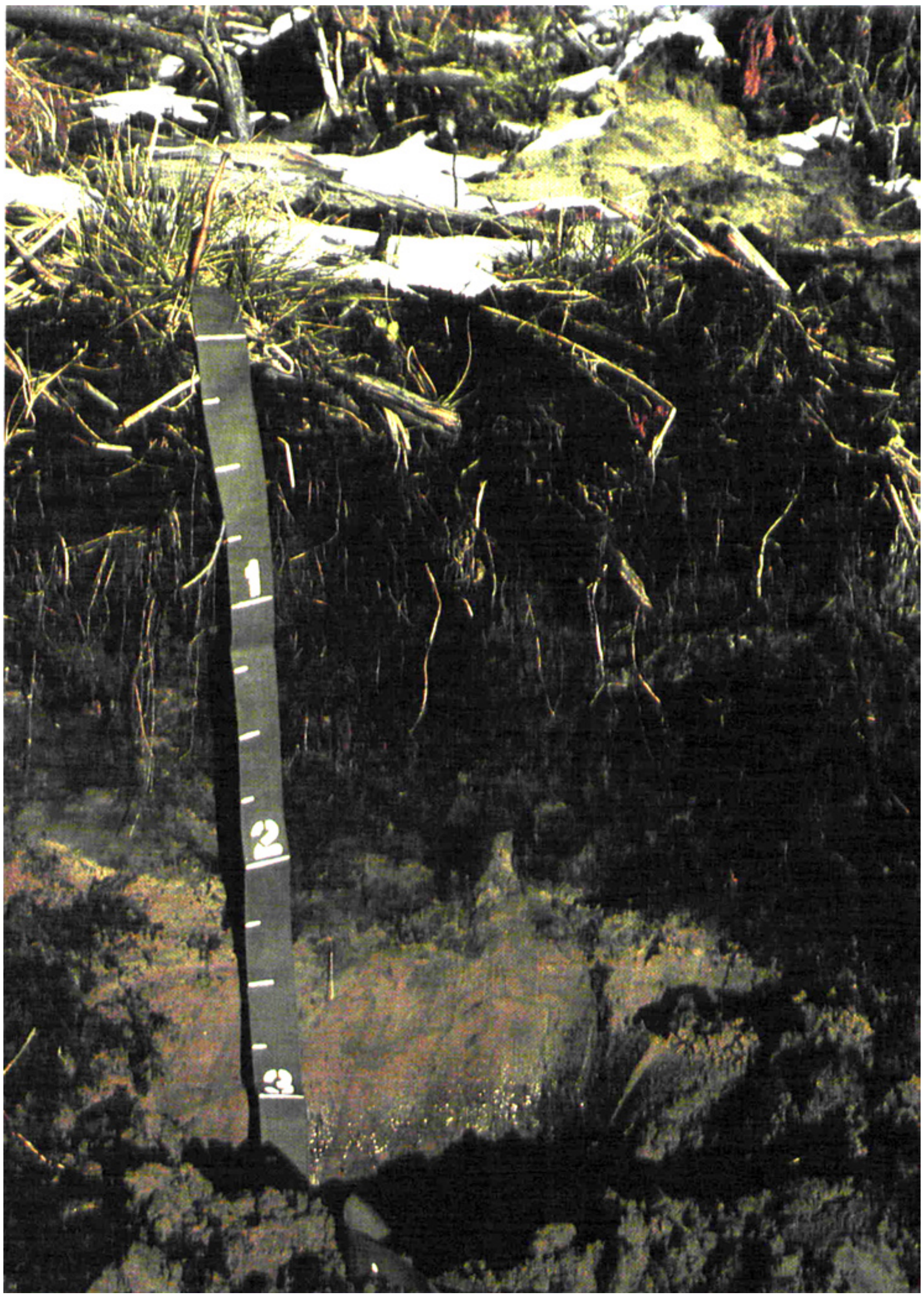

Figure 11.—Typical pedon of Adrian muck. The numbers on the marker are in feet.

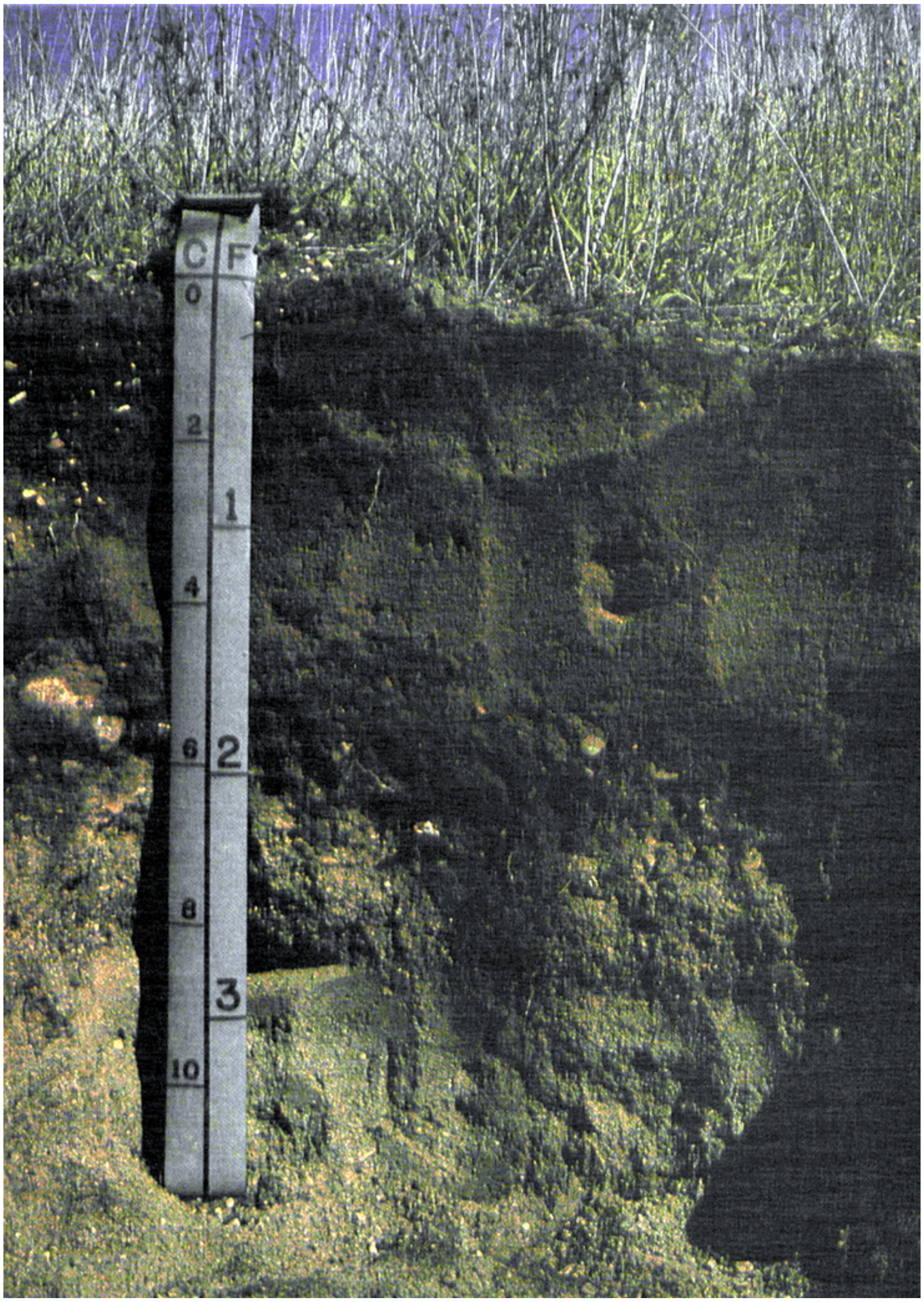

Figure 12.—Typical pedon of Boyer loamy sand, 0 to 6 percent slopes.

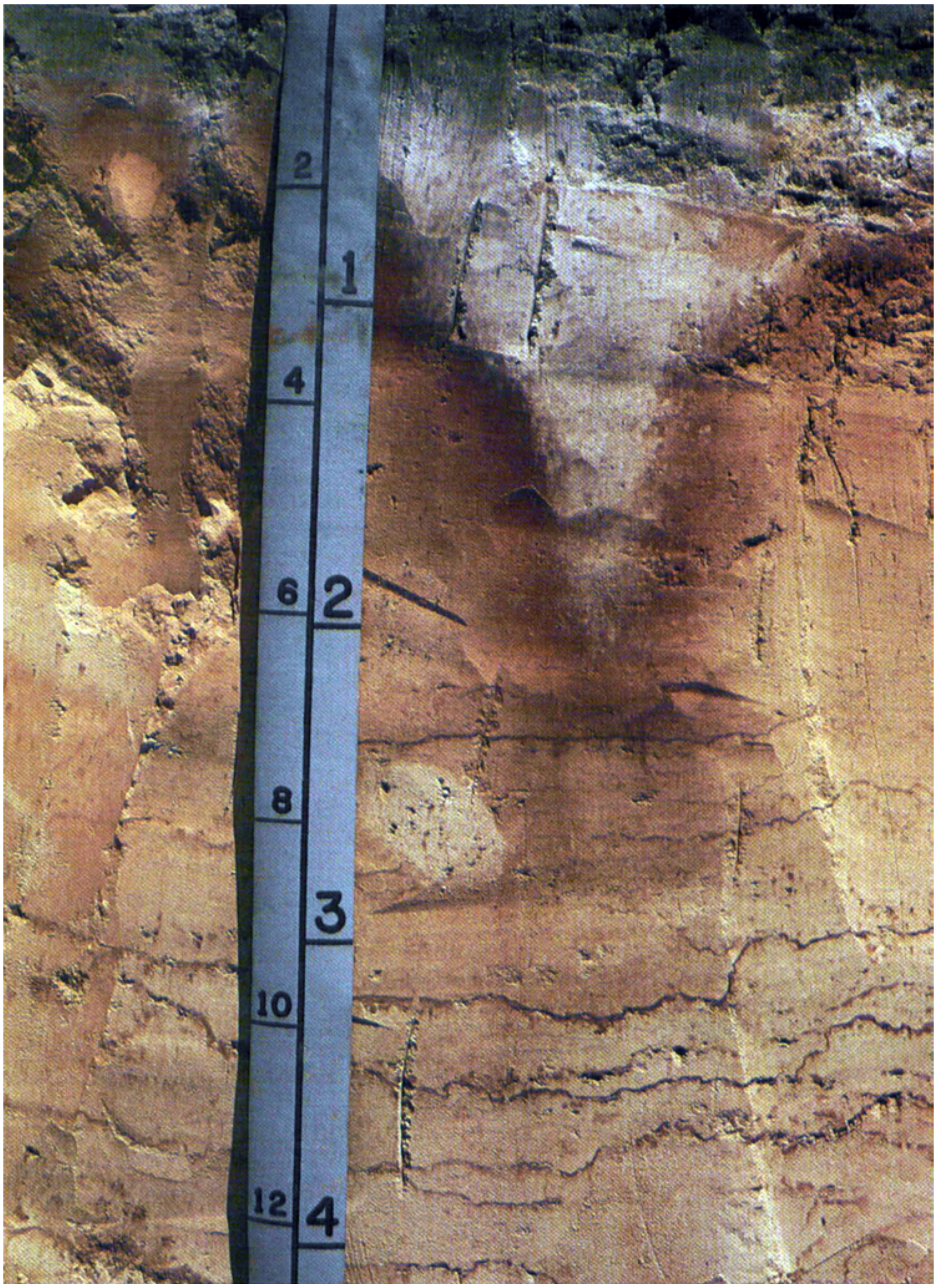

Figure 13.—Typical pedon of Chelsea fine sand, 0 to 6 percent slopes. The larger numbers on the marker are in feet.

Figure 14.—Typical pedon of Spinks sand, in an area of Spinks-Coloma sands, 0 to 6 percent slopes. The numbers on the marker are in feet.

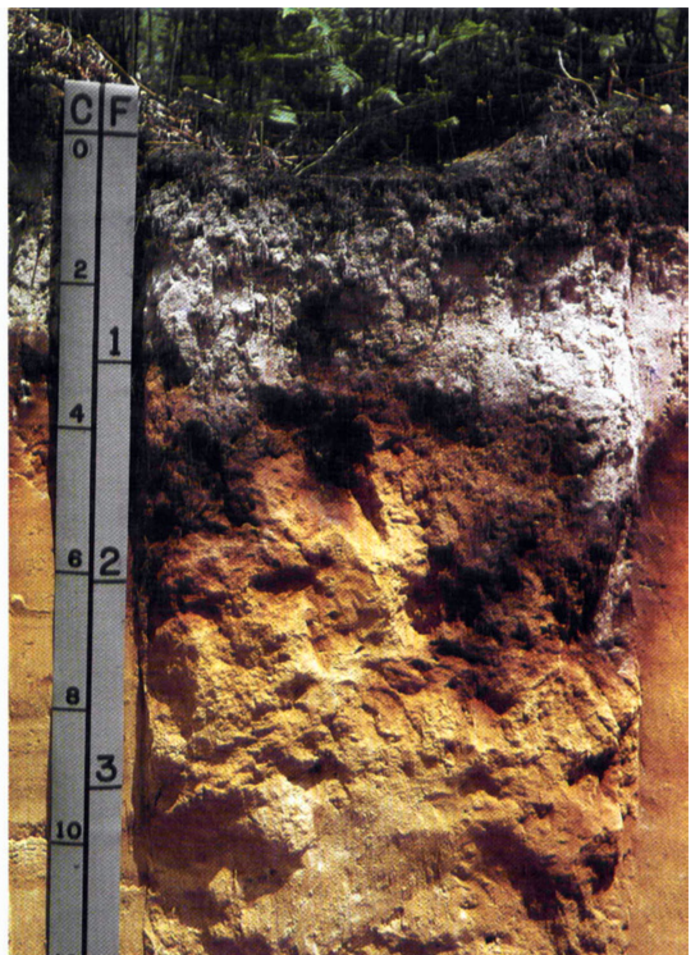

Figure 15.—Typical pedon of Wallace fine sand, 3 to 15 percent slopes.

strongly acid; clear wavy boundary.

Bs1—28 to 33 inches; brown (7.5YR 4/4) sand; few fine faint strong brown (7.5YR 4/6) mottles; single grain; loose; very strongly acid; clear wavy boundary.

Bs2—33 to 39 inches; strong brown (7.5YR 4/6) sand; single grain; loose; strongly acid; clear wavy boundary.

C—39 to 60 inches; strong brown (7.5YR 5/6) fine sand; single grain; loose; strongly acid.

The thickness of the solum ranges from 20 to 50 inches. The content of fine gravel is 0 to 5 percent throughout the profile.

Some pedons have an O horizon, which consists of well decomposed forest litter 1 to 4 inches thick. The A horizon has hue of 10YR to 5YR or is neutral in hue. It has value of 2 to 4 and chroma of 0 to 2. Cultivated areas have an Ap horizon, which has hue of 10YR, value of 2 to 4, and chroma of 1 or 2.

The E horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 1 or 2. It is sand or fine sand.

The Bhsm horizon has hue of 2.5YR to 7.5YR, value of 2 or 3, and chroma of 1 to 3. It is sand or fine sand. More than 90 percent of this horizon is weakly cemented to strongly cemented. Some pedons have a Bsm horizon. This horizon is as much as 3 inches thick. It has value and chroma of 4.

The Bs horizon has hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 4 to 6. It is sand or fine sand. The content of ortstein ranges from 0 to 70 percent.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 to 6. It is sand or fine sand.

Kerston Series

The Kerston series consists of very poorly drained, moderately slowly permeable to rapidly permeable soils on flood plains. These soils formed in alternating layers of organic material and sandy alluvium. Slopes are 0 to 2 percent.

Typical pedon of Kerston muck, in an area of Kerston-Carlisle-Glendora complex, frequently flooded, 1,980 feet south and 30 feet east of the northwest corner of sec. 30, T. 19 N., R. 16 W., Sherman Township:

Oa—0 to 18 inches; muck, black (10YR 2/1) broken face and rubbed; about 15 percent fiber, 5 percent rubbed; weak thick platy structure; friable; moderately acid; abrupt wavy boundary.

C—18 to 21 inches; very pale brown (10YR 7/3) sand; single grain; loose; moderately acid; abrupt irregular boundary.

Oa′—21 to 46 inches; muck, black (5YR 2.5/1) broken face and rubbed; less than 5 percent fiber unrubbed and rubbed; weak thick platy structure; friable; strongly acid; abrupt wavy boundary.

C′—46 to 58 inches; grayish brown (2.5Y 5/2) sand; few fine black (N 2/0) organic streaks; single grain; loose; strongly acid; abrupt smooth boundary.

Oa″—58 to 72 inches; muck, black (N 2/0) broken face and rubbed; about 10 percent fiber, 5 percent rubbed; moderate thin platy structure; friable; few woody fragments ¼ to 1 inch in diameter; strongly acid.

Depth to the uppermost mineral layer ranges from 16 to 25 inches. The content of woody fragments ranges from 5 to 15 percent in the organic layers.

The Oa horizon has hue of 5YR to 10YR or is neutral in hue. It has value of 2, 2.5, or 3 and chroma of 0 or 1.

The C horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 to 3. It is fine sand or sand.

Kibbie Series

The Kibbie series consists of somewhat poorly drained, moderately permeable soils on lake plains. These soils formed in stratified, loamy lacustrine deposits. Slopes range from 0 to 3 percent.

The Kibbie soils in Mason County are taxadjuncts because they are grayer in the subsoil than is defined as the range for the series. This difference, however, does not affect the use or behavior of the soils.

Typical pedon of Kibbie loam, 0 to 3 percent slopes, 2,100 feet east and 1,080 feet north of the southwest corner of sec. 8, T. 19 N., R. 17 W., Victory Township:

Ap—0 to 9 inches; dark brown (10YR 3/3) loam, light brownish gray (10YR 6/2) dry; few fine faint grayish brown (10YR 5/2) mottles; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

E—9 to 11 inches; dark yellowish brown (10YR 4/6) loamy fine sand; few medium distinct strong brown (7.5YR 4/6) mottles; single grain; loose; moderately acid; clear wavy boundary.

Bt1—11 to 18 inches; strong brown (7.5YR 4/6) loam; few light brownish gray (10YR 6/2) coatings of very fine sand on faces of peds; few fine faint gray (10YR 6/1) mottles; moderate fine subangular blocky structure; friable; very few distinct dark brown (7.5YR 4/2) continuous clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—18 to 37 inches; brown (7.5YR 5/4) silty clay loam; common fine prominent yellowish brown (10YR 5/6) and gray (10YR 6/1) mottles; moderate fine subangular blocky structure; friable; very few distinct dark brown (7.5YR 4/2) clay films on faces of peds; slightly acid; clear wavy boundary.

C—37 to 60 inches; brown (7.5YR 5/2), stratified silty clay loam and silt loam; common medium prominent yellowish brown (10YR 5/6) and common medium and coarse distinct light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; friable; varves of very fine sand; slightly effervescent; slightly alkaline.

The thickness of the solum and the depth to free carbonates range from 26 to 40 inches.

The Ap horizon has hue of 10YR and value and chroma of 3. It is dominantly loam, but the range includes fine sandy loam and silt loam. The E horizon has hue of 10YR, value of 4, and chroma of 6.

The Bt horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is loam or silty clay loam.

The C horizon has hue of 7.5YR, value of 5 or 6, and chroma of 2 to 4. It is mainly stratified silt loam and silty clay loam. A sandy substratum phase is mapped in this survey area.

Kingsville Series

The Kingsville series consists of poorly drained, rapidly permeable soils on outwash plains, till plains, and lake plains. These soils formed in sandy glaciofluvial material. Slopes range from 0 to 2 percent.

Typical pedon of Kingsville mucky sand, 2,350 feet south and 775 feet west of the northeast corner of sec. 26, T. 20 N., R. 15 W., Meade Township:

A—0 to 6 inches; black (N 2/0) mucky sand, dark gray (10YR 4/1) dry; weak fine and medium granular structure; very friable; common fine and medium roots; moderately acid; abrupt smooth boundary.

Bg—6 to 25 inches; gray (10YR 5/1) fine sand; weak coarse subangular blocky structure; very friable; few fine and medium roots; moderately acid; clear wavy boundary.

Cg—25 to 60 inches; light brownish gray (10YR 6/2) fine sand; single grain; loose; slightly acid.

The solum ranges from 24 to 40 inches in thickness. The content of gravel is 0 to 5 percent throughout the profile.

The A or Ap horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is dominantly mucky sand, but the range includes sand and fine sand.

The Bg horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. It is fine sand or sand.

The Cg horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It is fine sand or sand.

Kinross Series

The Kinross series consists of very poorly drained, rapidly permeable soils on lake plains and outwash plains. These soils formed in sandy lacustrine material or outwash. Slopes range from 0 to 2 percent.

The Kinross soils in Mason County are taxadjuncts because they have a slightly higher temperature than is defined as the range for the series. This difference, however, does not affect the use or behavior of the soils.

Typical pedon of Kinross mucky fine sand, 1,000 feet north and 2,300 feet east of the southwest corner of sec. 35, T. 20 N., R. 17 W., Grant Township:

A—0 to 9 inches; black (N 2/0) mucky fine sand, very dark grayish brown (10YR 3/2) dry; moderate fine granular structure; friable; very strongly acid; abrupt smooth boundary.

E—9 to 12 inches; grayish brown (10YR 5/2) fine sand; weak medium subangular blocky structure; very friable; strongly acid; abrupt smooth boundary.

Bhs—12 to 24 inches; dark brown (7.5YR 3/2) fine sand; few fine distinct brown (7.5YR 4/4) mottles; single grain; loose; very strongly acid; abrupt smooth boundary.

Bs—24 to 30 inches; dark brown (7.5YR 3/4) fine sand; single grain; loose; very strongly acid; clear wavy boundary.

C1—30 to 50 inches; yellowish brown (10YR 5/6) fine sand; single grain; loose; strongly acid; gradual wavy boundary.

C2—50 to 60 inches; light yellowish brown (10YR 6/4) fine sand; single grain; loose; strongly acid.

The solum ranges from 25 to 50 inches in thickness. The content of gravel is 0 to 5 percent throughout the profile.

The A horizon is dominantly mucky fine sand. In some pedons it is muck less than 6 inches thick.

The E, Bhs, Bs, and C horizons are sand or fine sand. The E horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The Bhs horizon has hue of 5YR or 7.5YR and value and chroma of 2 or 3. The Bs horizon has hue of 5YR to 10YR and value and chroma of 3 or 4. The C horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6.

Lamson Series

The Lamson series consists of poorly drained, moderately permeable or moderately rapidly permeable soils on lake plains and water-worked till plains. These soils formed in sandy and loamy lacustrine material or water-worked till. Slopes range from 0 to 2 percent.

Typical pedon of Lamson fine sandy loam, 925 feet west and 150 feet south of the northeast corner of sec. 22, T. 19 N., R. 16 W., Sherman Township:

Ap—0 to 13 inches; very dark gray (10YR 3/1) fine sandy loam, light gray (10YR 6/1) dry; weak medium subangular blocky structure; friable; moderately acid; abrupt smooth boundary.

Eg—13 to 15 inches; light brownish gray (10YR 6/2) sand; massive; friable; moderately acid; clear broken boundary.

Bw—15 to 18 inches; yellowish brown (10YR 5/4) loamy fine sand; few fine faint yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; moderately acid; clear broken boundary.

Bg—18 to 31 inches; gray (10YR 6/1) sandy clay loam; common fine and medium prominent brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; moderately acid; abrupt broken boundary.

C—31 to 40 inches; yellowish brown (10YR 5/6) sandy loam; few fine distinct yellowish brown (10YR 5/4) mottles; massive; friable; many strata of loamy fine sand and silt loam ¼ to ½ inch thick; slightly acid; clear wavy boundary.

Cg—40 to 60 inches; light brownish gray (10YR 6/2) fine sand; few coarse faint brown (10YR 5/3) mottles; single grain; loose; many strata of sand and silt loam ⅛ to ½ inch thick; slightly acid.

The thickness of the solum ranges from 30 to 50 inches. The content of gravel is 0 to 5 percent throughout the profile.

The Ap horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is dominantly fine sandy loam, but the range includes loamy fine sand. The Eg horizon has hue of 10YR, value of 6, and chroma of 2.

The Bw horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4. It is loamy fine sand or sandy loam. The Bg horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2.

The C and Cg horizons have hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 6. They are stratified fine sand, sandy loam, silt loam, or sandy clay loam.

Loxley Series

The Loxley series consists of very poorly drained, moderately rapidly permeable to moderately slowly permeable soils in closed depressions on outwash plains and moraines. These soils formed in organic material. Slopes range from 0 to 2 percent.

The Loxley soils in Mason County are taxadjuncts because they have a slightly higher temperature than is defined as the range for the series. This difference, however, does not affect the use or behavior of the soils.

Typical pedon of Loxley muck, in an area of Loxley and Dawson soils, 200 feet north and 2,200 feet east of the southwest corner of sec. 5, T. 19 N., R. 15 W., Sheridan Township:

Oa1—0 to 12 inches; muck, black (5YR 2.5/1) broken face, dark reddish brown (5YR 2/2) rubbed; about 15 percent fiber, 10 percent rubbed; weak fine granular structure; very friable; extremely acid; gradual wavy boundary.

Oa2—12 to 36 inches; muck, black (5YR 2.5/1) broken face, black (10YR 2/1) rubbed; about 10 percent fiber, 5 percent rubbed; weak fine granular structure; friable; extremely acid; gradual wavy boundary.

Oa3—36 to 70 inches; muck, black (5YR 2.5/1) broken face, black (10YR 2/1) rubbed; about 10 percent fiber, 5 percent rubbed; weak fine granular structure; friable; extremely acid.

The organic material is more than 51 inches thick. The surface layer is dominantly muck, but the range includes mucky peat and peat. The organic layers have hue of 2.5YR to 10YR, value of 2, 2.5, or 3, and chroma of 1 or 2.

Marlette Series

The Marlette series consists of well drained, moderately slowly permeable soils on moraines and till plains. These soils formed in loamy glacial till. Slopes range from 0 to 45 percent.

Typical pedon of Marlette fine sandy loam, 2 to 6 percent slopes, 1,600 feet south and 1,650 feet west of the northeast corner of sec. 28, T. 18 N., R. 16 W., Custer Township:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam, gray (10YR 6/1) dry; moderate medium subangular blocky structure; friable; about 1 percent fine gravel; slightly acid; abrupt smooth boundary.

B/E—9 to 18 inches; about 60 percent strong brown (7.5YR 4/6) clay loam (Bt) surrounded by or penetrated by tongues of light brownish gray (10YR 6/2) fine sandy loam (E); moderate medium subangular blocky structure; friable; common distinct dark brown (7.5YR 3/4) clay films on faces of peds in the Bt part; about 1 percent fine gravel; slightly acid; gradual wavy boundary.

Bt—18 to 34 inches; dark brown (7.5YR 4/4) clay loam;

moderate medium subangular blocky structure; firm; common faint dark brown (7.5YR 3/4) clay films on faces of peds; about 1 percent fine gravel; slightly acid; clear wavy boundary.

BC—34 to 38 inches; dark brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; about 2 percent fine gravel; neutral; clear wavy boundary.

C—38 to 60 inches; brown (7.5YR 5/4) clay loam; massive; firm; about 2 percent fine gravel; slight effervescence; slightly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches. The content of gravel is 1 to 5 percent throughout the profile.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 1 to 3. It is dominantly fine sandy loam, but the range includes loam and sandy loam. Some pedons have an E horizon, which has colors and textures similar to those of the E part of the B/E horizon.

The Bt part of the B/E horizon has colors similar to those of the Bt horizon. The E part has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It is sandy loam or fine sandy loam.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. It is silty clay loam, clay loam, or loam.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. It is mainly clay loam or loam, but pockets of sand or loamy sand are in some pedons.

Martisco Series

The Martisco series consists of very poorly drained soils in depressions on outwash plains and moraines. These soils formed in organic material that is 8 to 16 inches deep over deposits of marl. Permeability is moderate or moderately rapid in the organic material. Slopes range from 0 to 2 percent.

Typical pedon of Martisco muck, in an area of Edwards and Martisco mucks, 1,200 feet east and 75 feet south of the northwest corner of sec. 9, T. 18 N., R. 15 W., Branch Township:

Oa—0 to 8 inches; muck, black (N 2/0) broken faced and rubbed; about 10 percent fiber, less than 5 percent rubbed; weak fine granular structure; friable; slightly alkaline; abrupt smooth boundary.

Cg1—8 to 25 inches; gray (5Y 6/1) marl; massive; friable; violently effervescent; slightly alkaline; gradual wavy boundary.

Cg2—25 to 38 inches; gray (5Y 5/1) marl; massive; friable; violently effervescent; moderately alkaline; gradual wavy boundary.

Cg3—38 to 60 inches; gray (5Y 6/1) marl; massive; friable; violently effervescent; slightly alkaline.

The Oa horizon ranges from 8 to 16 inches in thickness. It has hue of 10YR or is neutral in hue. It has value of 2 and chroma of 0 or 1. The Cg horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1.

Mollic Psammaquents

These soils are mixed, mesic Mollic Psammaquents. They are poorly drained, rapidly permeable soils on flood plains, lake plains, and till plains. These soils formed in dominantly sandy glaciofluvial material. Slopes range from 0 to 2 percent.

Reference pedon of Mollic Psammaquents, 460 feet south and 1,320 feet west of the northeast corner of sec. 22, T. 20 N., R. 17 W., Grant Township:.

Oa—0 to 3 inches; muck, black (10YR 2/1) broken face and rubbed; about 20 percent fiber, less than 15 percent rubbed; weak fine granular structure; neutral; abrupt smooth boundary.

A—3 to 6 inches; black (10YR 2/1) fine sandy loam; weak medium granular structure; very friable; many very fine and fine roots; neutral; clear smooth boundary.

Cg—6 to 9 inches; light brownish gray (10YR 6/2) loamy sand; common fine distinct strong brown (7.5YR 5/6) mottles; massive; friable; many fine roots; neutral; abrupt irregular boundary.

C1—9 to 18 inches; brown (10YR 4/3) sand; massive; very friable; neutral; clear wavy boundary.

C2—18 to 60 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; neutral.

The thickness of the Oa horizon ranges from 2 to 7 inches.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. It is dominantly fine sandy loam, but the range includes loamy sand.

The Cg horizon has hue of 10YR, value of 4 to 6, and chroma of 2. It is sand or loamy sand.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is mainly sand or loamy sand, but strata of fine sand or coarse sand are in some pedons.

Nordhouse Series

The Nordhouse series consists of excessively drained, rapidly permeable soils on dunes. These soils formed in sandy eolian material. Slopes range from 3 to 75 percent.

Typical pedon of Nordhouse fine sand, 3 to 18 percent slopes, 2,600 feet south and 1,600 feet east of the northwest corner of sec. 28, T. 19 N., R. 18 W., Hamlin Township:

Oa—1 inch to 0; very dark grayish brown (10YR 3/2), well decomposed leaf litter; moderately acid; abrupt smooth boundary.
A1—0 to 4 inches; black (10YR 2/1) fine sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; common fine and many medium roots; slightly acid; clear broken boundary.
A2—4 to 6 inches; very dark gray (10YR 3/1) fine sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; many fine and few medium and coarse roots; neutral; abrupt smooth boundary.
E—6 to 18 inches; light brownish gray (10YR 6/2) fine sand; single grain; loose; many fine and few medium roots; neutral; gradual wavy boundary.
Bs1—18 to 25 inches; brownish yellow (10YR 6/6) fine sand; single grain; loose; few fine and medium roots; neutral; clear wavy boundary.
Bs2—25 to 49 inches; yellowish brown (10YR 5/6) fine sand; single grain; loose; neutral; clear wavy boundary.
C—49 to 72 inches; light yellowish brown (10YR 6/4) fine sand; single grain; loose; neutral.

The thickness of the solum ranges from 23 to 50 inches.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 to 3. The Bs 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 6 or 7, and chroma of 3 to 6.

Parkhill Series

The Parkhill series consists of poorly drained, moderately slowly permeable soils on till plains and moraines. These soils formed in loamy glacial till. Slopes range from 0 to 2 percent.

Typical pedon of Parkhill loam, 60 feet south and 790 feet west of the northeast corner of sec. 18, T. 19 N., R. 17 W., Victory Township:

A—0 to 8 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; friable; slightly acid; abrupt wavy boundary.
Bg1—8 to 18 inches; gray (5Y 6/1) silty clay loam; common coarse prominent brownish yellow (10YR 6/6) and few medium prominent very pale brown (10YR 8/4) mottles; moderate medium angular blocky structure; about 2 percent fine gravel; slightly acid; gradual wavy boundary.
Bg2—18 to 35 inches; gray (5Y 6/1) clay loam; many medium prominent brown (7.5YR 5/4) mottles; weak coarse angular blocky structure; firm; about 2 percent fine gravel; neutral; gradual wavy boundary.
Bw—35 to 60 inches; yellowish brown (10YR 5/4) clay loam; many medium prominent gray (5Y 6/1) mottles; weak fine subangular blocky structure; firm; about 2 percent fine gravel; few thin white (10YR 8/1) streaks of lime; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 40 to more than 60 inches. The depth to carbonates ranges from 22 to 40 inches. The content of gravel is 0 to 10 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The Bg horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam or clay loam.

The Bw horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 to 4. It is clay loam or loam.

Perrinton Series

The Perrinton series consists of well drained, slowly permeable soils on till plains and moraines. These soils formed in clayey or loamy glacial till. Slopes range from 2 to 35 percent.

Typical pedon of Perrinton loam, 12 to 18 percent slopes, 2,500 feet south and 50 feet east of the northwest corner of sec. 17, T. 17 N., R. 16 W., Eden Township:

Ap—0 to 7 inches; dark brown (10YR 3/3) loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; about 2 percent fine gravel; neutral; abrupt smooth boundary.
E/B—7 to 10 inches; about 65 percent light brownish gray (10YR 6/2) fine sandy loam (E) occurring as tongues extending into or surrounding isolated remnants of dark brown (7.5YR 4/4) clay loam (Bt); moderate medium subangular blocky structure; firm; about 2 percent fine gravel; neutral; abrupt smooth boundary.
B/E—10 to 15 inches; about 65 percent dark brown (7.5YR 4/4) clay loam (Bt) surrounded by or penetrated by tongues of light brownish gray (10YR 6/2) fine sandy loam (E); moderate medium subangular blocky structure; firm; common distinct dark brown (7.5YR 4/2) clay films on faces of peds in the Bt part; about 2 percent gravel; neutral; clear wavy boundary.

Bt1—15 to 24 inches; dark brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common faint dark brown (7.5YR 3/4) clay films on faces of peds; about 2 percent fine gravel; slightly alkaline; clear wavy boundary.

Bt2—24 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium subangular blocky structure; firm; few fine faint brown (7.5YR 4/4) clay flows in root channels; about 2 percent fine gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

Bw—30 to 60 inches; yellowish brown (10YR 5/4) clay loam; weak fine subangular structure; firm; about 3 percent fine gravel; common white (10YR 8/1) streaks of lime; slightly effervescent; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 40 to more than 60 inches. The content of gravel is 2 to 5 percent throughout the profile.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 1 to 3. It is dominantly loam, but the range includes fine sandy loam and clay loam. Some pedons have an E horizon.

The E part of the E/B and B/E horizons has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. It is loam or fine sandy loam. The Bt part has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 3 or 4.

The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 3 or 4. It is silty clay loam, clay loam, silty clay, or clay.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. It is clay loam, silty clay loam, or clay.

Pipestone Series

The Pipestone series consists of somewhat poorly drained, mainly rapidly permeable soils on lake plains and outwash plains. Permeability in a loamy substratum phase is moderately slow. These soils formed in sandy lacustrine material or outwash. Slopes range from 0 to 4 percent.

Typical pedon of Pipestone fine sand, 0 to 4 percent slopes, 2,500 feet north and 2,200 feet east of the southwest corner of sec. 5, T. 19 N., R. 17 W., Victory Township:

A—0 to 4 inches; dark brown (7.5YR 3/2) fine sand, dark brown (7.5YR 4/2) dry; weak fine granular structure; very friable; very strongly acid; abrupt wavy boundary.

E—4 to 11 inches; light brownish gray (10YR 6/2) fine sand; common fine faint dark grayish brown (10YR 4/2) mottles; weak fine granular structure; very friable; very strongly acid; clear wavy boundary.

Bhs—11 to 14 inches; dark reddish brown (5YR 3/2) fine sand; common fine prominent brown (10YR 5/3) mottles; weak fine granular structure; very friable; very strongly acid; clear wavy boundary.

Bs—14 to 40 inches; strong brown (7.5YR 5/6) sand; common medium faint strong brown (7.5YR 4/6) mottles; weak fine granular structure; very friable; very strongly acid; clear wavy boundary.

C—40 to 60 inches; yellowish brown (10YR 5/4) sand; single grain; loose; moderately acid.

The thickness of the solum ranges from 22 to 50 inches.

The A horizon has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 1 or 2. It is fine sand or sand. Some pedons have an Ap horizon.

The E horizon has hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 2. It is fine sand or sand.

The Bhs horizon has hue of 5YR, value of 3, and chroma of 2. The Bs horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. The Bhs and Bs horizon are sand or fine sand. Some pedons have a BC horizon.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 6. It is mainly sand or fine sand, but in some pedons loamy material is at a depth of more than 40 inches.

Plainfield Series

The Plainfield series consists of excessively drained, rapidly permeable soils on outwash plains. These soils formed in sandy outwash. Slopes range from 0 to 30 percent.

Typical pedon of Plainfield sand, 0 to 6 percent slopes, 50 feet north and 1,320 feet east of the southwest corner of sec. 2, T. 17 N., R. 16 W., Eden Township:

A—0 to 3 inches; very dark gray (10YR 3/1) sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; common fine and few medium roots; very strongly acid; abrupt wavy boundary.

Bw1—3 to 27 inches; brown (7.5YR 4/4) sand; single grain; loose; common medium roots; strongly acid; clear wavy boundary.

C1—27 to 50 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; about 2 percent fine gravel; few medium roots; moderately acid; clear wavy boundary.

C2—50 to 60 inches; very pale brown (10YR 7/4) sand; single grain; loose; about 3 percent fine gravel; moderately acid.

The solum ranges from 18 to 34 inches in thickness. The content of gravel is 0 to 15 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. Some pedons have a BC horizon.

The C horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 4 to 8. It is typically sand, but thin layers of fine sand are in some pedons.

Poy Series

The Poy series consists of poorly drained soils on lake plains. These soils formed in clayey lacustrine material over sandy lacustrine material. Permeability is slow in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Poy silty clay loam, 1,300 feet west and 75 feet north of the southeast corner of sec. 16, T. 19 N., R. 16 W., Sherman Township:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; many fine roots; moderately acid; abrupt wavy boundary.

Bg—8 to 18 inches; gray (5Y 5/1) silty clay; many medium prominent olive yellow (2.5Y 6/8) mottles; moderate medium angular blocky structure; firm; few fine roots; moderately acid; clear wavy boundary.

Cg—18 to 23 inches; gray (5Y 5/1) silty clay; many medium prominent olive yellow (2.5Y 6/8) and few fine prominent dark gray (10YR 4/1) mottles; massive; firm; moderately alkaline; abrupt smooth boundary.

2C—23 to 60 inches; light brownish gray (10YR 6/2) sand; many coarse prominent brownish yellow (10YR 6/6) mottles; single grain; loose; slightly alkaline.

The depth to sandy material ranges from 20 to 35 inches.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It is dominantly silty clay loam, but the range includes loam and silt loam.

The Bg horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 or 2. It is silty clay or silty clay loam.

The Cg horizon has hue of 10YR to 5Y, value of 5, and chroma of 1. It is silty clay or silty clay loam.

The 2C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 6. It is sand or loamy sand.

Remus Series

The Remus series consists of well drained, moderately slowly permeable soils on moraines. These soils formed in loamy glacial till. Slopes range from 1 to 30 percent.

Typical pedon of Remus fine sandy loam, in an area of Remus-Spinks complex, 12 to 18 percent slopes, 160 feet north and 1,220 feet west of the southeast corner of sec. 34, T. 19 N., R. 15 W., Sherman Township:

A—0 to 6 inches; brown (10YR 4/3) fine sandy loam, light gray (10YR 7/2) dry; moderate medium granular structure; friable; strongly acid; abrupt wavy boundary.

E/B—6 to 15 inches; about 55 percent light yellowish brown (10YR 6/4) fine sandy loam (E) extending into or surrounding isolated remnants of reddish brown (5YR 4/4) sandy clay loam (Bt); moderate medium subangular blocky structure; friable; strongly acid; gradual wavy boundary.

B/E—15 to 34 inches; about 85 percent reddish brown (5YR 4/4) sandy clay loam (Bt) surrounded by brown (10YR 5/3) sandy loam (E); moderate medium subangular blocky structure; friable; strongly acid; gradual wavy boundary.

Bt1—34 to 42 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; friable; many distinct reddish brown (5YR 4/4) continuous clay films on faces of peds and in pores; moderately acid; clear wavy boundary.

Bt2—42 to 50 inches; reddish brown (5YR 5/4) loam; moderate fine subangular blocky structure; friable; few faint discontinuous reddish brown (5YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bw—50 to 60 inches; brown (7.5YR 5/4) loam; weak fine subangular blocky structure; firm; few discontinuous prominent white (N 8/0) streaks of lime; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 40 to more than 60 inches.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 2 or 3. Some pedons have an Ap horizon, which has colors similar to those of the A horizon.

The E part of the E/B and B/E horizons has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is fine sandy loam or sandy loam. The Bt part has colors and textures similar to those of the Bt horizon.

The Bt horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 4 to 6. The Bw horizon has hue of 7.5YR, value of 4 to 6, and chroma of 3 or 4. The Bt and Bw horizons are loam or sandy clay loam.

Saugatuck Series

The Saugatuck series consists of somewhat poorly drained soils on lake plains and outwash plains. These soils formed in sandy outwash or lacustrine material. They have a cemented layer. Permeability is moderate in the cemented layer and rapid in the rest of the profile. Slopes range from 0 to 4 percent.

Typical pedon of Saugatuck sand, in an area of Pipestone-Saugatuck sands, 0 to 4 percent slopes, 2,400 feet south and 1,000 feet east of the northwest corner of sec. 31, T. 19 N., R. 17 W., Victory Township:

A—0 to 2 inches; black (N 2/0) sand, very dark gray (5YR 3/1) dry; weak medium granular structure; very friable; many fine and medium and common coarse roots; strongly acid; abrupt wavy boundary.

E—2 to 12 inches; light gray (10YR 7/1) sand; few fine faint light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; very friable; common fine and few medium and coarse roots; very strongly acid; abrupt smooth boundary.

Bhsm—12 to 24 inches; very dusky red (2.5YR 2.5/2) sand; common medium distinct dark reddish brown (2.5YR 3/4) mottles; massive; strongly cemented ortstein; strongly acid; clear irregular boundary.

Bs—24 to 45 inches; yellowish brown (10YR 5/6) sand; many fine distinct light brownish gray (10YR 6/2) mottles; single grain; loose; strongly acid; clear wavy boundary.

C—45 to 60 inches; yellowish brown (10YR 5/4) sand; many fine distinct light brownish gray (10YR 6/2) mottles; single grain; loose; moderately acid.

The solum ranges from 20 to 50 inches in thickness.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. Some pedons have a surface layer of partially decomposed forest litter or an Ap horizon.

The E, Bhsm, Bs, and C horizons are sand or fine sand. The E horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 1 or 2. The Bhsm horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 2, 2.5, or 3, and chroma of 2 or 3. More than 90 percent of this horizon is weakly cemented to strongly cemented. The Bs horizon has hue of 5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 3 to 6. The C horizon has value of 4 or 6 and chroma of 3 or 4. Some pedons have a BC horizon, which is sand or fine sand.

Scalley Series

The Scalley series consists of well drained soils on moraines. These soils formed in loamy glacial till over sandy glacial drift. Permeability is moderately slow in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 18 percent.

Typical pedon of Scalley fine sandy loam, 2 to 6 percent slopes, 2,500 feet east and 500 feet north of the southwest corner of sec. 22, T. 17 N., R. 16 W., Eden Township:

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

B/E—6 to 9 inches; about 70 percent strong brown (7.5YR 4/6) clay loam (Bt) surrounded by pale brown (10YR 6/3) fine sandy loam (E); moderate medium subangular blocky structure; firm; neutral; clear wavy boundary.

Bt1—9 to 18 inches; strong brown (7.5YR 4/6) clay loam; moderate medium angular blocky structure; firm; few faint dark brown (7.5YR 3/4) clay films on faces of peds; neutral; clear wavy boundary.

Bt2—18 to 23 inches; dark brown (7.5YR 4/4) clay loam; weak medium subangular blocky structure; firm; few faint dark brown (7.5YR 3/4) clay films on faces of peds; neutral; clear irregular boundary.

2C—23 to 60 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few bands of dark brown (7.5YR 4/4) sandy loam as much as 1 inch thick; neutral.

Depth to the 2C horizon ranges from 22 to 40 inches. The content of gravel is 0 to 10 percent in the solum and 0 to 15 percent in the sandy horizons.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. It is dominantly fine sandy loam, but the range includes loam.

Some pedons have an E horizon. The E horizon and E part of the B/E horizon have hue of 10YR, value of 6, and chroma of 3. They are fine sandy loam or sandy loam. The Bt part of the B/E horizon has hue of 7.5YR, value of 4, and chroma of 6. It is loam or clay loam.

The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 3 to 6. It is loam, clay loam, or silty clay loam.

Some pedons have a thin C horizon, which is loam or clay loam. The 2C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. It is sand, fine sand, loamy sand, or the gravelly analogs of those textures or is stratified sand and loamy sand.

Sickles Series

The Sickles series consists of poorly drained soils on lake plains and till plains. These soils formed in sandy glaciofluvial material over clayey lacustrine material or till. Permeability is rapid in the upper part of the profile and very slow in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Sickles loamy sand, 1,850 feet west and 325 feet north of the southeast corner of sec. 14, T. 17 N., R. 15 W., Logan Township:

Ap—0 to 8 inches; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; weak fine granular structure; slightly acid; abrupt smooth boundary.

Cg1—8 to 18 inches; dark grayish brown (10YR 4/2) sand; few medium faint brown (10YR 5/3) mottles; single grain; loose; moderately acid; clear wavy boundary.

Cg2—18 to 22 inches; grayish brown (10YR 5/2) sand; few medium faint brown (10YR 5/3) mottles; single grain; loose; neutral; abrupt smooth boundary.

2Bw1—22 to 30 inches; reddish brown (5YR 5/3) silty clay; few fine prominent gray (N 5/0); many medium prominent dark gray (10YR 4/1), and many fine prominent strong brown (7.5YR 5/6) mottles; strong medium and fine angular blocky structure; firm; slightly alkaline; clear wavy boundary.

2Bw2—30 to 42 inches; reddish brown (5YR 5/3) silty clay; many medium and coarse prominent greenish gray (5GY 5/1) and many fine and medium prominent yellowish brown (10YR 5/8) mottles; strong medium and fine angular blocky structure; firm; many medium light greenish gray (5GY 7/1) platelike soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

2Bw3—42 to 60 inches; reddish brown (5YR 5/3) silty clay; many medium prominent yellowish brown (10YR 5/8) and gray (5Y 5/1) mottles; moderate medium subangular blocky structure; firm; fine white (10YR 8/1) streaks of lime; violently effervescent; moderately alkaline.

Depth to the 2Bw horizon ranges from 20 to 40 inches. The content of gravel is 0 to 5 percent throughout the profile.

The Ap horizon has hue of 10YR or is neutral in hue. It has value of 2 and chroma or 0 or 1. It is dominantly loamy sand, but the range includes sandy loam.

The Cg horizon has hue of 10YR, value of 4 to 6, and chroma of 2. It is sand, fine sand, or loamy fine sand.

The 2Bw horizon has hue of 5YR to 2.5Y, value of 5, and chroma of 1 to 3. It is mainly silty clay or silty clay loam, but some pedons have lenses of sand.

Sloan Series

The Sloan series consists of very poorly drained, moderately slowly permeable soils on flood plains. These soils formed in loamy alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Sloan silt loam, 2,600 feet east and 1,000 feet south of the northwest corner of sec. 8, T. 19 N., R. 17 W., Victory Township:

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; friable; moderately acid; abrupt smooth boundary.

A—10 to 18 inches; very dark gray (10YR 3/1) silt loam; weak medium subangular blocky structure; friable; slightly alkaline; abrupt smooth boundary.

Bg—18 to 36 inches; dark gray (10YR 4/1) silt loam; many medium prominent yellowish brown (10YR 5/8) and many medium faint gray (10YR 5/1) mottles; weak coarse subangular blocky structure; friable; moderately alkaline; clear wavy boundary.

Cg—36 to 60 inches; gray (10YR 5/1) silt loam; many medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; streaks of black (10YR 2/1) organic material; moderately alkaline.

The thickness of the solum ranges from 20 to 36 inches. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. The C horizon has hue of 10YR to 5Y, value of 5, and chroma of 1. It is silt loam, clay loam, or silty clay loam.

Spinks Series

The Spinks series consists of well drained, moderately rapidly permeable soils on moraines and outwash plains. These soils formed in sandy glaciofluvial material (fig. 14). Slopes range from 0 to 40 percent.

Typical pedon of Spinks sand, in an area of Spinks-Coloma sands, 0 to 6 percent slopes, 3,960 feet east and 75 feet north of the southwest corner of sec. 3, T. 17 N., R. 16 W., Eden Township:

A—0 to 4 inches; very dark grayish brown (10YR 3/2) sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; many fine roots; strongly acid; abrupt smooth boundary.

E—4 to 28 inches; yellowish brown (10YR 5/8) sand; weak fine granular structure; very friable; few fine roots; about 4 percent gravel; strongly acid; abrupt wavy boundary.

E and Bt1—28 to 41 inches; very pale brown (10YR 7/4) sand (E); lamellae of strong brown (7.5YR 5/6) loamy sand (Bt); weak fine granular structure; very friable; clay bridges between sand grains; few fine roots; about 5 percent gravel; moderately acid; clear wavy boundary.

E and Bt2—41 to 60 inches; light yellowish brown (10YR 6/4) sand (E); lamellae of strong brown (7.5YR 4/6) loamy sand (Bt); weak medium subangular blocky structure; very friable; clay bridges between sand grains; common fine roots; about 10 percent gravel; moderately acid.

The solum ranges from 36 to more than 60 inches in thickness. The content of gravel is 0 to 15 percent in the solum.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is dominantly sand, but the range includes loamy sand. Some pedons have an Ap horizon.

The E horizon and the E part of the E and Bt horizon have hue of 10YR, value of 4 to 7, and chroma of 2 to 8. They are sand, fine sand, or loamy sand.

The Bt part of the E and Bt horizon consists of lamellae that are 5 to 10 inches apart, are ¼ inch to 5 inches thick, and have a total thickness of more than 6 inches. Depth to the uppermost lamellae ranges from 15 to 40 inches. The lamellae have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. They are loamy sand, loamy fine sand, or sandy loam.

Tekenink Series

The Tekenink series consists of well drained, moderately permeable soils on till plains and moraines. These soils formed in loamy glacial till. Slopes range from 2 to 25 percent.

Typical pedon of Tekenink loamy fine sand, 2 to 6 percent slopes, 1,400 feet west and 550 feet south of the northeast corner of sec. 2, T. 19 N., R. 15 W., Sherman Township:

A—0 to 4 inches; very dark gray (N 3/0) loamy fine sand, gray (10YR 5/1) dry; moderate fine granular structure; very friable; moderately acid; clear wavy boundary.

E—4 to 17 inches; yellowish brown (10YR 5/6) loamy fine sand; weak fine subangular blocky structure; very friable; strongly acid; clear wavy boundary.

E/Bt—17 to 45 inches; about 70 percent pinkish gray (7.5YR 7/2) loamy sand (E) extending into or surrounding isolated remnants of reddish brown (5YR 5/4) sandy loam (Bt); weak coarse subangular blocky structure; friable; few faint reddish brown (5YR 4/4) clay films on faces of peds; moderately acid; clear wavy boundary.

B/E—45 to 62 inches; about 85 percent reddish brown (5YR 5/4) sandy loam (Bt) surrounded by pale brown (10YR 6/3) loamy sand (E); few faint reddish brown (5YR 4/4) clay films on faces of peds and in pores; moderate medium subangular blocky structure; friable; moderately acid; clear wavy boundary.

Bt—62 to 72 inches; brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; few distinct reddish brown (5YR 4/4) clay films on faces of peds; neutral.

The solum is more than 60 inches thick.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3. It is dominantly loamy fine sand, but the range includes loamy sand.

The E horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 6. It is loamy sand or loamy fine sand.

The E part of the E/Bt horizon and the B/E horizon has hue of 7.5YR or 10YR, value of 6, and chroma of 2 to 4. It is loamy sand or loamy fine sand. The B part has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4. It is sandy loam, loam, or sandy clay loam. Some pedons have a C horizon.

Thetford Series

The Thetford series consists of somewhat poorly drained, moderately rapidly permeable soils on lake plains and outwash plains. These soils formed in sandy lacustrine material or outwash. Slopes range from 0 to 4 percent.

Typical pedon of Thetford fine sand, 0 to 4 percent slopes, 925 feet west and 2,245 feet south of the northeast corner of sec. 22, T. 19 N., R. 16 W., Sherman Township:

Ap—0 to 13 inches; dark brown (10YR 3/3) fine sand, yellowish brown (10YR 5/4) dry; weak fine granular structure; very friable; strongly acid; abrupt smooth boundary.

E1—13 to 19 inches; yellowish brown (10YR 5/4) fine sand; few fine distinct grayish brown (10YR 5/2) and prominent strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; very friable; strongly acid; clear wavy boundary.

E2—19 to 34 inches; light yellowish brown (10YR 6/4) fine sand; few fine distinct dark yellowish brown (10YR 4/4) and prominent strong brown (7.5YR 5/8) mottles; single grain; loose; moderately acid; clear wavy boundary.

E and Bt1—34 to 41 inches; pale brown (10YR 6/3) fine sand (E); single grain; loose; lamellae of dark yellowish brown (10YR 4/4) loamy fine sand (Bt);

few fine distinct brownish yellow (10YR 6/6) and few fine faint light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; very friable; clay bridges between sand grains; moderately acid; clear wavy boundary.

E and Bt2—41 to 60 inches; pale brown (10YR 6/3) fine sand (E); single grain; loose; lamellae of dark yellowish brown (10YR 4/4) loamy fine sand (Bt); common coarse faint light brownish gray (10YR 6/2) and common coarse distinct yellowish brown (10YR 5/6) mottles; weak fine granular structure; very friable; clay bridges between sand grains; moderately acid.

The solum is more than 60 inches thick. Depth to the uppermost lamellae ranges from 26 to 34 inches.

The Ap horizon has hue of 10YR and value and chroma of 3. It is dominantly fine sand, but the range includes loamy fine sand and sand.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 4. They are fine sand, sand, or loamy fine sand.

The E part of the E and Bt horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is sand or fine sand. The Bt part has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It occurs as lamellae of loamy fine sand, loamy sand, or fine sandy loam. The total thickness of the lamellae is more than 6 inches. In some pedons a C horizon is at a depth of less than 60 inches.

Tuscola Series

The Tuscola series consists of moderately well drained, moderately permeable soils on lake plains and water-worked till plains. These soils formed in stratified, loamy lacustrine material or water-worked till. Slopes range from 0 to 6 percent.

Typical pedon of Tuscola silt loam, 0 to 6 percent slopes, 2,490 feet east and 2,000 feet south of the northwest corner of sec. 8, T. 19 N., R. 17 W., Victory Township:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

Bt1—9 to 18 inches; dark brown (7.5YR 4/4) silty clay loam; common distinct pinkish gray (7.5YR 7/2) coatings of very fine sandy loam; weak medium subangular blocky structure; friable; common faint dark brown (7.5YR 3/4) discontinuous clay films on faces of peds; slightly acid; abrupt smooth boundary.

Bt2—18 to 30 inches; yellowish brown (10YR 5/6) silty clay loam; common coarse distinct light olive brown (2.5Y 5/6), few fine prominent gray (10YR 6/1), and many medium distinct light yellowish brown (2.5Y 6/4) mottles; moderate fine subangular blocky structure; friable; common distinct dark brown (7.5YR 3/4) discontinuous clay films on faces of peds; neutral; abrupt smooth boundary.

C1—30 to 49 inches; yellowish brown (10YR 5/6) and light olive brown (2.5Y 5/6), stratified silt loam, very fine sand, and fine sand; few fine distinct strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) and many medium distinct light yellowish brown (10YR 6/4) mottles; massive; friable; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C2—49 to 60 inches; strong brown (7.5YR 5/6) silt loam; many medium distinct strong brown (7.5YR 4/6) and common coarse prominent light gray (10YR 7/1) mottles; common fine soft masses of calcium carbonate; massive; friable; violently effervescent; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 30 to 48 inches.

The Ap horizon has hue of 10YR, value of 3, and chroma of 2. It is dominantly silt loam, but the range includes fine sandy loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam, clay loam, or silt loam.

The C horizon has hue of 7.5YR to 10YR, value of 4 or 5, and chroma of 3 to 6. It is stratified silty clay loam, silt loam, fine sand, or very fine sand.

Tustin Series

The Tustin series consists of well drained soils on till plains and moraines. These soils formed in sandy deposits and in the underlying clayey lacustrine material. Permeability is rapid in the upper part of the profile and slow in the lower part. Slopes range from 0 to 6 percent.

Typical pedon of Tustin loamy fine sand, 0 to 6 percent slopes, 2,250 feet south and 20 feet west of the northeast corner of sec. 17, T. 19 N., R. 16 W., Sherman Township:

Ap—0 to 9 inches; very dark gray (10YR 3/1) loamy fine sand, gray (10YR 6/1) dry; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

Bw1—9 to 17 inches; dark brown (7.5YR 4/4) loamy fine sand; weak medium subangular blocky structure; very friable; moderately acid; clear wavy boundary.

Bw2—17 to 28 inches; strong brown (7.5YR 4/6) loamy fine sand; weak medium subangular blocky structure; very friable; moderately acid; clear wavy boundary.

Bw3—28 to 29 inches; brown (10YR 5/3) loamy fine sand; weak medium subangular blocky structure; very friable; moderately acid; abrupt broken boundary.

2Bt—29 to 37 inches; reddish brown (5YR 4/4) silty clay; strong medium subangular blocky structure; firm; many thin faint reddish brown (5YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

2C—37 to 60 inches; brown (10YR 5/3) silty clay loam; massive; firm; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 37 to 58 inches. The thickness of the sandy material ranges from 20 to 36 inches. The content of gravel is 0 to 5 percent throughout the profile.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly loamy fine sand, but the range includes loamy sand and sand.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 3 to 6. It is loamy fine sand, fine sand, or sand.

The 2Bt horizon has hue of 5YR to 10YR and value and chroma of 3 or 4. It is silty clay, silty clay loam, or clay.

The 2C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is silty clay loam or silty clay.

Typic Haplaquods, Sandy

These soils are sandy, mixed, mesic Typic Haplaquods. They are very poorly drained, rapidly permeable soils on lake plains and outwash plains. The soils formed in sandy lacustrine material or outwash. Slopes range from 0 to 2 percent.

Reference pedon of Typic Haplaquods, sandy, 260 feet south and 1,584 feet east of the center of sec. 15, T. 20 N., R. 17 W., Grant Township:

A—0 to 4 inches; black (10YR 2/1) mucky sand, very dark gray (10YR 3/1) dry; weak medium granular structure; very friable; many very fine and fine roots; strongly acid; clear smooth boundary.

E—4 to 7 inches; grayish brown (10YR 5/2) sand; few distinct brown (7.5YR 5/2) mottles; weak medium granular structure; very friable; common fine roots; strongly acid; abrupt irregular boundary.

Bhs—7 to 9 inches; dark reddish brown (5YR 2.5/2) sand; moderate medium subangular blocky structure; friable; strongly acid; clear wavy boundary.

Bs—9 to 25 inches; dark brown (7.5YR 4/4) sand; weak medium subangular blocky structure; friable; strongly acid; gradual wavy boundary.

C—25 to 60 inches; yellowish brown (10YR 5/4) sand; single grain; loose; strongly acid.

The thickness of the solum ranges from 20 to 50 inches. The thickness of the surface layer ranges from 2 to 10 inches.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. In some pedons it is sand, fine sand, or loamy sand. The E horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 2 to 4.

The Bhs horizon has hue of 5YR or 7.5YR, value of 2, 2.5, or 3, and chroma of 1 to 3. Less than 30 percent of this horizon is weakly cemented ortstein. The Bs horizon has hue of 7.5YR, value of 3 to 5, and chroma of 3 to 6.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. In some pedons strata of loamy fine sand to coarse sand are in and below the C horizon.

Typic Haplaquolls, Sandy Over Loamy

These soils are sandy over loamy, mixed, mesic Typic Haplaquolls. They are very poorly drained soils on till plains, flood plains, and lake plains. The soils formed in lacustrine sediments or glacial till. They are sandy in the upper part and loamy in the lower part. Permeability is rapid in the sandy material and moderately slow in the loamy material. Slopes range from 0 to 2 percent.

Reference pedon of Typic Haplaquolls, sandy over loamy, 1,700 feet south and 260 feet west of the center of sec. 36, T. 20 N., R. 18 W., Grant Township:

Oa—0 to 4 inches; black (10YR 2/1) muck; highly decomposed leaves and woody debris.

A—4 to 14 inches; black (10YR 2/1) loamy fine sand, very dark gray (10YR 3/1) dry; weak medium granular structure; very friable; many very fine and fine roots; slightly alkaline; clear smooth boundary.

Bg—14 to 19 inches; reddish gray (5YR 5/2) fine sand; few medium prominent yellowish red (5YR 4/6) mottles; weak medium granular structure; very friable; many fine roots; slightly alkaline; gradual wavy boundary.

Cg—19 to 29 inches; grayish brown (10YR 5/2) fine sand; few medium distinct dark yellowish brown (10YR 4/4) mottles; single grain; loose; slightly alkaline; clear wavy boundary.

2Cg1—29 to 44 inches; brown (7.5YR 5/2) silt loam; massive; firm; moderately alkaline; clear wavy boundary.
2Cg2—44 to 60 inches; grayish brown (10YR 5/2) silty clay loam; massive; firm; moderately alkaline.

The thickness of the Oa horizon ranges from 1 to 5 inches. Depth to the loamy material ranges from 20 to 35 inches.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2.

The Bg horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. It is loamy fine sand to sand.

The Cg horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2. It is loamy fine sand to sand. Some pedons do not have a Cg horizon.

The 2Cg horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 1 or 2. It is mainly sandy clay loam, silty clay loam, or silt loam, but in some pedons it has strata of fine sand, sand, or loamy sand 1 to 3 inches thick.

Typic Udipsamments

These soils are mixed, mesic Typic Udipsamments. They are moderately well drained and excessively drained, rapidly permeable soils on outwash plains, stream terraces, and overwashed moraines. The soils formed in sandy glaciofluvial material. Slopes range from 0 to 30 percent.

Reference pedon of Typic Udipsamments, nearly level and undulating, 2,200 feet north and 200 feet east of the center of sec. 25, T. 18 N., R. 15 W., Branch Township:

Oi—1 to 0 inch; undecomposed hardwood and coniferous leaf litter.
A—0 to 2 inches; very dark gray (10YR 3/1) sand, dark grayish brown (10YR 4/2) dry; weak medium granular structure; very friable; many very fine and fine roots; strongly acid; abrupt wavy boundary.
Bw—2 to 22 inches; dark yellowish brown (10YR 4/6) sand; weak coarse subangular blocky structure; very friable; strongly acid; clear wavy boundary.
BC—22 to 40 inches; yellowish brown (10YR 5/6) sand; single grain; loose; strongly acid; gradual wavy boundary.
C—40 to 180 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; strongly acid.

The thickness of the solum ranges from 20 to 40 inches. The control section is sand. Some pedons are coarse sand, loamy sand, or fine sand below the control section. The content of gravel is 0 to 10 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 to 3.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6.

The C horizon has hue of 10YR or 7.5YR, value of 6 or 7, and chroma of 4 to 6. It is mainly sand or coarse sand. Some pedons have loamy sand, coarse loamy sand, or gravelly loamy sand at a depth of more than 60 inches. In banded substratum phases, thin bands of loamy sand or sandy loam are at a depth of more than 60 inches. A seasonal high water table is at a depth of more than 3 feet in some pedons.

Wallace Series

The Wallace series consists of well drained soils on old beach ridges and low dunes. These soils formed in sandy eolian material (fig. 15). They have an ortstein layer. Permeability is moderately rapid in the ortstein layer and rapid in the rest of the profile. Slopes range from 3 to 15 percent.

The Wallace soils in Mason County are taxadjuncts because they have a slightly higher temperature than is defined as the range for the series. This difference, however, does not affect the use or behavior of the soils.

Typical pedon of Wallace fine sand, 3 to 15 percent slopes, 150 feet east and 2,250 feet north of the southwest corner of sec. 11, T. 19 N., R. 18 W., Hamlin Township:

Oe—2 inches to 0; black (5YR 2/2), partially decomposed forest litter; weak medium granular structure; friable; very strongly acid; abrupt smooth boundary.
E—0 to 4 inches; pinkish gray (7.5YR 7/2) fine sand, light gray (10YR 7/1) dry; weak medium granular structure; very friable; many fine, common medium, and few coarse roots; strongly acid; clear wavy boundary.
Bs1—4 to 15 inches; strong brown (7.5YR 5/6) fine sand; single grain; loose; many fine and common medium roots; strongly acid; abrupt irregular boundary.
Bhsm—15 to 19 inches; dark reddish brown (5YR 3/2) fine sand; massive; weakly cemented to strongly cemented ortstein; common fine and few medium roots; strongly acid; abrupt irregular boundary.
Bs2—19 to 30 inches; strong brown (7.5YR 5/8) fine sand; single grain; loose; few fine roots; moderately acid; clear smooth boundary.
C1—30 to 42 inches; brown (7.5YR 5/4) fine sand;

single grain; loose; slightly acid; clear smooth boundary.

C2—42 to 72 inches; light yellowish brown (10YR 6/4) fine sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 32 to 54 inches.

Some pedons have an A horizon, which has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 1 or 2.

The Bs horizon has hue of 7.5YR, value of 3 to 5, and chroma of 4 to 8. The Bhsm horizon has hue of 5YR, value of 2, 2.5, or 3, and chroma of 2. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6.

Willette Series

The Willette series consists of very poorly drained soils in closed depressions and along drainageways on moraines and till plains. These soils formed in organic material over clayey till. Permeability is rapid in the organic layers and slow in the clayey material. Slopes range from 0 to 2 percent.

Typical pedon of Willette muck, 260 feet east and 50 feet north of the southwest corner of sec. 3, T. 18 N., R. 16 W., Custer Township:

Oa1—0 to 7 inches; muck, black (N 2/0) broken face and rubbed; about 15 percent fiber, 5 percent rubbed; strong medium granular structure; friable; many fine and few medium roots; neutral; clear wavy boundary.

Oa2—7 to 14 inches; muck, black (10YR 2/1) broken face and rubbed; about 20 percent fiber, 5 percent rubbed; moderate medium platy structure; friable; few coarse and common medium roots; neutral; clear wavy boundary.

Oa3—14 to 19 inches; muck, black (10YR 2/1) broken face and rubbed; about 15 percent fiber, 5 percent rubbed; moderate medium subangular blocky structure; friable; common medium roots; neutral; clear wavy boundary.

2Cg—19 to 60 inches; gray (5Y 5/1) silty clay; many coarse distinct grayish brown (2.5Y 5/2) mottles; massive; firm; strongly effervescent; moderately alkaline.

The thickness of organic material ranges from 16 to 51 inches. The Oa horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. The 2Cg horizon has hue of 5Y, value of 5, and chroma of 1. It is silty clay or silty clay loam.

Wixom Series

The Wixom series consists of somewhat poorly drained soils on lake plains and till plains. These soils formed in sandy material and in the underlying loamy lacustrine material or till. Permeability is rapid in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 4 percent.

Typical pedon of Wixom loamy sand, 0 to 4 percent slopes, 1,500 feet east and 1,800 feet south of the northwest corner of sec. 11, T. 17 N., R. 17 W., Riverton Township:

Ap—0 to 9 inches; black (10YR 2/1) loamy sand, gray (10YR 5/1) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

E—9 to 11 inches; grayish brown (10YR 5/2) loamy sand; few fine faint gray (10YR 5/1) mottles; weak medium granular structure; friable; neutral; irregular broken boundary.

Bs1—11 to 15 inches; dark brown (7.5YR 3/4) loamy sand; few fine faint gray (10YR 5/1) mottles; weak medium subangular blocky structure; friable; neutral; clear wavy boundary.

Bs2—15 to 27 inches; brownish yellow (10YR 6/6) sand; common medium distinct light yellowish brown (10YR 6/4) mottles; weak medium subangular blocky structure; friable; neutral; clear wavy boundary.

2Bt—27 to 33 inches; reddish brown (5YR 4/3) sandy loam; common medium distinct pinkish gray (7.5YR 6/2) mottles; weak thick platy structure; friable; slightly alkaline; clear wavy boundary.

2C—33 to 60 inches; pinkish gray (7.5YR 6/2) silty clay loam; few fine prominent yellowish brown (10YR 5/6) and many fine distinct light brownish gray (10YR 6/2) mottles; massive; firm; varves of very fine sand ⅛ to ¼ inch thick; violently effervescent; moderately alkaline.

Depth to the 2Bt horizon ranges from 20 to 40 inches. The content of gravel is 0 to 5 percent throughout the profile.

The Ap horizon has hue of 10YR, value of 2, and chroma of 1. The E horizon has hue of 10YR, value of 5, and chroma of 2.

The Bs horizon has hue of 7.5YR or 10YR and value and chroma of 3 to 6. It is loamy sand or sand. The content of ortstein fragments is as much as 30 percent.

The 2Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is sandy loam, loam, or clay loam.

The 2C horizon has hue of 5YR to 10YR, value of 6, and chroma of 2 or 3. It is mainly silty clay loam, clay loam, or loam, but most pedons have varves of very fine sand or silt.

Ziegenfuss Series

The Ziegenfuss series consists of poorly drained, slowly permeable soils on till plains and moraines. These soils formed in clayey glacial till. Slopes range from 0 to 2 percent.

The Ziegenfuss soils in Mason County are taxadjuncts because the colors in the substratum are brighter than is defined as the range for the series. This difference, however, does not affect the use or behavior of the soils.

Typical pedon of Ziegenfuss loam, 2,000 feet north and 500 feet west of the southeast corner of sec. 19, T. 17 N., R. 16 W., Eden Township:

Ap—0 to 7 inches; very dark gray (10YR 3/1) loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; moderately acid; abrupt smooth boundary.

Bg—7 to 23 inches; gray (5Y 6/1) silty clay; few fine prominent reddish brown (5YR 5/3) and many medium prominent strong brown (7.5YR 4/6) mottles; moderate coarse subangular blocky structure; firm; slightly acid; clear wavy boundary.

C1—23 to 27 inches; brown (7.5YR 5/4) silty clay; few fine prominent strong brown (7.5YR 4/6) and common medium prominent gray (5Y 6/1) mottles; massive; firm; about 2 percent fine gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

C2—27 to 60 inches; brown (7.5YR 5/4) silty clay; common medium prominent gray (5Y 6/1) and few fine prominent strong brown (7.5YR 4/6) mottles; massive; firm; about 2 percent fine gravel; strongly effervescent; moderately alkaline.

The solum ranges from 19 to 40 inches in thickness. The content of rock fragments ranges from 2 to 10 percent throughout the profile.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly loam, but the range includes silt loam and clay loam.

The Bg horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 or 2. It is silty clay loam, clay, silty clay, or clay loam.

The C horizon has hue of 7.5YR to 5Y, value of 5 or 6, and chroma of 1 to 4. It is silty clay, silty clay loam, or clay loam.

Formation of the Soils

Prepared by Tom Bauer, soil scientist, Michigan Department of Agriculture.

This section relates the factors of soil formation to the soils in Mason County. It also describes the processes of soil formation.

Factors of Soil Formation

Soil formation is the natural development of horizons in a profile. Soil forms through the interaction of five major factors—the physical, chemical, and mineral composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the processes of soil formation have acted on the parent material *(8)*. Human activities also affect soil formation.

Climate and plant and animal life are the active forces of soil formation. They slowly change the parent material into a natural body of soil that has genetically related layers, called horizons. The effects of climate and plant and animal life are conditioned by relief. The nature of the parent material 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 the parent material into a soil. Some time is always needed for the differentiation of soil horizons.

Parent Material

The unconsolidated mass in which a soil forms is called parent material. It is derived from rocks that have been disintegrated by abrasive action as particles move against each other because of flowing water, moving ice (glaciers), wind, freezing and thawing, or downslope movement. The small, loose rock particles that accumulate as a result of the grinding become parent material *(4)*.

The parent materials of the soils in Mason County were deposited by glaciers or glacial meltwater *(5)*. The glaciers covered the county 11,000 to 12,000 years ago. Some of the glacial material has been reworked and redeposited by the subsequent action of wind and water. Although the parent materials are of a common glacial origin, their properties vary greatly, sometimes within small areas, depending on how the materials were deposited. The dominant parent materials in Mason County are glacial till, glacial outwash, lacustrine sediments, alluvium, eolian material, and organic material. The bedrock beneath these materials is at a depth of 200 to 600 feet and has no influence on the soils. The general soil map in this publication can be used to locate broad areas of similar parent materials.

Glacial till was deposited directly by the glaciers with a minimum of water action. The till is a mixture of particles of different sizes. In Mason County it is dominantly calcareous clay loam and loam. Marlette and Perrinton are examples of soils that formed in glacial till. They typically are medium textured to fine textured and have a well developed subsoil. In some areas layers of sand are below the depth of soil formation *(5)*.

Outwash was deposited by running water from melting glaciers. The size of the particles varies according to the speed of the stream that carried them. As the speed of the stream decreased, the coarser particles were deposited. Only the finer particles, such as very fine sand, silt, and clay, can be carried by slow-moving water. Outwash generally occurs as layers of particles of similar size, such as sand or gravel. Grattan and Boyer are examples of soils that formed in outwash.

Lacustrine material was deposited near the shore of Glacial Lake Chicago, which moved inland as the glacier retreated toward the end of the last ice age *(9)*. Sand dropped out in the coastal waters. In Mason County the soils that formed in lacustrine deposits typically are near the lake and are coarse textured. Saugatuck and Pipestone soils are examples.

Alluvium is material recently deposited by floodwater from streams. This material varies in texture, depending on the speed of the water from which it was deposited. Sloan and Glendora are examples of soils that formed in alluvium.

Eolian material has been transported and deposited by the wind. Nordhouse and Wallace are examples of soils that formed in this material.

Organic material is the remains of plants. After the glaciers receded, water was left standing in depressions on outwash plains, flood plains, moraines, and till plains. Because of wetness, the shrubs, grasses, sedges, and water-tolerant plants that grew around the edges of these depressions did not decompose quickly after they died. Eventually, the plant residue filled the depressions and decomposed into muck. Houghton and Adrian mucks are examples of soils that formed in organic material.

Climate

Climate influences soil formation mainly through the effects of precipitation and temperature. A soil is said to be "formed" when it has detectable layers of accumulated organic material and has clay particles, sesquioxides, carbonates, or soluble salts that have been moved downward by water. The extent of colloid movement and the depth of deposition are determined partly by the amount and pattern of precipitation, which causes the leaching. Through its influence on soil temperature, climate also determines the rate of chemical reaction in the soil.

The climate in Mason County is cool and humid. In areas adjacent to Lake Michigan and inland a few miles, the lake modifies the temperature. Thus, late frosts in spring and early frosts in fall are less likely in these areas than in areas farther from the lake.

Plant and Animal Life

The activity of plants and animals and the decomposition of their organic residues and wastes have marked effects on soil formation *(3)*. The well drained soils in Mason County formed under forest vegetation. They have a light colored, leached subsurface layer underlain by a zone of accumulation. Organic soils, such Houghton and Adrian soils, formed in the decayed remains of plants accumulated in depressional areas. The roots of the plants provided channels for the downward movement of water through the soils and added organic matter as they decayed. Micro-organisms in the soils help to break down the organic matter into plant nutrients.

Differences in natural drainage and minor variations in the parent material affected the composition of the forest species. Well drained soils, such as Marlette, Perrinton, Remus, and Tekenink soils, were covered mainly by sugar maple, beech, and oak. Somewhat poorly drained or poorly drained soils, such as Arkona, Pipestone, and Ziegenfuss soils, were covered by elm, ash, and red maple.

Important changes caused by human activity have taken place in Mason County since the county was settled. Cutting the forest, draining many of the wet soils, and farming have altered the natural processes of soil formation. Removal of the protective forest cover and subsequent intensive cultivation have increased the extent to which the surface layer is eroded and have resulted in the formation of a plow layer. Compaction has resulted from the use of heavy machinery. Drainage measures have lowered the water table and thus have changed the chemistry of the soils by introducing more oxygen into the profile.

Relief

Relief affects the natural drainage of soils, the rate of erosion, the kind of plant cover, and the soil temperature. Slopes range from 0 to 70 percent in Mason County. Runoff is most rapid on the steeper slopes. In low areas water is temporarily ponded.

The soils in the county range from excessively drained on hilltops and ridgetops to very poorly drained in depressions. Through its effect on soil aeration, drainage partly determines the color of the soils. Water and air move freely through well drained soils and slowly through very poorly drained soils. In Marlette and other well aerated soils, the iron and aluminum compounds are brightly colored and oxidized. Parkhill and other poorly aerated soils are dull gray and mottled. The Marlette and Parkhill soils formed in similar kinds of parent material.

Time

The length of time necessary for a soil to develop the distinct layers called horizons depends upon many interrelated factors, such as climate, type of parent material, and relief. The glacial deposits in which many of the soils formed have been exposed to the soil-forming factors long enough for the development of distinct soil horizons. The soils that formed in recent alluvial sediments, however, have not been in place long enough for the development of distinct horizons. Sloan soils are an example of young alluvial soils. Marlette soils are an example of mature soils.

Processes of Soil Formation

The processes responsible for the development of soil horizons in the parent material are referred to as soil genesis. Several processes were involved in the development of horizons in the soils of Mason County—the accumulation of organic matter, the leaching of lime (calcium carbonate), the formation and translocation of silicate clay minerals in loamy soils, and the translocation of iron, aluminum, and carbon in sandy soils. In most of the soils, two or more of these processes have been active in the development of horizons.

As organic matter accumulates at the surface of a soil, an A horizon forms. If the soil is plowed, this horizon is mixed into a plow layer, or Ap horizon. In the soils in Mason County, the surface layer ranges from high to low in content of organic matter. Ziegenfuss soils are an example of soils that have a high content of organic matter in the surface layer. Plainfield soils are an example of soils that have a low content of organic matter.

The leaching of carbonates and other bases has occurred in most of the soils. The leaching of bases generally precedes the translocation of silicate clay minerals. Many of the soils in Mason County are moderately leached or strongly leached. For example, Tekenink soils are leached of carbonates to a depth of more than 60 inches, and Marlette soils typically are leached to a depth of 38 inches. The difference in the depth of leaching is a result of variations in the permeability of the parent material.

Gleying, or the reduction and transfer of iron, is evident in somewhat poorly drained to very poorly drained soils. A gray subsoil in these soils indicates the reduction and loss of iron. Ziegenfuss and Kingsville are examples of strongly gleyed soils.

The translocation of clay minerals contributes to horizon development in loamy soils. An eluviated, or leached, E horizon typically is lower in content of clay than the illuviated B horizon and typically is lighter in color. The B horizon typically has an accumulation of clay, or clay films, in pores and on the faces of peds. Soils at this stage of formation probably were leached of carbonates and soluble salts to a considerable extent before the silicate clays were translocated. Marlette soils are an example.

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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.

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.

Association, soil. A group of soils 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

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

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.

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 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.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Colluvium. Soil material, 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 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 are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

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. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

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.

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.

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.

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 periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

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.

Dune. A mound, ridge, or hill of loose, windblown sandy material, either bare or covered with vegetation.

Dysic soil. An organic soil having a pH value of less than 4.5 in all layers of the control section.

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.

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.

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, for example, 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.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Euic soil. An organic soil having a pH value of more than 4.5 in all layers of the control section.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). 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 (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). 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 and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

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 up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). 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.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Hill slope. The steeper part of a hill between its summit and its base. In descending order, the geomorphic components of a simple hill slope may include shoulder, back slope, foot slope, and toe slope.

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. The major horizons 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, any plowed or disturbed surface layer.

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 O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon 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) granular, 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 horizon. 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.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but 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-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

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 the adjacent landforms.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lamellae. In sandy soils, thin bands of more clayey material spaced a few centimeters to several inches apart.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

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.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Moraine (geology). 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. Mottling generally indicates poor aeration and impeded drainage. 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 colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

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 downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 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 thickness.

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.

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.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid 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.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
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

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.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 drawbar horsepower rating.

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.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

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.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

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.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

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 or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. 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.

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.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

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.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

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.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to Ca^{++} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing 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. Breaking up a compact subsoil by pulling a special chisel through the soil.

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.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 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. 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.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

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). A layer of 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.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

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.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

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 of 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.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-80 at Ludington, in Mason County, and Baldwin, in Lake County)

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Average	Temperature: 2 years in 10 will have-- Maximum temperature higher than--	Temperature: 2 years in 10 will have-- Minimum temperature lower than--	Temperature: Average number of growing degree days*	Precipitation: Average	Precipitation: 2 years in 10 will have-- Less than--	Precipitation: 2 years in 10 will have-- More than--	Precipitation: Average number of days with 0.10 inch or more	Precipitation: Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
LUDINGTON:											
January----	28.8	15.6	22.2	49	-6	0	2.39	1.44	3.24	7	27.0
February---	31.1	15.4	23.2	49	-11	0	1.80	0.86	2.62	5	17.6
March------	40.2	22.9	31.5	66	-1	4	1.99	0.88	2.96	5	9.6
April------	54.1	34.1	44.1	77	16	48	2.89	1.91	3.78	7	2.1
May--------	65.7	43.1	54.4	85	25	196	2.48	1.53	3.33	6	0.0
June-------	74.9	52.4	63.6	90	34	419	2.93	1.36	4.28	6	0.0
July-------	79.5	57.6	68.5	91	41	583	2.18	1.20	3.04	5	0.0
August-----	77.6	56.8	67.2	91	39	541	3.79	1.85	5.46	6	0.0
September--	70.2	50.3	60.2	87	30	321	3.25	1.41	4.82	6	0.0
October----	59.1	41.1	50.1	78	24	111	2.96	1.83	3.97	6	0.5
November---	45.4	31.1	38.2	67	9	12	2.75	1.78	3.63	7	6.6
December---	33.8	20.8	27.3	56	-2	0	2.45	1.51	3.29	7	19.4
Yearly:											
Average---	55.0	36.8	45.9	---	---	---	---	---	---	---	---
Extreme---	---	---	---	92	-12	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,235	31.86	28.11	35.51	73	82.8
BALDWIN:											
January----	29.0	11.1	20.1	51	-24	0	2.29	1.49	3.00	7	25.0
February---	32.1	9.4	20.7	51	-22	0	1.68	1.00	2.28	5	16.3
March------	41.9	18.7	30.3	70	-15	4	2.18	1.30	2.97	6	10.9
April------	57.3	31.3	44.3	82	10	60	3.19	2.15	4.14	8	1.9
May--------	70.5	42.0	56.3	89	21	247	2.93	1.72	4.02	7	0.1
June-------	79.3	51.0	65.2	95	30	463	3.27	1.45	4.83	7	0.0
July-------	83.1	54.7	68.9	95	37	593	2.88	1.71	3.92	6	0.0
August-----	80.9	53.2	67.0	94	35	536	3.62	1.67	5.30	6	0.0
September--	72.3	46.1	59.2	91	26	297	3.29	1.51	4.82	7	0.0
October----	61.0	36.6	48.8	82	17	102	3.00	1.48	4.32	7	0.5
November---	45.8	27.4	36.6	69	2	11	3.20	1.78	4.46	8	10.0
December---	33.5	17.0	25.2	56	-12	0	2.44	1.52	3.27	8	18.0
Yearly:											
Average---	57.2	33.2	45.2	---	---	---	---	---	---	---	---
Extreme---	---	---	---	97	-26	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,313	33.97	30.35	37.51	82	82.7

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-80 at Ludington, in Mason County, and Baldwin, in Lake County)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
LUDINGTON:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 3	May 21	June 6
2 years in 10 later than--	Apr. 27	May 14	May 30
5 years in 10 later than--	Apr. 16	May 2	May 18
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 22	Oct. 4	Sept. 15
2 years in 10 earlier than--	Oct. 28	Oct. 11	Sept. 22
5 years in 10 earlier than--	Nov. 9	Oct. 24	Oct. 4
BALDWIN:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 14	May 27	June 14
2 years in 10 later than--	May 10	May 22	June 9
5 years in 10 later than--	May 3	May 13	May 29
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 3	Sept. 17	Sept. 4
2 years in 10 earlier than--	Oct. 8	Sept. 22	Sept. 8
5 years in 10 earlier than--	Oct. 18	Sept. 30	Sept. 17

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-80 at Ludington, in Mason County, and Baldwin, in Lake County)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
LUDINGTON:			
9 years in 10	181	152	109
8 years in 10	190	159	119
5 years in 10	206	174	139
2 years in 10	221	189	158
1 year in 10	230	196	168
BALDWIN:			
9 years in 10	145	124	91
8 years in 10	153	129	98
5 years in 10	167	139	111
2 years in 10	182	150	124
1 year in 10	190	155	131

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Beaches	370	0.1
2A	Del Rey silty clay loam, 0 to 3 percent slopes	1,414	0.4
5F	Udorthents and Udipsamments, very steep	90	*
6	Kinross mucky fine sand	1,615	0.5
7	Sloan silt loam, frequently flooded	636	0.2
8B	Epworth fine sand, moderately wet, 0 to 6 percent slopes	2,132	0.7
9	Kerston-Carlisle-Glendora complex, frequently flooded	7,639	2.3
10B	Perrinton loam, 2 to 6 percent slopes	4,902	1.5
10B2	Perrinton clay loam, 2 to 6 percent slopes, eroded	341	0.1
10C	Perrinton loam, 6 to 12 percent slopes	1,307	0.4
10C2	Perrinton clay loam, 6 to 12 percent slopes, eroded	278	0.1
10D	Perrinton loam, 12 to 18 percent slopes	451	0.1
10D2	Perrinton clay loam, 12 to 18 percent slopes, eroded	94	*
10E	Perrinton loam, 18 to 35 percent slopes	212	0.1
11A	Ithaca loam, 0 to 3 percent slopes	7,841	2.4
12	Ziegenfuss loam	1,582	0.5
13B	Marlette fine sandy loam, 2 to 6 percent slopes	4,954	1.5
13B2	Marlette loam, 2 to 6 percent slopes, eroded	190	0.1
13C	Marlette fine sandy loam, 6 to 12 percent slopes	1,112	0.3
13C2	Marlette loam, 6 to 12 percent slopes, eroded	435	0.1
13D	Marlette fine sandy loam, 12 to 18 percent slopes	484	0.1
13E	Marlette fine sandy loam, 18 to 35 percent slopes	351	0.1
13F	Marlette fine sandy loam, 35 to 45 percent slopes	303	0.1
14A	Capac loam, 0 to 3 percent slopes	4,215	1.3
15	Parkhill loam	626	0.2
16B	Remus fine sandy loam, 1 to 6 percent slopes	724	0.2
16C	Remus fine sandy loam, 6 to 12 percent slopes	730	0.2
16D	Remus fine sandy loam, 12 to 18 percent slopes	625	0.2
18B	Fern-Spinks complex, 0 to 6 percent slopes	2,717	0.8
18C	Fern-Spinks complex, 6 to 12 percent slopes	1,247	0.4
18D	Fern-Spinks complex, 12 to 18 percent slopes	452	0.1
18E	Fern-Spinks complex, 18 to 35 percent slopes	455	0.1
19A	Kibbie loam, 0 to 3 percent slopes	492	0.2
20	Bono silty clay loam	1,159	0.4
22B	Arkport loamy fine sand, 0 to 6 percent slopes	305	0.1
22C	Arkport loamy fine sand, 6 to 12 percent slopes	122	*
23A	Freesoil loamy very fine sand, 0 to 3 percent slopes	1,338	0.4
24	Lamson fine sandy loam	1,013	0.3
26A	Kibbie fine sandy loam, sandy substratum, 0 to 3 percent slopes	540	0.2
27	Poy silty clay loam	672	0.2
28B	Scalley fine sandy loam, 2 to 6 percent slopes	257	0.1
31B	Boyer loamy sand, 0 to 6 percent slopes	930	0.3
31C	Boyer loamy sand, 6 to 12 percent slopes	101	*
32B	Fern fine sand, 0 to 6 percent slopes	5,435	1.7
32C	Fern fine sand, 6 to 12 percent slopes	672	0.2
32D	Fern fine sand, 12 to 18 percent slopes	294	0.1
32F	Fern fine sand, 18 to 45 percent slopes	329	0.1
34B	Wixom loamy sand, 0 to 4 percent slopes	3,420	1.0
36B	Fern-Marlette complex, 0 to 6 percent slopes	5,508	1.7
36C	Fern-Marlette complex, 6 to 12 percent slopes	1,874	0.6
36D	Fern-Marlette complex, 12 to 18 percent slopes	418	0.1
36E	Fern-Marlette complex, 18 to 35 percent slopes	442	0.1
37B	Wixom-Capac complex, 0 to 4 percent slopes	12,128	3.7
38B	Remus-Spinks complex, 0 to 6 percent slopes	1,765	0.5
38C	Remus-Spinks complex, 6 to 12 percent slopes	1,914	0.6
38D	Remus-Spinks complex, 12 to 18 percent slopes	1,094	0.3
38E	Remus-Spinks complex, 18 to 30 percent slopes	376	0.1
39B	Tustin loamy fine sand, 0 to 6 percent slopes	273	0.1
40B	Arkona loamy sand, 0 to 4 percent slopes	3,953	1.2
41	Sickles loamy sand	1,444	0.4
42B	Grattan sand, loamy substratum, 0 to 6 percent slopes	943	0.3
43B	Covert sand, loamy substratum, 0 to 6 percent slopes	2,545	0.8

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
44B	Pipestone fine sand, loamy substratum, 0 to 4 percent slopes	1,340	0.4
47B	Spinks-Coloma sands, 0 to 6 percent slopes	7,352	2.2
47C	Spinks-Coloma sands, 6 to 12 percent slopes	6,025	1.8
47D	Spinks-Coloma sands, 12 to 18 percent slopes	3,330	1.0
47E	Spinks-Coloma sands, 18 to 40 percent slopes	2,455	0.8
48B	Thetford fine sand, 0 to 4 percent slopes	845	0.3
52C	Wallace fine sand, 3 to 15 percent slopes	445	0.1
53A	Saugatuck-Jebavy complex, 0 to 3 percent slopes	4,813	1.5
54B	Grattan sand, dark subsoil, 0 to 6 percent slopes	4,641	1.4
54C	Grattan sand, dark subsoil, 6 to 12 percent slopes	764	0.2
54D	Grattan sand, dark subsoil, 12 to 18 percent slopes	194	0.1
56B	Pipestone-Saugatuck complex, 0 to 4 percent slopes	4,325	1.3
57B	Grattan sand, 0 to 6 percent slopes	15,205	4.7
57B3	Grattan sand, 0 to 10 percent slopes, severely eroded	218	0.1
57C	Grattan sand, 6 to 12 percent slopes	2,849	0.9
57D	Grattan sand, 12 to 18 percent slopes	863	0.3
57E	Grattan sand, 18 to 35 percent slopes	1,611	0.5
57F	Grattan sand, 35 to 50 percent slopes	270	0.1
58B	Covert sand, 0 to 6 percent slopes	13,725	4.2
59B	Pipestone fine sand, 0 to 4 percent slopes	6,909	2.1
60	Kingsville mucky sand	7,450	2.3
62D	Nordhouse fine sand, 3 to 18 percent slopes	823	0.3
62F	Nordhouse fine sand, 18 to 70 percent slopes	1,550	0.5
63B	Coloma sand, 0 to 6 percent slopes	2,080	0.6
63C	Coloma sand, 6 to 12 percent slopes	742	0.2
63D	Coloma sand, 12 to 18 percent slopes	228	0.1
63E	Coloma sand, 18 to 40 percent slopes	172	0.1
64B	Benona sand, 0 to 6 percent slopes	912	0.3
64C	Benona sand, 6 to 12 percent slopes	336	0.1
64D	Benona sand, 12 to 18 percent slopes	199	0.1
65B	Chelsea fine sand, 0 to 6 percent slopes	687	0.2
65C	Chelsea fine sand, 6 to 12 percent slopes	356	0.1
67B	Plainfield sand, 0 to 6 percent slopes	6,642	2.0
67C	Plainfield sand, 6 to 12 percent slopes	1,246	0.4
67E	Plainfield sand, 12 to 30 percent slopes	603	0.2
72	Glendora mucky silt loam, frequently flooded	1,971	0.6
76	Houghton muck	5,686	1.7
77	Adrian muck	2,940	0.9
78	Willette muck	859	0.3
79	Edwards and Martisco mucks	389	0.1
81	Loxley and Dawson soils	827	0.3
83	Histosols and Aquents, ponded	1,581	0.5
86F	Dune land-Quartzipsamments complex, hilly to very steep	3,105	0.9
87F	Dune land-Quartzipsamments-Psammaquents complex, nearly level to very steep	1,666	0.5
88B	Udipsamments, nearly level and gently sloping	837	0.3
89D	Udorthents, loamy, nearly level to rolling	771	0.2
89F	Udorthents, loamy, very steep	402	0.1
90B	Epworth fine sand, 0 to 6 percent slopes	6,396	2.0
90C	Epworth fine sand, 6 to 12 percent slopes	3,913	1.2
90D	Epworth fine sand, 12 to 18 percent slopes	947	0.3
91	Pits, gravel and sand	305	0.1
93B	Tuscola silt loam, 0 to 6 percent slopes	296	0.1
94B	Coloma-Scalley complex, 2 to 6 percent slopes	797	0.2
94C	Coloma-Scalley complex, 6 to 12 percent slopes	849	0.3
94D	Coloma-Scalley complex, 12 to 18 percent slopes	669	0.2
95A	Ithaca-Arkona complex, 0 to 3 percent slopes	3,982	1.2
97B	Urban land-Epworth complex, 0 to 8 percent slopes	2,258	0.7
98F	Udorthents-Fluvaquents complex, nearly level to very steep	1,898	0.6
99B	Tekenink loamy fine sand, 2 to 6 percent slopes	259	0.1
99C	Tekenink loamy fine sand, 6 to 12 percent slopes	433	0.1
99D	Tekenink loamy fine sand, 12 to 18 percent slopes	137	*
210B	Typic Udipsamments, nearly level and undulating	8,552	2.6

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
210C	Typic Udipsamments, rolling	2,642	0.8
210D	Typic Udipsamments, hilly	994	0.3
211B	Typic Udipsamments, banded substratum, nearly level and undulating	1,763	0.5
211C	Typic Udipsamments, banded substratum, rolling	132	*
212B	Typic Udipsamments, very deep water table, nearly level and undulating	3,076	0.9
213B	Alfic Udipsamments, nearly level and undulating	391	0.1
214B	Typic Udipsamments, deep water table, nearly level and undulating	413	0.1
220B	Entic Haplorthods, sandy, nearly level and undulating	4,383	1.3
220C	Entic Haplorthods, sandy, rolling	1,109	0.3
220D	Entic Haplorthods, sandy, hilly	660	0.2
220E	Entic Haplorthods, sandy, steep and very steep	382	0.1
221B	Entic Haplorthods, sandy, banded substratum, nearly level and undulating	3,567	1.1
221C	Entic Haplorthods, sandy, banded substratum, rolling	1,474	0.5
221D	Entic Haplorthods, sandy, banded substratum, hilly	449	0.1
222B	Entic Haplorthods, sandy, very deep water table, nearly level and undulating	3,255	1.0
224B	Entic Haplorthods, sandy, deep water table, nearly level and undulating	4,715	1.4
225B	Entic Haplorthods, sandy, loamy substratum, nearly level and undulating	1,239	0.4
225C	Entic Haplorthods, sandy, loamy substratum, rolling	1,165	0.4
231B	Entic Haplorthods, sandy-Alfic Haplorthods, sandy over loamy complex, nearly level and undulating	518	0.2
231C	Entic Haplorthods, sandy-Alfic Haplorthods, sandy over loamy complex, rolling	614	0.2
231D	Entic Haplorthods, sandy-Alfic Haplorthods, sandy over loamy complex, hilly	184	0.1
231E	Entic Haplorthods, sandy-Alfic Haplorthods, sandy over loamy complex, steep and very steep	128	*
233B	Alfic Haplorthods, sandy over loamy-Entic Haplorthods, sandy complex, nearly level and undulating	493	0.2
235B	Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy complex, nearly level and undulating	1,343	0.4
235C	Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy complex, rolling	1,322	0.4
235D	Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy complex, hilly	73	*
236B	Entic Haplorthods, sandy, low potential evaporation, nearly level and undulating	309	0.1
236C	Entic Haplorthods, sandy, low potential evaporation, rolling	87	*
236D	Entic Haplorthods, sandy, low potential evaporation, hilly	200	0.1
236E	Entic Haplorthods, sandy, low potential evaporation, steep and very steep	94	*
237B	Haplic Glossudalfs, fine-loamy, nearly level and undulating	359	0.1
237C	Haplic Glossudalfs, fine-loamy, rolling	572	0.2
237D	Haplic Glossudalfs, fine-loamy, hilly	71	*
240B	Entic Haplorthods, sandy, dark subsoil, nearly level and undulating	784	0.2
240C	Entic Haplorthods, sandy, dark subsoil, rolling	126	*
240D	Entic Haplorthods, sandy, dark subsoil, hilly	247	0.1
240E	Entic Haplorthods, sandy, dark subsoil, steep and very steep	113	*
245B	Entic Haplorthods, sandy, dark subsoil, loamy substratum, nearly level and undulating	111	*
245C	Entic Haplorthods, sandy, dark subsoil, loamy substratum, rolling	270	0.1
245D	Entic Haplorthods, sandy, dark subsoil, loamy substratum, hilly	261	0.1
250	Mollic Psammaquents-Aquic Udipsamments-Medisaprists, euic complex, frequently flooded	1,671	0.5
251A	Aeric Haplaquods, sandy-Typic Haplaquods, sandy complex, nearly level	493	0.2
252	Typic Haplaquods, sandy-Medisaprists, dysic complex	778	0.2
253A	Aeric Haplaquods, sandy, ortstein-Aquic Udipsamments complex, nearly level	485	0.1
255B	Aquic Udipsamments-Entic Haplorthods, sandy, deep water table complex, nearly level and undulating	486	0.1
256	Medisaprists, euic-Mollic Psammaquents complex	2,341	0.7
262A	Aeric Haplaquods, sandy, ortstein, nearly level	2,344	0.7
263A	Aquic Udipsamments, nearly level	1,155	0.4
272	Typic Haplaquods, sandy	502	0.2
273	Mollic Psammaquents	1,561	0.5
274	Typic Haplaquolls, sandy over loamy	219	0.1
280	Aquents and Histosols, ponded	348	0.1
281	Medisaprists, dysic	269	0.1

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
282	Medisaprists, euic	2,381	0.7
	Water	14,710	4.5
	Total	326,970	100.0

* Less than 0.1 percent.

TABLE 5.--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
2A	Del Rey silty clay loam, 0 to 3 percent slopes (where drained)
7	Sloan silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
10B	Perrinton loam, 2 to 6 percent slopes
10B2	Perrinton clay loam, 2 to 6 percent slopes, eroded
11A	Ithaca loam, 0 to 3 percent slopes (where drained)
12	Ziegenfuss loam (where drained)
13B	Marlette fine sandy loam, 2 to 6 percent slopes
13B2	Marlette loam, 2 to 6 percent slopes, eroded
14A	Capac loam, 0 to 3 percent slopes (where drained)
15	Parkhill loam (where drained)
16B	Remus fine sandy loam, 1 to 6 percent slopes
19A	Kibbie loam, 0 to 3 percent slopes (where drained)
20	Bono silty clay loam (where drained)
22B	Arkport loamy fine sand, 0 to 6 percent slopes
23A	Freesoil loamy very fine sand, 0 to 3 percent slopes (where drained)
24	Lamson fine sandy loam (where drained)
26A	Kibbie fine sandy loam, sandy substratum, 0 to 3 percent slopes (where drained)
27	Poy silty clay loam (where drained)
28B	Scalley fine sandy loam, 2 to 6 percent slopes
34B	Wixom loamy sand, 0 to 4 percent slopes (where drained)
37B	Wixom-Capac complex, 0 to 4 percent slopes (where drained)
38B	Remus-Spinks complex, 0 to 6 percent slopes
39B	Tustin loamy fine sand, 0 to 6 percent slopes
40B	Arkona loamy sand, 0 to 4 percent slopes (where drained)
93B	Tuscola silt loam, 0 to 6 percent slopes
95A	Ithaca-Arkona complex, 0 to 3 percent slopes (where drained)
99B	Tekenink loamy fine sand, 2 to 6 percent slopes

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Soils that are not likely to be used for crops or pasture are not listed. The land capability for each of those soils is given in the map unit description of the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Oats	Alfalfa hay	Corn silage
		Bu	Bu	Bu	Bu	Tons	Tons
2A-------------- Del Rey	IIw	115	37	49	69	---	---
6--------------- Kinross	VIw	---	---	---	---	---	---
7--------------- Sloan	IIIw	110	35	---	---	---	---
8B-------------- Epworth	IIIs	---	---	---	---	---	---
9--------------- Kerston-Carlisle-Glendora	Vw	---	---	---	---	---	---
10B------------- Perrinton	IIe	100	35	50	85	5.0	18
10B2------------ Perrinton	IIIe	100	30	50	80	4.8	17
10C------------- Perrinton	IIIe	95	30	45	80	4.5	16
10C2------------ Perrinton	IVe	85	24	45	75	3.6	15
10D------------- Perrinton	IVe	80	24	38	70	3.6	14
10D2------------ Perrinton	IVe	---	---	---	---	3.0	---
10E------------- Perrinton	VIIe	---	---	---	---	---	---
11A------------- Ithaca	IIw	120	40	55	90	5.5	19
12-------------- Ziegenfuss	IIw	125	42	60	100	5.8	19
13B------------- Marlette	IIe	100	35	60	95	4.8	19
13B2------------ Marlette	IIe	110	---	56	90	4.5	15
13C------------- Marlette	IIIe	110	---	56	90	4.5	15

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Oats	Alfalfa hay	Corn silage
		Bu	Bu	Bu	Bu	Tons	Tons
13C2------------ Marlette	IIIe	90	---	45	75	3.6	14
13D------------- Marlette	IVe	85	---	48	65	3.8	13
13E, 13F-------- Marlette	VIIe	---	---	---	---	---	---
14A------------- Capac	IIw	120	40	65	100	5.5	18
15-------------- Parkhill	IIw	140	45	65	115	4.2	22
16B------------- Remus	IIe	95	28	40	80	3.8	16
16C------------- Remus	IIIe	90	24	37	75	3.6	15
16D------------- Remus	IVe	85	20	34	65	3.4	12
18B------------- Fern-Spinks	IIIe	93	---	36	72	---	16
18C------------- Fern-Spinks	IIIe	84	---	34	65	---	15
18D------------- Fern-Spinks	IVe	---	---	---	---	---	---
18E------------- Fern-Spinks	VIIe	---	---	---	---	---	---
19A------------- Kibbie	IIw	130	40	65	105	5.0	20
20-------------- Bono	IIIw	120	40	42	80	---	---
22B------------- Arkport	IIe	105	---	50	85	---	21
22C------------- Arkport	IIIe	90	---	50	70	---	18
23A------------- Freesoil	IIIw	115	---	50	95	4.8	19
24-------------- Lamson	IIIw	75	---	---	50	---	15
26A------------- Kibbie	IIw	130	40	65	105	5.0	20
27-------------- Poy	IIw	95	30	---	75	---	15
28B------------- Scalley	IIe	115	---	55	85	4.8	18

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Oats	Alfalfa hay	Corn silage
		Bu	Bu	Bu	Bu	Tons	Tons
31B------------- Boyer	IIIs	80	30	35	60	3.8	14
31C------------- Boyer	IIIe	75	26	32	55	3.4	12
32B------------- Fern	IIIe	105	---	60	100	5.0	18
32C------------- Fern	IIIe	95	---	36	72	3.6	16
32D------------- Fern	IVe	---	---	---	---	---	---
32F------------- Fern	VIIe	---	---	---	---	---	---
34B------------- Wixom	IIIw	110	35	45	85	---	18
36B------------- Fern-Marlette	IIIe	111	---	48	86	4.3	19
36C------------- Fern-Marlette	IIIe	101	---	44	79	4.0	16
36D------------- Fern-Marlette	IVe	---	---	---	---	---	---
36E------------- Fern-Marlette	VIIe	---	---	---	---	---	---
37B------------- Wixom-Capac	IIIw	111	35	53	90	5.0	18
38B------------- Remus-Spinks	IIe	87	28	36	72	---	15
38C------------- Remus-Spinks	IIIe	81	23	34	67	---	14
38D------------- Remus-Spinks	IVe	---	---	30	59	---	---
38E------------- Remus-Spinks	VIIe	---	---	---	---	---	---
39B------------- Tustin	IIIe	80	26	---	60	---	13
40B------------- Arkona	IIIw	100	35	45	80	---	16
41-------------- Sickles	Vw	---	---	---	---	---	---
42B------------- Grattan	VIs	---	---	---	---	---	---
43B------------- Covert	IVs	80	---	45	70	3.5	13

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Oats	Alfalfa hay	Corn silage
		Bu	Bu	Bu	Bu	Tons	Tons
44B------------- Pipestone	IIIw	80	---	35	65	3.5	14
47B------------- Spinks-Coloma	IIIs	61	23	50	53	---	10
47C------------- Spinks-Coloma	IIIs	---	---	45	---	---	---
47D------------- Spinks-Coloma	IVe	---	---	---	---	---	---
47E------------- Spinks-Coloma	VIIe	---	---	---	---	---	---
48B------------- Thetford	IIIw	80	29	32	60	3.4	13
52C------------- Wallace	VIs	---	---	---	---	2.3	---
53A------------- Saugatuck-Jebavy	IVw	---	---	---	---	---	---
54B------------- Grattan	IVs	---	---	---	---	---	---
54C, 54D-------- Grattan	VIs	---	---	---	---	---	---
56B------------- Pipestone-Saugatuck	IVw	65	---	28	53	---	---
57B, 57B3, 57C-- Grattan	VIs	---	---	---	---	---	---
57D, 57E, 57F--- Grattan	VIIs	---	---	---	---	---	---
58B------------- Covert	IVs	80	---	40	60	3.5	13
59B------------- Pipestone	IVw	65	---	30	60	3.5	12
60-------------- Kingsville	Vw	---	---	---	---	---	---
62D, 62F-------- Nordhouse	VIIs	---	---	---	---	---	---
63B------------- Coloma	IVs	45	18	---	45	---	7
63C, 63D-------- Coloma	VIs	---	---	---	---	---	---
63E------------- Coloma	VIIs	---	---	---	---	---	---

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Oats	Alfalfa hay	Corn silage
		Bu	Bu	Bu	Bu	Tons	Tons
64B------------- Benona	IVs	55	---	---	---	3.0	11
64C, 64D-------- Benona	VIs	---	---	---	---	2.5	---
65B------------- Chelsea	IVs	68	23	---	41	---	---
65C------------- Chelsea	VIs	---	---	---	---	---	---
67B------------- Plainfield	IVs	43	16	---	42	---	5
67C------------- Plainfield	VIs	---	---	---	---	---	---
67E------------- Plainfield	VIIs	---	---	---	---	---	---
72-------------- Glendora	VIw	---	---	---	---	---	---
76-------------- Houghton	Vw	---	---	---	---	---	---
77-------------- Adrian	Vw	---	---	---	---	---	---
78-------------- Willette	Vw	---	---	---	---	---	---
79-------------- Edwards and Martisco	Vw	---	---	---	---	---	---
81-------------- Loxley and Dawson	VIIw	---	---	---	---	---	---
90B------------- Epworth	IIIs	---	---	---	---	---	---
90C------------- Epworth	IIIe	---	---	---	---	---	---
90D------------- Epworth	IVe	---	---	---	---	---	---
93B------------- Tuscola	IIe	100	32	47	80	---	17
94B------------- Coloma-Scalley	IVs	73	---	---	61	---	11
94C, 94D-------- Coloma-Scalley	VIs	---	---	---	---	---	---
95A------------- Ithaca-Arkona	IIw	112	38	51	86	---	17

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Oats	Alfalfa hay	Corn silage
		Bu	Bu	Bu	Bu	Tons	Tons
99B------------- Tekenink	IIe	100	35	40	80	4.0	17
99C------------- Tekenink	IIIe	90	32	35	70	3.6	16
99D------------- Tekenink	IVe	80	30	32	55	3.2	15

TABLE 7.--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)
		Acres	Acres	Acres
I	---	---	---	---
II	35,375	14,011	21,364	---
III	78,634	29,474	25,832	23,328
IV	65,643	10,498	15,547	39,598
V	35,521	---	35,521	---
VI	57,724	71	4,866	52,787
VII	68,670	51,016	827	16,827
VIII	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
2A: Del Rey	3C	Slight	Moderate	Severe	Slight	Northern red oak	56	44	Northern red oak, eastern cottonwood, northern whitecedar, white spruce, eastern white pine.
						White ash	56	44	
						Red maple	56	36	
						White oak	56	44	
						American basswood	56	44	
6: Kinross	2W	Slight	Severe	Severe	Severe	Quaking aspen	45	32	---
						Black spruce	---	---	
						Tamarack	---	---	
						Northern whitecedar	---	---	
						Balsam fir	---	---	
						Red maple	---	---	
						Jack pine	---	---	
7: Sloan	3W	Slight	Severe	Moderate	Severe	Red maple	66	41	Black spruce, northern whitecedar, eastern cottonwood.
						Swamp white oak	---	---	
						White ash	66	60	
						Green ash	66	60	
						Eastern cottonwood	89	100	
						Pin oak	---	---	
8B: Epworth	4S	Slight	Moderate	Slight	Moderate	Northern red oak	67	60	Red pine, jack pine.
						White oak	---	---	
						Red maple	---	---	
9**:									
Kerston	2W	Slight	Severe	Severe	Severe	Red maple	51	33	---
						White ash	---	---	
						Green ash	---	---	
						Silver maple	---	---	
						Tamarack	---	---	
						Black ash	---	---	
						American basswood	51	35	
Carlisle	2W	Slight	Severe	Severe	Severe	Red maple	56	36	Green ash.
						White ash	---	---	
						Green ash	---	---	
						Quaking aspen	---	---	
						Swamp white oak	---	---	
						Silver maple	82	36	
Glendora	3W	Slight	Severe	Moderate	Severe	Silver maple	90	42	---
						Red maple	65	40	
						Swamp white oak	---	---	
						Quaking aspen	---	---	
						Black ash	---	---	
						Eastern cottonwood	---	---	
						White ash	65	59	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
10B, 10B2, 10C, 10C2, 10D, 10D2-----------	4A	Slight	Slight	Slight	Severe	Northern red oak----	69	64	Northern red
Perrinton						Sugar maple---------	---	---	oak, white
						Red maple-----------	---	---	spruce,
						White ash-----------	---	---	eastern white
						American basswood---	---	---	pine, northern
						Bitternut hickory---	---	---	whitecedar.
10E------------	4R	Moderate	Moderate	Slight	Severe	Northern red oak----	69	64	Northern red
Perrinton						Sugar maple---------	---	---	oak, white
						Red maple-----------	---	---	spruce,
						White ash-----------	---	---	eastern white
						American basswood---	---	---	pine, northern
						Bitternut hickory---	---	---	whitecedar.
11A------------	4W	Slight	Severe	Slight	Severe	Northern red oak----	65	59	White spruce,
Ithaca						Sugar maple---------	---	---	northern
						American basswood---	---	---	whitecedar,
						White ash-----------	---	---	eastern white
						Northern pin oak----	---	---	pine.
						Red maple-----------	---	---	
						Bitternut hickory---	---	---	
12-------------	3W	Slight	Severe	Severe	Severe	Red maple-----------	66	41	Eastern white
Ziegenfuss						White ash-----------	---	---	pine, white
						American basswood---	---	---	spruce, Norway
						Swamp white oak-----	---	---	spruce.
						Green ash-----------	---	---	
						Eastern cottonwood--	---	---	
13B, 13C, 13D---	3A	Slight	Slight	Slight	Severe	Sugar maple---------	65	40	Northern red
Marlette						Northern red oak----	69	64	oak, eastern
						White ash-----------	---	---	white pine,
						Black walnut--------	---	---	red pine,
						American basswood---	---	---	white spruce.
						Black cherry--------	---	---	
						White oak-----------	---	---	
						Black oak-----------	---	---	
13E------------	3R	Moderate	Moderate	Slight	Severe	Sugar maple---------	65	40	Northern red
Marlette						Northern red oak----	69	64	oak, eastern
						White ash-----------	---	---	white pine,
						Black walnut--------	---	---	red pine,
						American basswood---	---	---	white spruce.
						Black cherry--------	---	---	
						White oak-----------	---	---	
						Black oak-----------	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Erosion hazard	Equipment limitation	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	Trees to plant
13F------------- Marlette	3R	Severe	Severe	Slight	Severe	Sugar maple--------- Northern red oak---- White ash----------- Black walnut-------- American basswood--- Black cherry-------- White oak----------- Black oak-----------	65 69 --- --- --- --- --- ---	40 64 --- --- --- --- --- ---	Northern red oak, eastern white pine, red pine, white spruce.
14A------------- Capac	4W	Slight	Moderate	Slight	Severe	Northern red oak---- American basswood--- Pin oak------------- White ash----------- Red maple----------- Bitternut hickory--- Sugar maple--------- Black cherry--------	65 --- --- --- --- --- --- ---	59 --- --- --- --- --- --- ---	Northern red oak, eastern white pine, white spruce.
15-------------- Parkhill	3W	Slight	Severe	Severe	Severe	Red maple----------- Silver maple-------- White ash----------- American basswood--- Swamp white oak-----	66 91 66 66 ---	41 43 60 60 ---	Eastern white pine, white spruce.
16B, 16C, 16D--- Remus	3A	Slight	Slight	Slight	Moderate	Sugar maple--------- Northern red oak---- American basswood--- Eastern hemlock----- Quaking aspen------- White ash----------- White oak----------- Red maple----------- Black cherry-------- American beech------ Paper birch--------- Bitternut hickory--- Bigtooth aspen------	61 --- --- --- --- --- --- --- --- --- --- --- 74	38 --- --- --- --- --- --- --- --- --- --- --- 86	White spruce, eastern white pine, red pine, northern red oak.
18B**, 18C**, 18D**:									
Fern-----------	4S	Slight	Moderate	Slight	Moderate	Northern red oak---- Red maple----------- Sugar maple--------- American basswood--- Black cherry--------	66 --- --- --- ---	60 --- --- --- ---	White spruce, eastern white pine, red pine.
Spinks---------	4S	Slight	Moderate	Slight	Slight	Northern red oak---- White oak----------- Black oak----------- Black cherry-------- Sugar maple---------	66 --- --- --- ---	60 --- --- --- ---	Red pine, eastern white pine, imperial Carolina poplar.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	
18E**:									
Fern	4R	Moderate	Moderate	Slight	Moderate	Northern red oak	66	60	White spruce, eastern white pine, red pine.
						Red maple	---	---	
						Sugar maple	---	---	
						American basswood	---	---	
						Black cherry	---	---	
Spinks	4R	Moderate	Moderate	Slight	Slight	Northern red oak	66	60	Red pine, eastern white pine, imperial Carolina poplar.
						White oak	---	---	
						Black oak	---	---	
						Black cherry	---	---	
						Sugar maple	---	---	
19A Kibbie	4W	Slight	Severe	Slight	Severe	Northern red oak	66	60	Imperial Carolina poplar, eastern white pine, Norway spruce.
						Red maple	---	---	
						White ash	---	---	
						American basswood	---	---	
						Quaking aspen	---	---	
						Sugar maple	---	---	
20 Bono	4W	Slight	Severe	Severe	Severe	Pin oak	80	62	Red maple, eastern cottonwood, green ash.
						Swamp white oak	---	---	
						Green ash	---	---	
						Red maple	---	---	
						Eastern cottonwood	---	---	
22B, 22C Arkport	3A	Slight	Slight	Slight	Moderate	Sugar maple	70	43	Norway spruce, red pine, eastern white pine.
						Red pine	85	169	
						Eastern white pine	85	196	
						Black cherry	---	---	
23A Freesoil	3W	Slight	Severe	Moderate	Severe	Red maple	67	41	Eastern white pine, jack pine, white spruce.
						Paper birch	---	---	
						Quaking aspen	---	---	
						Eastern white pine	---	---	
24 Lamson	8W	Slight	Severe	Severe	Severe	Eastern white pine	65	136	Northern whitecedar, eastern white pine.
						Red maple	65	40	
						Swamp white oak	---	---	
26A Kibbie	4W	Slight	Severe	Slight	Severe	Northern red oak	66	60	Eastern white pine, Norway spruce, imperial Carolina poplar.
						Red maple	---	---	
						White ash	---	---	
						American basswood	---	---	
						Quaking aspen	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
27-------------- Poy	4W	Slight	Severe	Severe	Severe	Red maple-----------	86	53	Red maple, white ash, silver maple, green ash, white spruce.
						Swamp white oak-----	---	---	
						Northern red oak----	---	---	
						White ash-----------	80	6	
						Silver maple--------	---	---	
						American elm--------	---	---	
						Green ash-----------	---	---	
						American basswood---	---	---	
28B------------- Scalley	3A	Slight	Slight	Slight	Moderate	Sugar maple---------	61	38	White spruce, eastern white pine, red pine.
						Northern red oak----	---	---	
						Black cherry--------	---	---	
						White ash-----------	---	---	
						White oak-----------	---	---	
31B, 31C-------- Boyer	4A	Slight	Slight	Slight	Moderate	Northern red oak----	66	60	Northern red oak, white oak, eastern white pine, red pine.
						White oak-----------	---	---	
						American basswood---	---	---	
						Sugar maple---------	---	---	
						Black oak-----------	---	---	
32B, 32C, 32D--- Fern	4S	Slight	Moderate	Slight	Moderate	Northern red oak----	66	60	White spruce, eastern white pine, red pine.
						Red maple-----------	---	---	
						Sugar maple---------	---	---	
						American basswood---	---	---	
						Black cherry--------	---	---	
32F------------- Fern	4R	Moderate	Moderate	Slight	Moderate	Northern red oak----	66	60	White spruce, eastern white pine, red pine.
						Red maple-----------	---	---	
						Sugar maple---------	---	---	
						American basswood---	---	---	
						Black cherry--------	---	---	
34B------------- Wixom	6W	Slight	Moderate	Moderate	Severe	Quaking aspen-------	70	81	Eastern white pine, white spruce, northern red oak.
						American beech------	---	---	
						Northern red oak----	---	---	
						Red maple-----------	66	41	
						American basswood---	---	---	
36B**, 36C**, 36D**:									
Fern----------	4S	Slight	Moderate	Slight	Moderate	Northern red oak----	66	60	White spruce, eastern white pine, red pine.
						Red maple-----------	---	---	
						Sugar maple---------	---	---	
						American basswood---	---	---	
						Black cherry--------	---	---	
Marlette------	3A	Slight	Slight	Slight	Severe	Sugar maple---------	65	40	Northern red oak, eastern white pine, red pine, white spruce.
						Northern red oak----	69	64	
						White ash-----------	---	---	
						American basswood---	---	---	
						Black cherry--------	---	---	
						White oak-----------	---	---	
						Black oak-----------	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns: Erosion hazard	Management concerns: Equip-ment limita-tion	Management concerns: Wind-throw hazard	Management concerns: Plant competi-tion	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
36E**:									
Fern	4R	Moderate	Moderate	Slight	Moderate	Northern red oak	66	60	White spruce, eastern white pine, red pine.
						Red maple	---	---	
						Sugar maple	---	---	
						American basswood	---	---	
						Black cherry	---	---	
Marlette	3R	Moderate	Moderate	Slight	Severe	Sugar maple	65	40	Northern red oak, eastern white pine, red pine, white spruce.
						Northern red oak	69	64	
						White ash	---	---	
						American basswood	---	---	
						Black cherry	---	---	
						White oak	---	---	
						Black oak	---	---	
37B**:									
Wixom	6W	Slight	Moderate	Moderate	Severe	Quaking aspen	70	81	Eastern white pine, white spruce, northern red oak.
						American beech	---	---	
						Northern red oak	---	---	
						Red maple	66	41	
						American basswood	---	---	
Capac	4W	Slight	Moderate	Slight	Severe	Northern red oak	65	59	Northern red oak, eastern white pine, white spruce.
						American basswood	---	---	
						Pin oak	---	---	
						White ash	---	---	
						Red maple	---	---	
						Bitternut hickory	---	---	
						Sugar maple	---	---	
						Black cherry	---	---	
38B**, 38C**, 38D**:									
Remus	3A	Slight	Slight	Slight	Moderate	Sugar maple	61	38	White spruce, eastern white pine, red pine, northern red oak.
						Northern red oak	---	---	
						American basswood	---	---	
						Eastern hemlock	---	---	
						Quaking aspen	---	---	
						White ash	---	---	
						White oak	---	---	
						Red maple	---	---	
						Black cherry	---	---	
						American beech	---	---	
						Paper birch	---	---	
						Bitternut hickory	---	---	
						Bigtooth aspen	74	86	
Spinks	4S	Slight	Moderate	Slight	Slight	Northern red oak	66	60	Red pine, eastern white pine, imperial Carolina poplar.
						White oak	---	---	
						Black oak	---	---	
						Black cherry	---	---	
						Sugar maple	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
38E**:									
Remus----------	3R	Moderate	Moderate	Slight	Moderate	Sugar maple---------	61	38	White spruce, eastern white pine, red pine, northern red oak.
						Northern red oak----	---	---	
						American basswood---	---	---	
						Eastern hemlock-----	---	---	
						Quaking aspen-------	---	---	
						White ash-----------	---	---	
						White oak-----------	---	---	
						Red maple-----------	---	---	
						Black cherry--------	---	---	
						American beech------	---	---	
						Paper birch---------	---	---	
						Bitternut hickory---	---	---	
						Bigtooth aspen------	74	86	
Spinks---------	4R	Moderate	Moderate	Slight	Slight	Northern red oak----	66	60	Red pine, eastern white pine, imperial Carolina poplar.
						White oak-----------	---	---	
						Black oak-----------	---	---	
						Black cherry--------	---	---	
						Sugar maple---------	---	---	
39B------------- Tustin	3A	Slight	Slight	Slight	Slight	Black oak-----------	55	38	Red pine, eastern white pine, Norway spruce.
						Red pine------------	---	---	
						Eastern white pine--	---	---	
						Northern red oak----	---	---	
40B------------- Arkona	2W	Slight	Moderate	Slight	Severe	Red maple-----------	56	36	White spruce, Norway spruce, eastern white pine, imperial Carolina poplar.
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
						Eastern cottonwood--	91	105	
						Bitternut hickory---	---	---	
						Northern red oak----	---	---	
						Sugar maple---------	---	---	
41-------------- Sickles	5W	Slight	Severe	Severe	Severe	Quaking aspen-------	61	66	White spruce, eastern white pine.
						White ash-----------	---	---	
						Eastern cottonwood--	---	---	
						American basswood---	---	---	
						Red maple-----------	---	---	
42B------------- Grattan	9S	Slight	Moderate	Slight	Slight	Eastern white pine--	62	127	Eastern white pine, red pine.
						Quaking aspen-------	---	---	
						White oak-----------	---	---	
43B------------- Covert	4S	Slight	Moderate	Slight	Moderate	Northern red oak----	67	61	Red pine, eastern white pine, imperial Carolina poplar.
						Red maple-----------	66	41	
						Eastern cottonwood--	---	---	
						American basswood---	---	---	
						Black cherry--------	---	---	
						White oak-----------	---	---	
44B------------- Pipestone	3W	Slight	Severe	Moderate	Severe	Red maple-----------	65	40	White spruce, eastern white pine.
						Eastern hemlock-----	---	---	
						Paper birch---------	---	---	
						Eastern white pine--	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
47B**, 47C**, 47D**:									
Spinks	4S	Slight	Moderate	Slight	Slight	Northern red oak	66	60	Red pine, eastern white pine, imperial Carolina poplar.
						White oak	---	---	
						Black oak	---	---	
						Black cherry	---	---	
						Sugar maple	---	---	
Coloma	2S	Slight	Moderate	Slight	Slight	Northern pin oak	49	33	Red pine, eastern white pine, jack pine.
						Jack pine	---	---	
						Eastern white pine	---	---	
						Black oak	---	---	
47E**:									
Spinks	4R	Moderate	Moderate	Slight	Slight	Northern red oak	66	60	Red pine, eastern white pine, imperial Carolina poplar.
						White oak	---	---	
						Black oak	---	---	
						Black cherry	---	---	
						Sugar maple	---	---	
						Red maple	---	---	
Coloma	2R	Moderate	Moderate	Slight	Slight	Northern pin oak	49	33	Red pine, eastern white pine, jack pine.
						Eastern white pine	---	---	
						Black oak	---	---	
48B Thetford	3W	Slight	Moderate	Slight	Severe	Red maple	65	40	White spruce, eastern white pine.
						White ash	---	---	
						Quaking aspen	---	---	
						Eastern cottonwood	---	---	
						Northern red oak	---	---	
						Bitternut hickory	---	---	
52C Wallace	6D	Slight	Moderate	Severe	Slight	Red pine	55	88	Red pine, white spruce.
						Red maple	---	---	
						Eastern white pine	52	96	
						Eastern hemlock	---	---	
						Paper birch	63	70	
						Quaking aspen	75	87	
						Sugar maple	---	---	
						Bigtooth aspen	---	---	
						Northern red oak	---	---	
						White oak	---	---	
53A**:									
Saugatuck	2W	Slight	Severe	Severe	Severe	Red maple	45	29	Eastern white pine, white spruce.
						Eastern cottonwood	---	---	
						Black spruce	---	---	
						White ash	---	---	
						Pin oak	---	---	
						Paper birch	56	59	
						Eastern white pine	---	---	
Jebavy	2W	Slight	Severe	Severe	Severe	Red maple	57	36	Eastern white pine, jack pine, white spruce.
						Quaking aspen	---	---	
						Eastern hemlock	---	---	
						Eastern white pine	66	139	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Erosion hazard	Equipment limitation	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	Trees to plant
54B, 54C, 54D---Grattan	3S	Slight	Moderate	Slight	Slight	Sugar maple---------	70	43	Red pine, eastern white pine.
						Northern red oak----	---	---	
56B**:									
Pipestone------	3W	Slight	Severe	Moderate	Severe	Red maple-----------	65	40	Eastern white pine, white spruce.
						White ash-----------	---	---	
						Eastern cottonwood--	---	---	
						Bitternut hickory---	---	---	
						Eastern white pine--	64	133	
						Paper birch---------	---	---	
Saugatuck------	2W	Slight	Severe	Severe	Severe	Red maple-----------	45	29	Eastern white pine, white spruce.
						Eastern cottonwood--	---	---	
						Black spruce--------	---	---	
						White ash-----------	---	---	
						Pin oak-------------	---	---	
						Paper birch---------	56	59	
						Eastern white pine--	---	---	
57B, 57B3, 57C, 57D------------Grattan	9S	Slight	Moderate	Slight	Slight	Eastern white pine--	62	127	Eastern white pine, red pine.
						Quaking aspen-------	---	---	
						White oak-----------	---	---	
						Black oak-----------	---	---	
						Sugar maple---------	59	37	
						Northern red oak----	---	---	
57E------------Grattan	9R	Moderate	Moderate	Slight	Slight	Eastern white pine--	62	127	Eastern white pine, red pine.
						Quaking aspen-------	---	---	
						White oak-----------	---	---	
						Black oak-----------	---	---	
						Sugar maple---------	59	37	
						Northern red oak----	---	---	
57F------------Grattan	9R	Severe	Severe	Slight	Slight	Eastern white pine--	62	127	Eastern white pine, red pine.
						Quaking aspen-------	---	---	
						White oak-----------	---	---	
						Black oak-----------	---	---	
						Sugar maple---------	59	37	
						Northern red oak----	---	---	
58B------------Covert	4S	Slight	Moderate	Slight	Moderate	Northern red oak----	67	61	Eastern white pine, red pine.
						Red maple-----------	66	41	
						Black cherry--------	---	---	
						Eastern cottonwood--	---	---	
						American basswood---	---	---	
						White oak-----------	---	---	
						Quaking aspen-------	---	---	
						American beech------	---	---	
						Eastern white pine--	---	---	
59B------------Pipestone	3W	Slight	Severe	Moderate	Severe	Red maple-----------	65	40	Eastern white pine, white spruce.
						White ash-----------	---	---	
						Eastern cottonwood--	---	---	
						Bitternut hickory---	---	---	
						Eastern white pine--	64	133	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
60-------------- Kingsville	5W	Slight	Severe	Severe	Severe	Bigtooth aspen------	67	76	Baldcypress, white spruce, eastern white pine.
						Red maple-----------	65	40	
						Quaking aspen-------	67	76	
						Swamp white oak-----	63	46	
						Silver maple--------	---	---	
						White ash-----------	---	---	
						Green ash-----------	---	---	
62D------------- Nordhouse	4S	Slight	Moderate	Slight	Slight	Northern red oak----	67	61	Red pine, eastern white pine.
						Red maple-----------	---	---	
						American beech------	---	---	
						Paper birch---------	---	---	
						Eastern white pine--	---	---	
						Eastern hemlock-----	---	---	
62F------------- Nordhouse	4R	Severe	Severe	Slight	Slight	Northern red oak----	67	61	Red pine, eastern white pine.
						Red maple-----------	---	---	
						American beech------	---	---	
						Paper birch---------	---	---	
						Eastern white pine--	---	---	
						Eastern hemlock-----	---	---	
63B, 63C, 63D--- Coloma	2S	Slight	Moderate	Slight	Slight	Northern pin oak----	49	33	Red pine, eastern white pine, jack pine.
						Eastern white pine--	---	---	
						Black oak-----------	---	---	
63E------------- Coloma	2R	Moderate	Moderate	Slight	Slight	Northern pin oak----	49	33	Red pine, eastern white pine, jack pine.
						Eastern white pine--	---	---	
						Black oak-----------	---	---	
64B, 64C, 64D--- Benona	4S	Slight	Moderate	Slight	Slight	Northern red oak----	67	61	Red pine, eastern white pine, jack pine.
						American beech------	---	---	
						Black cherry--------	---	---	
						Hemlock-------------	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
						Red pine------------	---	---	
65B, 65C-------- Chelsea	5S	Slight	Moderate	Slight	Moderate	White oak-----------	70	66	---
						Red pine------------	72	134	
						Eastern white pine--	83	190	
						Jack pine-----------	70	107	
						Quaking aspen-------	70	66	
						Northern red oak----	70	66	
67B, 67C-------- Plainfield	8S	Slight	Moderate	Slight	Slight	Eastern white pine--	58	115	Red pine, eastern white pine, jack pine.
						Red pine------------	55	88	
						Jack pine-----------	49	65	
						Northern red oak----	---	---	
						Black oak-----------	---	---	
						White oak-----------	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
67E------------- Plainfield	8R	Moderate	Moderate	Slight	Slight	Eastern white pine--	58	115	Red pine, eastern white pine, jack pine.
						Red pine-----------	55	88	
						Jack pine----------	49	65	
						Northern red oak----	---	---	
						Black oak----------	---	---	
						White oak----------	---	---	
72-------------- Glendora	3W	Slight	Severe	Moderate	Severe	Silver maple--------	90	42	---
						Red maple----------	65	40	
						Quaking aspen-------	---	---	
						Black ash----------	---	---	
						Eastern cottonwood--	---	---	
						White ash----------	65	59	
						Paper birch---------	---	---	
						Yellow birch--------	---	---	
						American beech------	---	---	
						Northern red oak----	---	---	
76-------------- Houghton	2W	Slight	Severe	Severe	Severe	Silver maple--------	82	36	---
						Red maple----------	56	36	
						White ash----------	56	44	
						Quaking aspen-------	60	64	
						Tamarack-----------	52	45	
						Green ash----------	---	---	
						Northern whitecedar-	37	24	
77-------------- Adrian	2W	Slight	Severe	Severe	Severe	Silver maple--------	78	32	---
						Red maple----------	53	34	
						White ash----------	69	64	
						Quaking aspen-------	60	64	
						Tamarack-----------	45	35	
						Green ash----------	69	64	
78-------------- Willette	2W	Slight	Severe	Severe	Severe	Red maple----------	51	33	---
						Silver maple--------	76	30	
						White ash----------	51	35	
						Northern whitecedar-	27	15	
						Black ash----------	---	---	
79**:									
Edwards--------	2W	Slight	Severe	Severe	Severe	Red maple----------	56	36	---
						White ash----------	---	---	
						Green ash----------	---	---	
						Tamarack-----------	---	---	
						Swamp white oak-----	---	---	
						Silver maple--------	---	---	
Martisco-------	2W	Slight	Severe	Severe	Severe	Red maple----------	55	36	---
						Quaking aspen-------	---	---	
81**:									
Loxley---------	2W	Slight	Severe	Severe	Severe	Tamarack-----------	---	---	---
						Eastern white pine--	---	---	
Dawson---------	2W	Slight	Severe	Severe	Severe	Tamarack-----------	---	---	---
						Eastern white pine--	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
90B, 90C, 90D--- Epworth	4S	Slight	Moderate	Slight	Slight	Northern red oak---- White oak----------- Red maple-----------	67 --- ---	61 --- ---	Red pine, jack pine.
93B------------- Tuscola	5A	Slight	Slight	Slight	Moderate	Northern red oak---- White ash----------- American basswood--- White oak----------- Sugar maple--------- Black oak-----------	70 --- --- --- --- 72	66 --- --- --- --- 54	Eastern white pine, Norway spruce, red pine.
94B**, 94C**, 94D**:									
Coloma---------	2S	Slight	Moderate	Slight	Slight	Northern pin oak---- Eastern white pine-- Black oak-----------	49 --- ---	33 --- ---	Red pine, eastern white pine, jack pine.
Scalley--------	3A	Slight	Slight	Slight	Moderate	Sugar maple--------- Northern red oak---- Black cherry-------- White ash----------- White oak-----------	61 --- --- --- ---	38 --- --- --- ---	White spruce, eastern white pine, red pine, northern red oak.
95A**:									
Ithaca----------	4W	Slight	Severe	Slight	Severe	Northern red oak---- Sugar maple--------- American basswood--- White ash----------- Northern pin oak---- Red maple----------- Bitternut hickory---	65 --- --- --- --- --- ---	59 --- --- --- --- --- ---	White spruce, northern whitecedar, eastern white pine.
Arkona----------	2W	Slight	Moderate	Slight	Severe	Red maple----------- Quaking aspen------- Paper birch--------- Eastern cottonwood-- Bitternut hickory--- Northern red oak---- Sugar maple---------	56 --- --- 91 --- --- ---	36 --- --- 105 --- --- ---	White spruce, Norway spruce, eastern white pine, imperial Carolina poplar.
97B**: Urban land.									
Epworth---------	4S	Slight	Moderate	Slight	Slight	Northern red oak---- White oak----------- Red maple-----------	67 --- ---	61 --- ---	Red pine, jack pine.
99B, 99C, 99D--- Tekenink	4A	Slight	Slight	Slight	Moderate	Northern red oak---- Black cherry-------- White ash----------- American basswood--- American beech------ Sugar maple---------	66 --- --- --- --- ---	60 --- --- --- --- ---	Black walnut, red pine, eastern white pine, yellow-poplar.
210B**, 210C**-- Typic Udipsamments	2S	Slight	Moderate	Slight	Slight	Black oak----------- White oak----------- Northern red oak----	50 42 54	34 25 54	Red pine, jack pine.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
210D**---------- Typic Udipsamments	2R	Moderate	Moderate	Slight	Slight	Black oak----------- White oak----------- Northern red oak----	50 42 54	34 25 54	Red pine, jack pine.
211B**, 211C**-- Typic Udipsamments	3S	Slight	Moderate	Slight	Slight	Black oak----------- White oak----------- Northern red oak----	53 45 54	36 27 40	Red pine.
212B**---------- Typic Udipsamments	3S	Slight	Moderate	Slight	Slight	Black oak----------- White oak----------- Northern red oak----	56 49 55	39 31 42	Red pine.
213B**---------- Alfic Udipsamments	---	Slight	Moderate	Slight	Slight	Black oak----------- White oak----------- Northern red oak----	--- --- ---	--- --- ---	---
214B**---------- Typic Udipsamments	2S	Slight	Moderate	Slight	Moderate	White oak----------- Black oak----------- Eastern white pine-- Jack pine-----------	51 58 --- ---	35 41 --- ---	Red pine.
220B**, 220C**-- Entic Haplorthods	4S	Slight	Moderate	Slight	Slight	Northern red oak---- White oak----------- Black oak----------- Red maple-----------	61 52 60 ---	53 37 43 ---	---
220D**---------- Entic Haplorthods	4R	Moderate	Moderate	Slight	Slight	Northern red oak---- White oak----------- Black oak----------- Red maple-----------	61 52 60 ---	53 37 43 ---	---
220E**---------- Entic Haplorthods	4R	Severe	Severe	Slight	Slight	Northern red oak---- White oak----------- Black oak----------- Red maple-----------	61 52 60 ---	53 37 43 ---	---
221B**, 221C**-- Entic Haplorthods	4S	Slight	Moderate	Slight	Slight	Northern red oak---- White oak----------- Black oak----------- Red maple-----------	65 53 66 ---	59 39 48 ---	---
221D**---------- Entic Haplorthods	4R	Moderate	Moderate	Slight	Slight	Northern red oak---- White oak----------- Black oak----------- Red maple-----------	65 53 66 ---	59 39 48 ---	---
222B**---------- Entic Haplorthods	4S	Slight	Moderate	Slight	Slight	Northern red oak---- Red maple----------- White oak----------- Eastern white pine-- Black oak-----------	65 --- 55 --- 66	59 --- 42 --- 48	---
224B**---------- Entic Haplorthods	4S	Slight	Moderate	Slight	Moderate	Northern red oak---- Eastern white pine-- Paper birch--------- White oak----------- Red maple-----------	66 --- --- 54 ---	60 --- --- 40 ---	---

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
225B**, 225C**--Entic Haplorthods	4S	Slight	Moderate	Slight	Slight	Northern red oak----	67	61	---
						Red maple-----------	---	---	
						Eastern white pine--	---	---	
						White oak-----------	57	46	
231B**, 231C**:									
Entic Haplorthods---	4S	Slight	Moderate	Slight	Slight	Northern red oak----	61	53	---
						White oak-----------	52	37	
						Black oak-----------	60	43	
						Red maple-----------	---	---	
Alfic Haplorthods---	5S	Slight	Moderate	Slight	Slight	Northern red oak----	77	76	---
						Red maple-----------	74	46	
						Paper birch---------	---	---	
231D**:									
Entic Haplorthods---	4R	Moderate	Moderate	Slight	Slight	Northern red oak----	61	53	---
						White oak-----------	52	37	
						Black oak-----------	60	43	
						Red maple-----------	---	---	
Alfic Haplorthods---	5R	Moderate	Moderate	Slight	Slight	Northern red oak----	77	76	---
						Red maple-----------	74	46	
						Paper birch---------	---	---	
231E**:									
Entic Haplorthods---	4R	Severe	Severe	Slight	Slight	Northern red oak----	61	53	---
						White oak-----------	52	37	
						Black oak-----------	60	43	
						Red maple-----------	---	---	
Alfic Haplorthods---	5R	Severe	Severe	Slight	Slight	Northern red oak----	77	76	---
						Red maple-----------	74	46	
						Paper birch---------	---	---	
233B**:									
Alfic Haplorthods---	5S	Slight	Moderate	Slight	Slight	Northern red oak----	77	76	---
						Red maple-----------	74	46	
						Paper birch---------	---	---	
Entic Haplorthods---	4S	Slight	Moderate	Slight	Slight	Northern red oak----	61	53	---
						White oak-----------	52	37	
						Black oak-----------	60	43	
						Red maple-----------	---	---	
235B**:									
Alfic Haplorthods---	5S	Slight	Moderate	Slight	Slight	Northern red oak----	77	76	---
						Red maple-----------	74	46	
						Paper birch---------	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
235B**:									
Alfic Haplorthods---	3S	Slight	Moderate	Slight	Slight	Red maple-----------	72	44	---
						Northern red oak----	75	73	
						White oak-----------	60	51	
235C**:									
Alfic Haplorthods---	5S	Slight	Moderate	Slight	Slight	Northern red oak----	77	76	---
						Red maple-----------	74	46	
						Paper birch---------	---	---	
Alfic Haplorthods---	3S	Slight	Moderate	Slight	Slight	Red maple-----------	72	44	---
						Northern red oak----	75	73	
						White oak-----------	60	51	
235D**:									
Alfic Haplorthods---	5R	Moderate	Moderate	Slight	Slight	Northern red oak----	77	76	---
						Red maple-----------	74	46	
						Paper birch---------	---	---	
Alfic Haplorthods---	3R	Moderate	Moderate	Slight	Slight	Red maple-----------	72	44	---
						Northern red oak----	75	73	
						White oak-----------	60	51	
236B**, 236C**-- Entic Haplorthods	4S	Slight	Moderate	Slight	Slight	Northern red oak----	61	53	---
						White oak-----------	52	37	
						Black oak-----------	60	43	
						Red maple-----------	---	---	
236D**---------- Entic Haplorthods	4R	Moderate	Moderate	Slight	Slight	Northern red oak----	61	53	---
						White oak-----------	52	37	
						Black oak-----------	60	43	
						Red maple-----------	---	---	
236E**---------- Entic Haplorthods	4R	Severe	Severe	Slight	Slight	Northern red oak----	61	53	---
						White oak-----------	52	37	
						Black oak-----------	60	43	
						Red maple-----------	---	---	
237B**, 237C**-- Haplic Glossudalfs	6A	Slight	Slight	Slight	Moderate	Northern red oak----	85	88	---
						White oak-----------	63	56	
						Red maple-----------	69	42	
237D**---------- Haplic Glossudalfs	6R	Moderate	Moderate	Slight	Moderate	Northern red oak----	85	88	---
						White oak-----------	63	56	
						Red maple-----------	69	42	
240B**, 240C**-- Entic Haplorthods	3S	Slight	Moderate	Slight	Slight	Sugar maple---------	65	40	---
						Northern red oak----	76	75	
						Red maple-----------	65	40	
						American beech------	---	---	
240D**---------- Entic Haplorthods	3R	Moderate	Moderate	Slight	Slight	Sugar maple---------	65	40	---
						Northern red oak----	76	75	
						Red maple-----------	65	40	
						American beech------	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equip-ment limita-tion	Wind-throw hazard	Plant competi-tion	Common trees	Site index	Volume*	
240E**----------- Entic Haplorthods	3R	Severe	Severe	Slight	Slight	Sugar maple---------	65	40	---
						Northern red oak----	76	75	
						Red maple-----------	65	40	
						American beech------	---	---	
245B**, 245C**-- Entic Haplorthods	3S	Slight	Moderate	Slight	Slight	Sugar maple---------	75	47	---
						American beech------	---	---	
						Northern red oak----	88	91	
						White ash-----------	85	88	
						American basswood---	---	---	
245D**----------- Entic Haplorthods	3R	Moderate	Moderate	Slight	Slight	Sugar maple---------	75	47	---
						American beech------	---	---	
						Northern red oak----	88	91	
						White ash-----------	85	88	
						American basswood---	---	---	
250**:									
Mollic Psammaquents--	---	Slight	Severe	Severe	Severe	Red maple-----------	---	---	---
						Balsam fir----------	---	---	
						Paper birch---------	---	---	
						Black ash-----------	---	---	
Aquic Udipsamments--	4S	Slight	Moderate	Slight	Moderate	Northern red oak----	65	59	---
						Red maple-----------	---	---	
						Balsam fir----------	---	---	
Medisaprists.									
251A**:									
Aeric Haplaquods----	4W	Slight	Severe	Severe	Moderate	Northern red oak----	60	51	---
						Black oak-----------	---	---	
						White oak-----------	52	37	
						Red maple-----------	---	---	
						Paper birch---------	---	---	
						Jack pine-----------	---	---	
Typic Haplaquods----	---	Slight	Severe	Severe	Severe	Red maple-----------	---	---	---
						Paper birch---------	---	---	
						Jack pine-----------	---	---	
						Tamarack------------	---	---	
252**:									
Typic Haplaquods----	---	Slight	Severe	Severe	Severe	Red maple-----------	---	---	---
						Paper birch---------	---	---	
						Jack pine-----------	---	---	
						Tamarack------------	---	---	
Medisaprists---	---	Slight	Severe	Severe	Severe	Black spruce--------	---	---	---

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
253A**:									
Aeric Haplaquods	4W	Slight	Severe	Severe	Moderate	Northern red oak	60	51	---
						Black oak	---	---	
						White oak	52	37	
						Red maple	---	---	
						Paper birch	---	---	
						Jack pine	---	---	
Aquic Udipsamments	4S	Slight	Moderate	Slight	Moderate	Northern red oak	64	57	
						Red maple	---	---	---
						Balsam fir	---	---	
255B**:									
Aquic Udipsamments	---	Slight	Moderate	Slight	Moderate	---	---	---	---
Entic Haplorthods	4S	Slight	Moderate	Slight	Moderate	Northern red oak	66	60	---
						Eastern white pine	---	---	
						Paper birch	---	---	
						White oak	54	40	
						Red maple	---	---	
256**:									
Medisaprists	---	Slight	Severe	Severe	Severe	Northern whitecedar	---	---	---
						American basswood	---	---	
Mollic Psammaquents	---	Slight	Severe	Severe	Severe	Black ash	---	---	---
						Green ash	---	---	
						Hemlock	---	---	
						Red maple	---	---	
						Paper birch	---	---	
						Balsam fir	---	---	
262A** Aeric Haplaquods	4W	Slight	Severe	Severe	Moderate	Northern red oak	60	51	---
						Black oak	---	---	
						White oak	52	37	
						Red maple	---	---	
						Paper birch	---	---	
						Jack pine	---	---	
263A** Aquic Udipsamments	---	Slight	Moderate	Slight	Moderate	Northern red oak	65	57	---
						Red maple	---	---	
						Balsam fir	---	---	
272** Typic Haplaquods	---	Slight	Severe	Severe	Severe	Red maple	---	---	---
						Paper birch	---	---	
						Jack pine	---	---	
						Tamarack	---	---	
273** Mollic Psammaquents	---	Slight	Severe	Severe	Severe	Black ash	---	---	---
						Green ash	---	---	
						Hemlock	---	---	
						Red maple	---	---	
						Paper birch	---	---	
						Balsam fir	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Volume*	
274**----------- Typic Haplaquolls	---	Slight	Severe	Severe	Severe	Black ash-----------	---	---	---
						Eastern hemlock-----	---	---	
						American basswood---	---	---	
						Northern whitecedar-	---	---	
						Red maple-----------	---	---	
						White spruce--------	---	---	
281------------- Medisaprists	---	Slight	Severe	Severe	Severe	Black spruce--------	---	---	---
282------------- Medisaprists	---	Slight	Severe	Severe	Severe	Northern whitecedar-	---	---	---
						American basswood---	---	---	

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked unmanaged stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(Only the soils likely to be used for windbreaks and environmental plantings are listed. The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
2A: Del Rey	American cranberrybush, Amur privet, late lilac.	Eastern white pine, white spruce.	White ash, red pine, red maple, Norway spruce, Black Hills spruce.	Green ash.
7: Sloan	Green ash, Indigo silky dogwood, Amur privet, white spruce, American cranberrybush.	Northern whitecedar, Manchurian crabapple.	Golden willow	Imperial Carolina poplar.
8B: Epworth	Eastern redcedar, Siberian peashrub, lilac, Amur honeysuckle.	Austrian pine, red pine, jack pine.	Eastern white pine	---
9*:				
Kerston	Amur privet, nannyberry viburnum, Indigo silky dogwood, American cranberrybush, gray dogwood.	Siberian crabapple, northern whitecedar, white spruce.	Eastern white pine, green ash, Norway spruce.	Imperial Carolina poplar.
Carlisle	Nannyberry viburnum, American cranberrybush, Indigo silky dogwood, arrowwood.	Northern whitecedar, Austrian pine, white spruce, Siberian crabapple.	Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
Glendora.				
10B, 10B2, 10C, 10C2, 10D, 10D2, 10E: Perrinton	Roselow sargent crabapple, lilac, Indigo silky dogwood, northern whitecedar, American cranberrybush, nannyberry viburnum.	White spruce, Amur maple, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce.	---
11A: Ithaca	Northern whitecedar, Indigo silky dogwood, Amur maple, lilac, American cranberrybush, Amur privet.	White spruce, Siberian crabapple, eastern white pine, Norway spruce.	Green ash, red maple	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
12 Ziegenfuss	Northern whitecedar, lilac, nannyberry viburnum, Indigo silky dogwood, American cranberrybush, Amur maple, Roselow sargent crabapple.	Norway spruce, white spruce, blue spruce, Manchurian crabapple.	Green ash	---
13B Marlette	American cranberrybush, common ninebark, lilac, Indigo silky dogwood.	White spruce, Amur maple, Manchurian crabapple, nannyberry viburnum.	Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
13B2 Marlette	American cranberrybush, lilac, Indigo silky dogwood, nannyberry viburnum.	White spruce, northern whitecedar, Amur maple, Manchurian crabapple.	Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
13C Marlette	American cranberrybush, common ninebark, lilac, Indigo silky dogwood.	White spruce, Amur maple, Manchurian crabapple, nannyberry viburnum.	Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
13C2 Marlette	American cranberrybush, lilac, Indigo silky dogwood, nannyberry viburnum.	White spruce, northern whitecedar, Amur maple, Manchurian crabapple.	Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
13D, 13E, 13F Marlette	American cranberrybush, common ninebark, lilac, Indigo silky dogwood.	White spruce, Amur maple, Manchurian crabapple, nannyberry viburnum.	Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
14A Capac	Indigo silky dogwood, American cranberrybush, Amur privet, lilac.	White spruce, northern whitecedar, Amur maple.	Eastern white pine, red maple, Norway spruce, green ash.	Imperial Carolina poplar.
15 Parkhill	Common ninebark, lilac, nannyberry viburnum, American cranberrybush.	Northern whitecedar, white spruce, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce.	---
16B, 16C, 16D Remus	Nannyberry viburnum, American cranberrybush, lilac, Indigo silky dogwood.	Northern whitecedar, Siberian crabapple, white spruce.	Norway spruce, red pine, green ash, eastern white pine.	Imperial Carolina poplar.
18B*, 18C*, 18D*, 18E*:				
Fern	Amur maple, nannyberry viburnum, American cranberrybush, Siberian peashrub, lilac, Indigo silky dogwood.	White spruce, green ash.	Norway spruce, red pine, eastern white pine.	Imperial Carolina poplar.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
18B*, 18C*, 18D*, 18E*:				
Spinks	American cranberrybush, Indigo silky dogwood, lilac, Siberian peashrub, Amur honeysuckle.	White spruce, eastern redcedar.	Eastern white pine, red pine, green ash, Norway spruce.	Imperial Carolina poplar.
19A Kibbie	Common ninebark, Indigo silky dogwood, lilac, nannyberry viburnum, American cranberrybush.	Northern whitecedar, white spruce, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce.	---
20 Bono	American cranberrybush, Indigo silky dogwood, Amur privet, Amur honeysuckle.	Northern whitecedar, Austrian pine, blue spruce, Washington hawthorn.	Eastern white pine, Norway spruce.	---
22B, 22C Arkport	American cranberrybush, Amur honeysuckle, Amur privet, Washington hawthorn.	Eastern redcedar, northern whitecedar, Austrian pine.	Red pine, Norway spruce, eastern white pine.	---
23A Freesoil	Lilac, Indigo silky dogwood, nannyberry viburnum, arrowwood, Roselow sargent crabapple, autumn olive.	Manchurian crabapple, white spruce, Austrian pine.	Norway spruce, green ash.	Imperial Carolina poplar.
24 Lamson	American cranberrybush, Amur honeysuckle, Amur privet, Indigo silky dogwood.	Northern whitecedar, white spruce.	Eastern white pine, green ash.	---
26A Kibbie	Common ninebark, lilac, nannyberry viburnum, American cranberrybush, Indigo silky dogwood.	Northern whitecedar, white spruce, Manchurian crabapple.	Eastern white pine, Norway spruce, green ash.	---
27 Poy	Northern whitecedar, American cranberrybush, nannyberry viburnum, Indigo silky dogwood, redosier dogwood, common ninebark.	White spruce, balsam fir.	Silver maple, white ash, green ash, red maple.	---
28B Scalley	Lilac, Roselow sargent crabapple, Indigo silky dogwood, Amur honeysuckle, eastern redcedar, Siberian peashrub.	Austrian pine, Siberian crabapple, jack pine.	Eastern white pine, red pine, green ash.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
31B, 31C: Boyer	Amur maple, Siberian peashrub, lilac, Roselow sargent crabapple, Manchurian crabapple.	Red pine, Austrian pine, green ash, eastern redcedar.	Eastern white pine	---
32B, 32C, 32D, 32F: Fern	Amur maple, nannyberry viburnum, American cranberrybush, Siberian peashrub, lilac, Indigo silky dogwood.	White spruce, green ash.	Norway spruce, red pine, eastern white pine.	Imperial Carolina poplar.
34B: Wixom	Indigo silky dogwood, lilac, nannyberry viburnum, American cranberrybush.	White spruce, northern whitecedar, Amur maple.	Eastern white pine, Norway spruce, green ash, red maple.	Imperial Carolina poplar.
36B*, 36C*, 36D*, 36E*:				
Fern	Amur maple, nannyberry viburnum, American cranberrybush, Siberian peashrub, lilac, Indigo silky dogwood.	White spruce, green ash.	Norway spruce, red pine, eastern white pine.	Imperial Carolina poplar.
Marlette	American cranberrybush, common ninebark, lilac, Indigo silky dogwood.	White spruce, Amur maple, Manchurian crabapple, nannyberry viburnum.	Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
37B*:				
Wixom	Indigo silky dogwood, lilac, nannyberry viburnum, American cranberrybush.	White spruce, northern whitecedar, Amur maple.	Eastern white pine, Norway spruce, green ash, red maple.	Imperial Carolina poplar.
Capac	Indigo silky dogwood, American cranberrybush, Amur privet, lilac.	White spruce, northern whitecedar, Amur maple.	Eastern white pine, red maple, Norway spruce, green ash.	Imperial Carolina poplar.
38B*, 38C*, 38D*, 38E*:				
Remus	Nannyberry viburnum, American cranberrybush, lilac, Indigo silky dogwood.	Northern whitecedar, Siberian crabapple, white spruce.	Norway spruce, red pine, green ash, eastern white pine.	Imperial Carolina poplar.
Spinks	American cranberrybush, Indigo silky dogwood, lilac, Siberian peashrub, Amur honeysuckle.	White spruce, eastern redcedar.	Eastern white pine, red pine, green ash, Norway spruce.	Imperial Carolina poplar.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
39B--------------- Tustin	Siberian peashrub, lilac, eastern redcedar, Indigo silky dogwood, Amur maple, gray dogwood, American cranberrybush.	Norway spruce---------	Eastern white pine, red pine.	---
40B--------------- Arkona	American cranberrybush, Indigo silky dogwood, lilac, Amur honeysuckle, nannyberry viburnum.	Northern whitecedar, blue spruce, Siberian crabapple.	Eastern white pine, Norway spruce, green ash.	Imperial Carolina poplar.
42B--------------- Grattan	Eastern redcedar, lilac, Siberian peashrub, smooth sumac, hedge cotoneaster, staghorn sumac.	Red pine, eastern white pine, Austrian pine, jack pine.	---	---
43B--------------- Covert	Siberian peashrub, eastern redcedar, Amur honeysuckle, lilac.	Red pine, jack pine, Austrian pine.	Eastern white pine----	Imperial Carolina poplar.
44B--------------- Pipestone	American cranberrybush, lilac, Indigo silky dogwood, Roselow sargent crabapple, nannyberry viburnum.	White spruce, northern whitecedar, Siberian crabapple.	Green ash, eastern white pine, Norway spruce.	Imperial Carolina poplar.
47B*, 47C*, 47D*, 47E*:				
Spinks----------	American cranberrybush, Indigo silky dogwood, lilac, Siberian peashrub, Amur honeysuckle.	White spruce, eastern redcedar.	Eastern white pine, red pine, green ash, Norway spruce.	Imperial Carolina poplar.
Coloma----------	Eastern redcedar, Siberian peashrub, lilac, American cranberrybush, Indigo silky dogwood, gray dogwood, Amur maple.	Norway spruce---------	Eastern white pine, red pine, jack pine.	---
48B--------------- Thetford	Indigo silky dogwood, lilac, American cranberrybush.	White spruce, northern whitecedar, Amur maple.	Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
52C--------------- Wallace	Siberian peashrub, northern whitecedar, Amur privet, lilac, Indigo silky dogwood, nannyberry viburnum, common ninebark.	Red pine, Siberian crabapple, white spruce.	Eastern white pine, green ash.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
53A*:				
Saugatuck	Siberian peashrub, lilac, Indigo silky dogwood, nannyberry viburnum, common ninebark, American cranberrybush.	White spruce, northern whitecedar, Siberian crabapple.	Eastern white pine, Norway spruce, green ash.	---
Jebavy.				
54B, 54C, 54D: Grattan	Lilac, eastern redcedar, Amur honeysuckle, Siberian peashrub.	Red pine, Austrian pine, jack pine.	Eastern white pine	---
56B*:				
Pipestone	Lilac, Indigo silky dogwood, American cranberrybush.	Northern whitecedar, Amur maple, white spruce.	Red maple, Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
Saugatuck	Siberian peashrub, lilac, Indigo silky dogwood, nannyberry viburnum, common ninebark, American cranberrybush.	White spruce, northern whitecedar, Siberian crabapple.	Eastern white pine, Norway spruce, green ash.	---
57B, 57B3, 57C, 57D, 57E, 57F: Grattan	Lilac, eastern redcedar, Siberian peashrub, Amur honeysuckle.	Siberian crabapple, Austrian pine, jack pine.	Red pine, eastern white pine.	---
58B: Covert	Lilac, eastern redcedar, Amur honeysuckle, Siberian peashrub.	Austrian pine, jack pine, red pine.	Eastern white pine	---
59B: Pipestone	Lilac, Indigo silky dogwood, American cranberrybush.	Northern whitecedar, Amur maple, white spruce.	Red maple, Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
62D, 62F: Nordhouse	Amur honeysuckle, eastern redcedar, lilac, Siberian peashrub.	Red pine, jack pine, Austrian pine.	Eastern white pine	---
63B, 63C, 63D, 63E: Coloma	Eastern redcedar, Siberian peashrub, lilac, American cranberrybush, Indigo silky dogwood, gray dogwood, Amur maple.	Norway spruce	Eastern white pine, red pine, jack pine.	---
64B, 64C, 64D: Benona	Eastern redcedar, Siberian peashrub, Amur honeysuckle, red pine.	Austrian pine, jack pine.	Eastern white pine	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
65B, 65C. Chelsea	Eastern redcedar	Red pine, jack pine, Austrian pine.	Eastern white pine	---
67B, 67C, 67E. Plainfield	Siberian peashrub, lilac, eastern redcedar, American cranberrybush, Indigo silky dogwood, gray dogwood, Amur maple.	Norway spruce	Eastern white pine, red pine, jack pine.	---
76. Houghton	Indigo silky dogwood, lilac, Amur privet, common ninebark, nannyberry viburnum.	Siberian crabapple, northern whitecedar.	Green ash, Norway spruce, eastern white pine.	Imperial Carolina poplar.
77. Adrian	Indigo silky dogwood, common ninebark, Amur privet, American cranberrybush, late lilac, Siberian peashrub, nannyberry viburnum.	Northern whitecedar, Siberian crabapple.	Eastern white pine, green ash.	Imperial Carolina poplar.
78. Willette	Indigo silky dogwood, nannyberry viburnum, common ninebark, lilac, white spruce.	Northern whitecedar, green ash, Manchurian crabapple.	Eastern white pine, Norway spruce.	---
81*:				
Loxley	Common ninebark, nannyberry viburnum, Indigo silky dogwood, lilac, American cranberrybush, gray dogwood.	Siberian crabapple, northern whitecedar.	Eastern white pine, green ash, Norway spruce.	Imperial Carolina poplar.
Dawson.				
90B, 90C, 90D. Epworth	Eastern redcedar, Siberian peashrub, lilac, Amur honeysuckle.	Austrian pine, red pine, jack pine.	Eastern white pine	---
93B. Tuscola	Common ninebark, Amur privet, American cranberrybush, lilac, gray dogwood, Indigo silky dogwood.	White spruce, Siberian crabapple.	Eastern white pine, Norway spruce, red maple, red pine.	---
94B*, 94C*, 94D*:				
Coloma	Eastern redcedar, Siberian peashrub, lilac, American cranberrybush, Indigo silky dogwood, gray dogwood, Amur maple.	Norway spruce	Eastern white pine, red pine, jack pine.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
94B*, 94C*, 94D*:				
Scalley	Lilac, Roselow sargent crabapple, Indigo silky dogwood, Amur honeysuckle, eastern redcedar, Siberian peashrub.	Austrian pine, Siberian crabapple, jack pine.	Eastern white pine, red pine, green ash.	---
95A*:				
Ithaca	Northern whitecedar, Indigo silky dogwood, Amur maple, lilac, American cranberrybush, Amur privet.	White spruce, Siberian crabapple, eastern white pine, Norway spruce.	Green ash, red maple	---
Arkona	American cranberrybush, Indigo silky dogwood, lilac, Tatarian honeysuckle, nannyberry viburnum.	Northern whitecedar, blue spruce, Siberian crabapple.	Eastern white pine, Norway spruce, green ash.	Imperial Carolina poplar.
97B*:				
Urban land.				
Epworth	Eastern redcedar, Siberian peashrub, lilac, Amur honeysuckle.	Austrian pine, red pine, jack pine.	Eastern white pine	---
99B, 99C, 99D Tekenink	Amur privet, nannyberry viburnum, lilac, Indigo silky dogwood, American cranberrybush.	White spruce, northern whitecedar, green ash.	Eastern white pine, red pine, Norway spruce.	Imperial Carolina poplar.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
1. Beaches				
2A Del Rey	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
5F*:				
Udorthents	Variable	Variable	Variable	Variable.
Udipsamments	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
6 Kinross	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.
7 Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
8B Epworth	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
9*:				
Kerston	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.
Carlisle	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.
Glendora	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
10B Perrinton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: erodes easily.
10B2 Perrinton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight.
10C Perrinton	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
10C2: Perrinton	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
10D: Perrinton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
10D2: Perrinton	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
10E: Perrinton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
11A: Ithaca	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
12: Ziegenfuss	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
13B, 13B2: Marlette	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight.
13C, 13C2: Marlette	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
13D: Marlette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
13E, 13F: Marlette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
14A: Capac	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
15: Parkhill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
16B: Remus	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight.
16C: Remus	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
16D: Remus	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
18B*:				
Fern	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Spinks	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
18C*:				
Fern	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Spinks	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
18D*:				
Fern	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Spinks	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
18E*:				
Fern	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
Spinks	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
19A Kibbie	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
20 Bono	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.
22B Arkport	Slight	Slight	Moderate: slope.	Slight.
22C Arkport	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
23A Freesoil	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
24 Lamson	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
26A Kibbie	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
27: Poy	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
28B: Scalley	Slight	Slight	Moderate: slope, small stones.	Slight.
31B: Boyer	Slight	Slight	Moderate: slope, small stones.	Slight.
31C: Boyer	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
32B: Fern	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
32C: Fern	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
32D: Fern	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
32F: Fern	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
34B: Wixom	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
36B*:				
Fern	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Marlette	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight.
36C*:				
Fern	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Marlette	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
36D*:				
Fern	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Marlette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
36E*:				
Fern	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
Marlette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
37B*:				
Wixom	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Capac	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
38B*:				
Remus	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight.
Spinks	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
38C*:				
Remus	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
Spinks	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
38D*, 38E*:				
Remus	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Spinks	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
39B Tustin	Moderate: percs slowly, too sandy.	Moderate: too sandy, percs slowly.	Moderate: slope, too sandy.	Moderate: too sandy.
40B Arkona	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.
41 Sickles	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.
42B Grattan	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
43B------------------- Covert	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
44B------------------- Pipestone	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.
47B*:				
Spinks---------------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Coloma---------------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
47C*:				
Spinks---------------	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Coloma---------------	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
47D*:				
Spinks---------------	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, toc sandy.	Severe: too sandy.
Coloma---------------	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
47E*:				
Spinks---------------	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
Coloma---------------	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
48B------------------- Thetford	Severe: wetness, too sandy.	Severe: too sandy.	Severe: too sandy, wetness.	Severe: too sandy.
52C------------------- Wallace	Severe: too sandy, cemented pan.	Severe: too sandy, cemented pan.	Severe: slope, too sandy, cemented pan.	Severe: too sandy.
53A*:				
Saugatuck------------	Severe: wetness, too sandy, cemented pan.	Severe: wetness, too sandy, cemented pan.	Severe: too sandy, wetness, cemented pan.	Severe: wetness, too sandy.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
53A*:				
Jebavy	Severe: ponding, too sandy, cemented pan.	Severe: ponding, too sandy, cemented pan.	Severe: too sandy, ponding, cemented pan.	Severe: ponding, too sandy.
54B Grattan	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
54C Grattan	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
54D Grattan	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
56B*:				
Pipestone	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.
Saugatuck	Severe: wetness, too sandy, cemented pan.	Severe: wetness, too sandy, cemented pan.	Severe: too sandy, wetness, cemented pan.	Severe: wetness, too sandy.
57B, 57B3 Grattan	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
57C Grattan	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
57D Grattan	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
57E, 57F Grattan	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
58B Covert	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
59B Pipestone	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.
60 Kingsville	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.
62D Nordhouse	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
62F------------------ Nordhouse	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
63B------------------ Coloma	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
63C------------------ Coloma	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
63D------------------ Coloma	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
63E------------------ Coloma	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
64B------------------ Benona	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
64C------------------ Benona	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
64D------------------ Benona	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
65B------------------ Chelsea	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
65C------------------ Chelsea	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
67B------------------ Plainfield	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
67C------------------ Plainfield	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
67E------------------ Plainfield	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
72------------------- Glendora	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
76------------------- Houghton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
77-------------------- Adrian	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.
78-------------------- Willette	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.
79*:				
Edwards--------------	Severe: ponding, percs slowly, excess humus.	Severe: ponding, excess humus, percs slowly.	Severe: excess humus, ponding, percs slowly.	Severe: ponding, excess humus.
Martisco-------------	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.
81*:				
Loxley---------------	Severe: ponding, excess humus, too acid.	Severe: ponding, excess humus, too acid.	Severe: excess humus, ponding, too acid.	Severe: ponding, excess humus.
Dawson---------------	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.
83*:				
Histosols------------	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.
Aquents--------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
86F*:				
Dune land------------	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
Quartzipsamments-----	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
87F*:				
Dune land------------	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
Quartzipsamments-----	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
Psammaquents---------	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
88B------------------- Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
89D, 89F-------------- Udorthents	Variable-------------	Variable-------------	Variable-------------	Variable.
90B------------------- Epworth	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
90C------------------- Epworth	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
90D------------------- Epworth	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
91*. Pits				
93B------------------- Tuscola	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight.
94B*:				
Coloma---------------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Scalley--------------	Slight---------------	Slight---------------	Moderate: slope, small stones.	Slight.
94C*:				
Coloma---------------	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Scalley--------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
94D*:				
Coloma---------------	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Scalley--------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
95A*:				
Ithaca---------------	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
Arkona---------------	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
97B*:				
Urban land	Variable	Variable	Variable	Variable.
Epworth	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
98F*:				
Udorthents	Variable	Variable	Variable	Variable.
Fluvaquents	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.
99B Tekenink	Slight	Slight	Moderate: slope, small stones.	Slight.
99C Tekenink	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
99D Tekenink	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
210B* Typic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
210C* Typic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
210D* Typic Udipsamments	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
211B* Typic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
211C* Typic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
212B* Typic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
213B* Alfic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
214B* Typic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
220B* Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
220C* Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
220D*: Entic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
220E*: Entic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
221B*: Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
221C*: Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
221D*: Entic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
222B*, 224B*, 225B*: Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
225C*: Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
231B*:				
Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Alfic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
231C*:				
Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Alfic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
231D*:				
Entic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Alfic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
231E*:				
Entic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
Alfic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
233B*:				
Alfic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
235B*:				
Alfic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Alfic Haplorthods	Moderate: percs slowly, too sandy.	Moderate: too sandy, percs slowly.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.
235C*:				
Alfic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Alfic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
235D*:				
Alfic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Alfic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
236B* Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
236C* Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
236D* Entic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
236E* Entic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
237B* Haplic Glossudalfs	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight.
237C* Haplic Glossudalfs	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
237D*: Haplic Glossudalfs	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
240B*: Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
240C*: Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
240D*: Entic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
240E*: Entic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
245B*: Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
245C*: Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
245D*: Entic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
250*:				
Mollic Psammaquents	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.
Aquic Udipsamments	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy, flooding.	Severe: too sandy.
Medisaprists	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.
251A*:				
Aeric Haplaquods	Severe: wetness, too sandy, cemented pan.	Severe: wetness, too sandy, cemented pan.	Severe: too sandy, wetness, cemented pan.	Severe: wetness, too sandy.
Typic Haplaquods	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.
252*:				
Typic Haplaquods	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
252*:				
Medisaprists	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
253A*:				
Aeric Haplaquods	Severe: wetness, too sandy, cemented pan.	Severe: wetness, too sandy, cemented pan.	Severe: too sandy, wetness, cemented pan.	Severe: wetness, too sandy.
Aquic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
255B*:				
Aquic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
256*:				
Medisaprists	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.
Mollic Psammaquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
262A* Aeric Haplaquods	Severe: wetness, too sandy, cemented pan.	Severe: wetness, too sandy, cemented pan.	Severe: too sandy, wetness, cemented pan.	Severe: wetness, too sandy.
263A* Aquic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
272* Typic Haplaquods	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.
273* Mollic Psammaquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
274* Typic Haplaquolls	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.
280*:				
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Histosols	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.
281 Medisaprists	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
282------------------- Medisaprists	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1. Beaches										
2A. Del Rey	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
5F*:										
Udorthents.										
Udipsamments.										
6. Kinross	Very poor.	Poor	Poor	Fair	Fair	Good	Good	Very poor.	Fair	Good.
7. Sloan	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Poor	Good.
8B. Epworth	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
9*:										
Kerston	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Carlisle	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Glendora	Very poor.	Very poor.	Fair	Fair	Fair	Good	Good	Very poor.	Fair	Good.
10B, 10B2. Perrinton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
10C, 10C2. Perrinton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10D, 10D2. Perrinton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
10E. Perrinton	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
11A. Ithaca	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
12. Ziegenfuss	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
13B, 13B2. Marlette	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
13C, 13C2. Marlette	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
13D----------------- Marlette	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
13E, 13F----------- Marlette	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
14A----------------- Capac	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
15------------------ Parkhill	Poor	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
16B----------------- Remus	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
16C, 16D----------- Remus	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
18B*:										
Fern---------------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Good.
Spinks-------------	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
18C*:										
Fern---------------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Good.
Spinks-------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
18D*:										
Fern---------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Good.
Spinks-------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
18E*:										
Fern---------------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Good.
Spinks-------------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
19A----------------- Kibbie	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
20------------------ Bono	Fair	Fair	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
22B----------------- Arkport	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
22C----------------- Arkport	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
23A---------------- Freesoil	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
24----------------- Lamson	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
26A---------------- Kibbie	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
27----------------- Poy	Good	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
28B---------------- Scalley	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
31B, 31C----------- Boyer	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
32B, 32C----------- Fern	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Good.
32D---------------- Fern	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Good.
32F---------------- Fern	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Good.
34B---------------- Wixom	Fair	Fair	Good	Good	Fair	Poor	Poor	Fair	Good	Poor.
36B*:										
Fern---------------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Good.
Marlette----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
36C*:										
Fern---------------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Good.
Marlette----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
36D*:										
Fern---------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Good.
Marlette----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
36E*:										
Fern---------------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Good.
Marlette----------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
37B*:										
Wixom	Fair	Fair	Good	Good	Fair	Poor	Poor	Fair	Good	Poor.
Capac	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor.
38B*:										
Remus	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Spinks	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
38C*, 38D*, 38E*:										
Remus	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Spinks	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
39B Tustin	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
40B Arkona	Fair	Fair	Good	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
41 Sickles	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
42B Grattan	Poor	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
43B Covert	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Poor.
44B Pipestone	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
47B*:										
Spinks	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Coloma	Fair	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
47C*, 47D*:										
Spinks	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Coloma	Poor	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
47E*:										
Spinks	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Coloma	Very poor.	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
48B----------------Thetford	Poor	Poor	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
52C----------------Wallace	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
53A*:										
Saugatuck----------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Poor.
Jebavy------------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
54B----------------Grattan	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
54C, 54D-----------Grattan	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
56B*:										
Pipestone----------	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
Saugatuck----------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Poor.
57B, 57B3----------Grattan	Poor	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
57C, 57D, 57E, 57F-Grattan	Very poor.	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
58B----------------Covert	Poor	Poor	Fair	Good	Good	Poor	Poor	Poor	Good	Poor.
59B----------------Pipestone	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
60-----------------Kingsville	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
62D----------------Nordhouse	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
62F----------------Nordhouse	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Very poor.	Fair	Very poor.
63B----------------Coloma	Fair	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
63C, 63D-----------Coloma	Poor	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
63E----------------Coloma	Very poor.	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
64B, 64C, 64D------Benona	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
65B----------------Chelsea	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
65C----------------- Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
67B----------------- Plainfield	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
67C, 67E----------- Plainfield	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
72------------------ Glendora	Very poor.	Very poor.	Fair	Fair	Fair	Good	Good	Very poor.	Fair	Good.
76------------------ Houghton	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
77------------------ Adrian	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
78------------------ Willette	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
79*:										
Edwards------------	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Martisco-----------	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
81*:										
Loxley-------------	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Dawson-------------	Very poor.	Poor	Poor	Poor	Poor	Poor	Good	Poor	Poor	Fair.
83*:										
Histosols.										
Aquents.										
86F*:										
Dune land----------	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Quartzipsamments.										
87F*:										
Dune land----------	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Quartzipsamments.										
Psammaquents.										
88B. Udipsamments										
89D, 89F. Udorthents										

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
90B Epworth	Fair	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
90C Epworth	Fair	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
90D Epworth	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
91*. Pits										
93B Tuscola	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
94B*:										
Coloma	Fair	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Scalley	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
94C*, 94D*:										
Coloma	Poor	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Scalley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
95A*:										
Ithaca	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Arkona	Fair	Fair	Good	Fair	Fair	Poor	Fair	Fair	Fair	Poor.
97B*:										
Urban land.										
Epworth	Fair	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
98F*:										
Udorthents.										
Fluvaquents.										
99B, 99C, 99D Tekenink	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
210B* Typic Udipsamments	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
210C*, 210D* Typic Udipsamments	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
211B* Typic Udipsamments	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
211C*: Typic Udipsamments	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
212B*: Typic Udipsamments	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
213B*: Alfic Udipsamments	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
214B*: Typic Udipsamments	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Poor.
220B*: Entic Haplorthods	Poor	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
220C*, 220D*, 220E*: Entic Haplorthods	Very poor.	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
221B*: Entic Haplorthods	Poor	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
221C*, 221D*: Entic Haplorthods	Very poor.	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
222B*: Entic Haplorthods	Poor	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
224B*: Entic Haplorthods	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
225B*: Entic Haplorthods	Poor	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
225C*: Entic Haplorthods	Very poor.	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
231B*:										
Entic Haplorthods	Poor	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Alfic Haplorthods	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
231C*, 231D*, 231E*:										
Entic Haplorthods	Very poor.	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Alfic Haplorthods	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
233B*:										
Alfic Haplorthods	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Entic Haplorthods	Poor	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
235B*:										
Alfic Haplorthods	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Alfic Haplorthods	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
235C*, 235D*:										
Alfic Haplorthods	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Alfic Haplorthods	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
236B*: Entic Haplorthods	Poor	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
236C*, 236D*, 236E*: Entic Haplorthods	Very poor.	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
237B*: Haplic Glossudalfs	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
237C*: Haplic Glossudalfs	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
237D*: Haplic Glossudalfs	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
240B*: Entic Haplorthods	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
240C*, 240D*, 240E*: Entic Haplorthods	Poor	Poor	Poor	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
245B*: Entic Haplorthods	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
245C*, 245D*: Entic Haplorthods	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
250*:										
Mollic Psammaquents	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Aquic Udipsamments	Poor	Poor	Fair	Good	Good	Fair	Poor	Poor	Good	Fair.
Medisaprists	Very poor.	Very poor.	Poor	Poor	Poor	Good	Good	Very poor.	Poor	Good.
251A*:										
Aeric Haplaquods	Poor	Poor	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor.
Typic Haplaquods	Very poor.	Poor	Poor	Fair	Poor	Good	Good	Very poor.	Fair	Good.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
252*:										
Typic Haplaquods	Very poor.	Poor	Poor	Fair	Poor	Good	Good	Very poor.	Fair	Good.
Medisaprists	Very poor.	Very poor.	Poor	Poor	Poor	Fair	Fair	Very poor.	Poor	Fair.
253A*:										
Aeric Haplaquods	Poor	Poor	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor.
Aquic Udipsamments	Poor	Poor	Fair	Good	Good	Poor	Poor	Poor	Good	Poor.
255B*:										
Aquic Udipsamments	Poor	Poor	Fair	Good	Good	Poor	Poor	Poor	Good	Poor.
Entic Haplorthods	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
256*:										
Medisaprists	Very poor.	Very poor.	Poor	Poor	Fair	Good	Good	Very poor.	Fair	Good.
Mollic Psammaquents	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
262A* Aeric Haplaquods	Poor	Poor	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor.
263A* Aquic Udipsamments	Poor	Poor	Fair	Good	Good	Poor	Poor	Poor	Good	Poor.
272* Typic Haplaquods	Very poor.	Poor	Poor	Fair	Poor	Good	Good	Very poor.	Fair	Good.
273* Mollic Psammaquents	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
274* Typic Haplaquolls	Poor	Poor	Good	Fair	Fair	Good	Good	Poor	Good	Good.
280*:										
Aquents.										
Histosols.										
281 Medisaprists	Very poor.	Very poor.	Poor	Poor	Poor	Fair	Fair	Very poor.	Poor	Fair.
282 Medisaprists	Very poor.	Very poor.	Poor	Poor	Fair	Good	Good	Very poor.	Fair	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1. Beaches						
2A---------------- Del Rey	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
5F*:						
Udorthents-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
Udipsamments-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
6----------------- Kinross	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
7----------------- Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
8B---------------- Epworth	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty.
9*:						
Kerston----------	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, ponding, flooding.	Severe: ponding, flooding, excess humus.
Carlisle---------	Severe: excess humus, ponding.	Severe: flooding, ponding, subsides.	Severe: flooding, ponding, subsides.	Severe: flooding, ponding, subsides.	Severe: ponding, flooding, subsides.	Severe: ponding, flooding, excess humus.
Glendora---------	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness.
10B, 10B2--------- Perrinton	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
10C, 10C2--------- Perrinton	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
10D, 10D2, 10E---- Perrinton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
11A---------------- Ithaca	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
12---------------- Ziegenfuss	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
13B, 13B2--------- Marlette	Slight---------	Slight---------	Slight---------	Moderate: slope.	Severe: low strength.	Slight.
13C, 13C2--------- Marlette	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
13D, 13E, 13F----- Marlette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
14A---------------- Capac	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
15---------------- Parkhill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
16B---------------- Remus	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: large stones, droughty.
16C---------------- Remus	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
16D---------------- Remus	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
18B*:						
Fern--------------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: droughty.
Spinks-----------	Severe: cutbanks cave.	Severe: subsides.	Severe: subsides.	Severe: subsides.	Severe: subsides.	Severe: droughty.
18C*:						
Fern--------------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
Spinks-----------	Severe: cutbanks cave.	Severe: subsides.	Severe: subsides.	Severe: subsides, slope.	Severe: subsides.	Severe: droughty.
18D*, 18E*:						
Fern--------------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
18D*, 18E*:						
Spinks	Severe: cutbanks cave, slope.	Severe: subsides, slope.	Severe: subsides, slope.	Severe: subsides, slope.	Severe: subsides, slope.	Severe: droughty, slope.
19A Kibbie	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
20 Bono	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
22B Arkport	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
22C Arkport	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
23A Freesoil	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
24 Lamson	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
26A Kibbie	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
27 Poy	Severe: cutbanks cave, ponding.	Severe: ponding, shrink-swell.	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
28B Scalley	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
31B Boyer	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
31C Boyer	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
32B Fern	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
32C Fern	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
32D, 32F Fern	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
34B--------------- Wixom	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
36B*:						
Fern--------------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: droughty.
Marlette---------	Slight---------	Slight---------	Slight---------	Slight---------	Severe: low strength.	Slight.
36C*:						
Fern--------------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
Marlette---------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
36D*, 36E*:						
Fern--------------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Marlette---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
37B*:						
Wixom------------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Capac------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
38B*:						
Remus------------	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: large stones, droughty.
Spinks-----------	Severe: cutbanks cave.	Severe: subsides.	Severe: subsides.	Severe: subsides.	Severe: subsides.	Severe: droughty.
38C*:						
Remus------------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
Spinks-----------	Severe: cutbanks cave.	Severe: subsides.	Severe: subsides.	Severe: subsides, slope.	Severe: subsides.	Severe: droughty.
38D*, 38E*:						
Remus------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
38D*, 38E*:						
Spinks	Severe: cutbanks cave, slope.	Severe: subsides, slope.	Severe: subsides, slope.	Severe: subsides, slope.	Severe: subsides, slope.	Severe: droughty, slope.
39B Tustin	Severe: cutbanks cave.	Slight	Severe: shrink-swell.	Slight	Moderate: frost action.	Moderate: droughty.
40B Arkona	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
41 Sickles	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
42B Grattan	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
43B Covert	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.
44B Pipestone	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
47B*:						
Spinks	Severe: cutbanks cave.	Severe: subsides.	Severe: subsides.	Severe: subsides.	Severe: subsides.	Severe: droughty.
Coloma	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
47C*:						
Spinks	Severe: cutbanks cave.	Severe: subsides.	Severe: subsides.	Severe: subsides, slope.	Severe: subsides.	Severe: droughty.
Coloma	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
47D*, 47E*:						
Spinks	Severe: cutbanks cave, slope.	Severe: subsides, slope.	Severe: subsides, slope.	Severe: subsides, slope.	Severe: subsides, slope.	Severe: droughty, slope.
Coloma	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
48B Thetford	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
52C Wallace	Severe: cemented pan, cutbanks cave.	Moderate: slope, cemented pan.	Severe: cemented pan.	Severe: slope.	Moderate: cemented pan, slope.	Severe: droughty, cemented pan.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
53A*:						
Saugatuck	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, cemented pan.	Severe: wetness.	Severe: wetness.	Severe: wetness, cemented pan.
Jebavy	Severe: cemented pan, cutbanks cave, ponding.	Severe: ponding.	Severe: ponding, cemented pan.	Severe: ponding.	Severe: ponding.	Severe: ponding, droughty, cemented pan.
54B Grattan	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
54C Grattan	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
54D Grattan	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
56B*:						
Pipestone	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Saugatuck	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, cemented pan.	Severe: wetness.	Severe: wetness.	Severe: wetness, cemented pan.
57B Grattan	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
57B3 Grattan	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: droughty.
57C Grattan	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
57D, 57E, 57F Grattan	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
58B Covert	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.
59B Pipestone	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
60 Kingsville	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
62D Nordhouse	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
62F: Nordhouse	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
63B: Coloma	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
63C: Coloma	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
63D, 63E: Coloma	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
64B: Benona	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
64C: Benona	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
64D: Benona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
65B: Chelsea	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
65C: Chelsea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
67B: Plainfield	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
67C: Plainfield	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
67E: Plainfield	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
72: Glendora	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness.
76: Houghton	Severe: ponding, excess humus.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: excess humus, ponding.
77: Adrian	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
78: Willette	Severe: excess humus, ponding.	Severe: ponding, low strength, subsides.	Severe: ponding, shrink-swell, subsides.	Severe: ponding, low strength, subsides.	Severe: ponding, frost action, subsides.	Severe: ponding, excess humus.
79*:						
Edwards	Severe: cutbanks cave, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
Martisco	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
81*:						
Loxley	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: too acid, ponding, excess humus.
Dawson	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
83*:						
Histosols	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
86F*:						
Dune land	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Quartzipsamments	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
87F*:						
Dune land	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Quartzipsamments	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Psammaquents	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
88B--------------- Udipsamments	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
89D, 89F---------- Udorthents	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
90B--------------- Epworth	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
90C--------------- Epworth	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
90D--------------- Epworth	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
91*. Pits						
93B--------------- Tuscola	Severe: cutbanks cave, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.	Slight.
94B*:						
Coloma-----------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Severe: droughty.
Scalley----------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
94C*:						
Coloma-----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Scalley----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
94D*:						
Coloma-----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Scalley----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
95A*:						
Ithaca-----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Arkona-----------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
97B*:						
Urban land	Variable	Variable	Variable	Variable	Variable	Variable.
Epworth	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
98F*:						
Udorthents	Variable	Variable	Variable	Variable	Variable	Variable.
Fluvaquents	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding.	Severe: ponding, flooding.
99B Tekenink	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: large stones, droughty.
99C Tekenink	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
99D Tekenink	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
210B* Typic Udipsamments	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
210C* Typic Udipsamments	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
210D* Typic Udipsamments	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
211B* Typic Udipsamments	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
211C* Typic Udipsamments	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
212B* Typic Udipsamments	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty, too sandy.
213B* Alfic Udipsamments	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
214B* Typic Udipsamments	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty, too sandy.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
220B*: Entic Haplorthods	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
220C*: Entic Haplorthods	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
220D*, 220E*: Entic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
221B*: Entic Haplorthods	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
221C*: Entic Haplorthods	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
221D*: Entic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
222B*, 224B*: Entic Haplorthods	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty, too sandy.
225B*: Entic Haplorthods	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
225C*: Entic Haplorthods	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
231B*:						
Entic Haplorthods	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
Alfic Haplorthods	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
231C*:						
Entic Haplorthods	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
Alfic Haplorthods	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
231D*, 231E*:						
Entic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Alfic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
233B*:						
Alfic Haplorthods	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
Entic Haplorthods	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
235B*:						
Alfic Haplorthods	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
Alfic Haplorthods	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
235C*:						
Alfic Haplorthods	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
Alfic Haplorthods	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: droughty, slope, too sandy.
235D*:						
Alfic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Alfic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
236B* Entic Haplorthods	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
236C* Entic Haplorthods	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
236D*, 236E* Entic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
237B*: Haplic Glossudalfs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
237C*: Haplic Glossudalfs	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
237D*: Haplic Glossudalfs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
240B*: Entic Haplorthods	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
240C*: Entic Haplorthods	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
240D*, 240E*: Entic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
245B*: Entic Haplorthods	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
245C*: Entic Haplorthods	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
245D*: Entic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
250*:						
Mollic Psammaquents	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding.	Severe: ponding, flooding, excess humus.
Aquic Udipsamments	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Medisaprists	Severe: excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding.	Severe: flooding, ponding, low strength.	Severe: ponding, flooding, frost action.	Severe: ponding, flooding, excess humus.
251A*:						
Aeric Haplaquods	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, cemented pan.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty, cemented pan.
Typic Haplaquods	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
252*:						
Typic Haplaquods	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Medisaprists	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
253A*:						
Aeric Haplaquods	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, cemented pan.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty, cemented pan.
Aquic Udipsamments	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty, too sandy.
255B*:						
Aquic Udipsamments	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty, too sandy.
Entic Haplorthods	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty, too sandy.
256*:						
Medisaprists	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
Mollic Psammaquents	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, excess humus.
262A*: Aeric Haplaquods	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, cemented pan.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty, cemented pan.
263A*: Aquic Udipsamments	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty, too sandy.
272*: Typic Haplaquods	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
273*: Mollic Psammaquents	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, excess humus.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
274*--------------- Typic Haplaquolls	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
280*:						
Aquents----------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
Histosols--------	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
281--------------- Medisaprists	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
282--------------- Medisaprists	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1. Beaches					
2A Del Rey	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
5F*:					
Udorthents	Variable	Variable	Variable	Variable	Variable.
Udipsamments	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
6 Kinross	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
7 Sloan	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
8B Epworth	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy.
9*:					
Kerston	Severe: flooding, ponding, percs slowly.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, ponding.
Carlisle	Severe: flooding, ponding, subsides.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding, excess humus.
Glendora	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
10B, 10B2 Perrinton	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
10C, 10C2----------- Perrinton	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
10D, 10D2, 10E------ Perrinton	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
11A----------------- Ithaca	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
12------------------ Ziegenfuss	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
13B, 13B2----------- Marlette	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
13C, 13C2----------- Marlette	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
13D, 13E, 13F------- Marlette	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
14A----------------- Capac	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
15------------------ Parkhill	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
16B----------------- Remus	Severe: percs slowly.	Moderate: slope.	Slight-----------	Slight-----------	Good.
16C----------------- Remus	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
16D----------------- Remus	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
18B*:					
Fern----------------	Moderate: percs slowly.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Spinks--------------	Severe: subsides.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
18C*:					
Fern	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Spinks	Severe: subsides.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
18D*, 18E*:					
Fern	Severe: slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Spinks	Severe: subsides, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
19A Kibbie	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy, wetness.
20 Bono	Severe: ponding, percs slowly.	Slight	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
22B Arkport	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Fair: too sandy, thin layer.
22C Arkport	Moderate: slope.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage.	Fair: slope, too sandy, thin layer.
23A Freesoil	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: wetness.	Poor: too sandy, wetness.
24 Lamson	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: ponding, thin layer.
26A Kibbie	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
27 Poy	Severe: ponding, percs slowly, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
28B----------------- Scalley	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
31B----------------- Boyer	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
31C----------------- Boyer	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
32B----------------- Fern	Moderate: percs slowly.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
32C----------------- Fern	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
32D, 32F------------ Fern	Severe: slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
34B----------------- Wixom	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
36B*:					
Fern---------------	Moderate: percs slowly.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Marlette-----------	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
36C*:					
Fern---------------	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Marlette-----------	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
36D*, 36E*:					
Fern---------------	Severe: slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Marlette-----------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
37B*:					
Wixom	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
Capac	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
38B*:					
Remus	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Spinks	Severe: subsides.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
38C*:					
Remus	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Spinks	Severe: subsides.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
38D*, 38E*:					
Remus	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Spinks	Severe: subsides, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
39B Tustin	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
40B Arkona	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: wetness, too clayey.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, wetness.
41 Sickles	Severe: ponding, percs slowly, poor filter.	Severe: seepage, ponding.	Severe: ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
42B Grattan	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
43B Covert	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
44B-----------------Pipestone	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
47B*:					
Spinks--------------	Severe: subsides.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Coloma--------------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
47C*:					
Spinks--------------	Severe: subsides.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Coloma--------------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
47D*, 47E*:					
Spinks--------------	Severe: subsides, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Coloma--------------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
48B-----------------Thetford	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy, wetness.
52C-----------------Wallace	Severe: cemented pan, poor filter.	Severe: seepage, cemented pan, slope.	Severe: seepage, too sandy.	Severe: cemented pan, seepage.	Poor: cemented pan, seepage, too sandy.
53A*:					
Saugatuck-----------	Severe: cemented pan, wetness, poor filter.	Severe: seepage, cemented pan, wetness.	Severe: seepage, wetness, too sandy.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
Jebavy--------------	Severe: cemented pan, ponding, poor filter.	Severe: seepage, cemented pan, ponding.	Severe: seepage, ponding, too sandy.	Severe: cemented pan, seepage, ponding.	Poor: cemented pan, seepage, too sandy.
54B-----------------Grattan	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
54C----------------- Grattan	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
54D----------------- Grattan	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
56B*:					
Pipestone----------	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Saugatuck----------	Severe: cemented pan, wetness, poor filter.	Severe: seepage, cemented pan, wetness.	Severe: seepage, wetness, too sandy.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
57B, 57B3----------- Grattan	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
57C----------------- Grattan	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
57D, 57E, 57F------- Grattan	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
58B----------------- Covert	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
59B----------------- Pipestone	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
60------------------ Kingsville	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
62D----------------- Nordhouse	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
62F----------------- Nordhouse	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
63B----------------- Coloma	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
63C----------------- Coloma	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
63D, 63E----------- Coloma	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
64B----------------- Benona	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
64C----------------- Benona	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
64D----------------- Benona	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
65B----------------- Chelsea	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
65C----------------- Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
67B----------------- Plainfield	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
67C----------------- Plainfield	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
67E----------------- Plainfield	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
72------------------ Glendora	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
76------------------ Houghton	Severe: subsides, ponding, percs slowly.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
77------------------ Adrian	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
78------------------- Willette	Severe: ponding, percs slowly, subsides.	Severe: seepage, excess humus, ponding.	Severe: ponding, too clayey.	Severe: seepage, ponding.	Poor: too clayey, hard to pack, ponding.
79*:					
Edwards------------	Severe: ponding, percs slowly, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Martisco-----------	Severe: ponding, percs slowly.	Severe: seepage, excess humus.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.
81*:					
Loxley-------------	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus, too acid.
Dawson-------------	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
83*:					
Histosols----------	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.
Aquents------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
86F*:					
Dune land----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Quartzipsamments---	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: too sandy, slope.
87F*:					
Dune land----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Quartzipsamments---	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: too sandy, slope.
Psammaquents-------	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
88B----------------- Udipsamments	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
89D, 89F------------ Udorthents	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
90B----------------- Epworth	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
90C----------------- Epworth	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
90D----------------- Epworth	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: too sandy, slope.
91*. Pits					
93B----------------- Tuscola	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy.
94B*:					
Coloma-------------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Scalley------------	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
94C*:					
Coloma-------------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Scalley------------	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
94D*:					
Coloma-------------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Scalley------------	Severe: percs slowly, poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
95A*:					
Ithaca	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Arkona	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: wetness, too clayey.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, wetness.
97B*:					
Urban land	Variable	Variable	Variable	Variable	Variable.
Epworth	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
98F*:					
Udorthents	Variable	Variable	Variable	Variable	Variable.
Fluvaquents	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
99B Tekenink	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: too sandy, small stones.
99C Tekenink	Moderate: percs slowly, slope.	Severe: slope.	Severe: seepage.	Moderate: slope.	Fair: too sandy, small stones, slope.
99D Tekenink	Severe: slope.	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
210B* Typic Udipsamments	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
210C* Typic Udipsamments	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
210D* Typic Udipsamments	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
211B* Typic Udipsamments	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
211C* Typic Udipsamments	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
212B*: Typic Udipsamments	Severe: poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
213B*: Alfic Udipsamments	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
214B*: Typic Udipsamments	Severe: wetness, poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
220B*: Entic Haplorthods	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
220C*: Entic Haplorthods	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
220D*, 220E*: Entic Haplorthods	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
221B*: Entic Haplorthods	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
221C*: Entic Haplorthods	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
221D*: Entic Haplorthods	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
222B*: Entic Haplorthods	Severe: poor filter.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Poor: seepage, too sandy.
224B*: Entic Haplorthods	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
225B*: Entic Haplorthods	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
225C*: Entic Haplorthods	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
231B*:					
Entic Haplorthods--	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Alfic Haplorthods--	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
231C*:					
Entic Haplorthods--	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Alfic Haplorthods--	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
231D*, 231E*:					
Entic Haplorthods--	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Alfic Haplorthods--	Severe: percs slowly, poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
233B*:					
Alfic Haplorthods--	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Entic Haplorthods--	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
235B*:					
Alfic Haplorthods--	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Alfic Haplorthods--	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
235C*:					
Alfic Haplorthods--	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Alfic Haplorthods--	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
235D*:					
Alfic Haplorthods--	Severe: percs slowly, poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
235D*:					
Alfic Haplorthods	Severe: percs slowly, poor filter, slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
236B* Entic Haplorthods	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
236C* Entic Haplorthods	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
236D*, 236E* Entic Haplorthods	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
237B* Haplic Glossudalfs	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
237C* Haplic Glossudalfs	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
237D* Haplic Glossudalfs	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
240B* Entic Haplorthods	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
240C* Entic Haplorthods	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
240D*, 240E* Entic Haplorthods	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
245B* Entic Haplorthods	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
245C* Entic Haplorthods	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
245D* Entic Haplorthods	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
250*:					
Mollic Psammaquents	Severe: flooding, ponding, poor filter.	Severe: seepage, flooding, ponding.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, ponding.
Aquic Udipsamments-	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
Medisaprists-------	Severe: flooding, ponding.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding, excess humus.	Severe: flooding, ponding.	Poor: ponding, excess humus.
251A*:					
Aeric Haplaquods---	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan, wetness.	Severe: seepage, wetness, too sandy.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
Typic Haplaquods---	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
252*:					
Typic Haplaquods---	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Medisaprists-------	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: ponding.
253A*:					
Aeric Haplaquods---	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan, wetness.	Severe: seepage, wetness, too sandy.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
Aquic Udipsamments-	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
255B*:					
Aquic Udipsamments-	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Entic Haplorthods--	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
256*:					
Medisaprists	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Mollic Psammaquents	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
262A* Aeric Haplaquods	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan, wetness.	Severe: seepage, wetness, too sandy.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
263A* Aquic Udipsamments	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
272* Typic Haplaquods	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
273* Mollic Psammaquents	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
274* Typic Haplaquolls	Severe: ponding, percs slowly, poor filter.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
280*:					
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Histosols	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.
281 Medisaprists	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: ponding.
282 Medisaprists	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1. Beaches				
2A Del Rey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
5F*:				
Udorthents	Variable	Variable	Variable	Variable.
Udipsamments	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
6 Kinross	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
7 Sloan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
8B Epworth	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
9*:				
Kerston	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Carlisle	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Glendora	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
10B, 10B2, 10C, 10C2 Perrinton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
10D, 10D2 Perrinton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
10E Perrinton	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
11A Ithaca	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
12 Ziegenfuss	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
13B, 13B2: Marlette	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
13C, 13C2: Marlette	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
13D: Marlette	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
13E, 13F: Marlette	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
14A: Capac	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
15: Parkhill	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
16B: Remus	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
16C: Remus	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
16D: Remus	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
18B*, 18C*:				
Fern	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
Spinks	Good	Probable	Improbable: too sandy.	Poor: too sandy.
18D*:				
Fern	Fair: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
Spinks	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
18E*:				
Fern	Poor: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
Spinks	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
19A------------------- Kibbie	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
20-------------------- Bono	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
22B, 22C-------------- Arkport	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
23A------------------- Freesoil	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
24-------------------- Lamson	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
26A------------------- Kibbie	Fair: wetness.	Probable-------------	Improbable: too sandy.	Fair: too clayey.
27-------------------- Poy	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too clayey, wetness.
28B------------------- Scalley	Good-----------------	Probable-------------	Improbable: too sandy.	Poor: small stones, area reclaim.
31B, 31C-------------- Boyer	Good-----------------	Probable-------------	Probable-------------	Poor: small stones, area reclaim.
32B, 32C-------------- Fern	Good-----------------	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
32D------------------- Fern	Fair: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
32F------------------- Fern	Poor: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
34B------------------- Wixom	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
36B*:				
Fern------------------	Good-----------------	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
Marlette--------------	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
36C*:				
Fern	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
Marlette	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
36D*:				
Fern	Fair: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
Marlette	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
36E*:				
Fern	Poor: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
Marlette	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
37B*:				
Wixom	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
Capac	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
38B*:				
Remus	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Spinks	Good	Probable	Improbable: too sandy.	Poor: too sandy.
38C*:				
Remus	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Spinks	Good	Probable	Improbable: too sandy.	Poor: too sandy.
38D*, 38E*:				
Remus	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Spinks	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
39B Tustin	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
40B Arkona	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
41 Sickles	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
42B Grattan	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
43B Covert	Fair: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
44B Pipestone	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
47B*, 47C*:				
Spinks	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Coloma	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
47D*:				
Spinks	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
Coloma	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, slope.
47E*:				
Spinks	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
Coloma	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, slope.
48B Thetford	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
52C Wallace	Good	Probable	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
53A*:				
Saugatuck	Poor: wetness.	Probable	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
Jebavy	Poor: wetness.	Probable	Improbable: too sandy.	Poor: cemented pan, too sandy, wetness.
54B, 54C Grattan	Good	Probable	Improbable: too sandy.	Poor: too sandy.
54D Grattan	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
56B*:				
Pipestone	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Saugatuck	Poor: wetness.	Probable	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
57B, 57B3, 57C Grattan	Good	Probable	Improbable: too sandy.	Poor: too sandy.
57D Grattan	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
57E, 57F Grattan	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
58B Covert	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
59B Pipestone	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
60 Kingsville	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
62D Nordhouse	Good	Probable	Improbable: too sandy.	Poor: too sandy.
62F Nordhouse	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
63B, 63C: Coloma	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
63D: Coloma	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, slope.
63E: Coloma	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, slope.
64B, 64C: Benona	Good	Probable	Improbable: too sandy.	Poor: too sandy.
64D: Benona	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
65B, 65C: Chelsea	Good	Probable	Improbable: too sandy.	Poor: too sandy.
67B, 67C: Plainfield	Good	Probable	Improbable: too sandy.	Poor: too sandy.
67E: Plainfield	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
72: Glendora	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
76: Houghton	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness, excess humus.
77: Adrian	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
78: Willette	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
79*:				
Edwards	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Martisco	Poor: thin layer, wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
81*:				
Loxley	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness, too acid.
Dawson	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
83*:				
Histosols	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Aquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
86F*:				
Dune land	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Quartzipsamments	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
87F*:				
Dune land	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Quartzipsamments	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Psammaquents	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
88B Udipsamments	Good	Probable	Improbable: too sandy.	Poor: too sandy.
89D, 89F Udorthents	Variable	Variable	Variable	Variable.
90B, 90C Epworth	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
90D Epworth	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, slope.
91*. Pits				
93B Tuscola	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
94B*, 94C*:				
Coloma	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
Scalley	Good	Probable	Improbable: too sandy.	Poor: small stones, area reclaim.
94D*:				
Coloma	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, slope.
Scalley	Fair: slope.	Probable	Improbable: too sandy.	Poor: small stones, area reclaim, slope.
95A*:				
Ithaca	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Arkona	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
97B*:				
Urban land	Variable	Variable	Variable	Variable.
Epworth	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
98F*:				
Udorthents	Variable	Variable	Variable	Variable.
Fluvaquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
99B, 99C Tekenink	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
99D Tekenink	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
210B*, 210C* Typic Udipsamments	Good	Probable	Improbable: too sandy.	Poor: too sandy.
210D* Typic Udipsamments	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
211B*, 211C*, 212B* Typic Udipsamments	Good	Probable	Improbable: too sandy.	Poor: too sandy.
213B* Alfic Udipsamments	Good	Probable	Improbable: too sandy.	Poor: too sandy.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
214B*----- Typic Udipsamments	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
220B*, 220C*----- Entic Haplorthods	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
220D*----- Entic Haplorthods	Fair: slope.	Probable-----	Improbable: too sandy.	Poor: too sandy, slope.
220E*----- Entic Haplorthods	Poor: slope.	Probable-----	Improbable: too sandy.	Poor: too sandy, slope.
221B*, 221C*----- Entic Haplorthods	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
221D*----- Entic Haplorthods	Fair: slope.	Probable-----	Improbable: too sandy.	Poor: too sandy, slope.
222B*, 224B*----- Entic Haplorthods	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
225B*, 225C*----- Entic Haplorthods	Good-----	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
231B*, 231C*:				
Entic Haplorthods----	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
Alfic Haplorthods----	Good-----	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
231D*:				
Entic Haplorthods----	Fair: slope.	Probable-----	Improbable: too sandy.	Poor: too sandy, slope.
Alfic Haplorthods----	Fair: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
231E*:				
Entic Haplorthods----	Poor: slope.	Probable-----	Improbable: too sandy.	Poor: too sandy, slope.
Alfic Haplorthods----	Poor: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
233B*:				
Alfic Haplorthods----	Good-----	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
Entic Haplorthods----	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
235B*:				
Alfic Haplorthods	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
Alfic Haplorthods	Good	Probable	Improbable: too sandy.	Poor: too sandy.
235C*:				
Alfic Haplorthods	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
Alfic Haplorthods	Fair: thin layer.	Probable	Improbable: too sandy.	Poor: too sandy.
235D*:				
Alfic Haplorthods	Fair: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
Alfic Haplorthods	Fair: thin layer, slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
236B*, 236C* Entic Haplorthods	Good	Probable	Improbable: too sandy.	Poor: too sandy.
236D* Entic Haplorthods	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
236E* Entic Haplorthods	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
237B* Haplic Glossudalfs	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
237C* Haplic Glossudalfs	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
237D* Haplic Glossudalfs	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
240B*, 240C* Entic Haplorthods	Good	Probable	Improbable: too sandy.	Poor: too sandy.
240D* Entic Haplorthods	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
240E* Entic Haplorthods	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
245B*, 245C*: Entic Haplorthods	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
245D*: Entic Haplorthods	Fair: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
250*:				
Mollic Psammaquents	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Aquic Udipsamments	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Medisaprists	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
251A*:				
Aeric Haplaquods	Poor: wetness.	Probable	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
Typic Haplaquods	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
252*:				
Typic Haplaquods	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Medisaprists	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
253A*:				
Aeric Haplaquods	Poor: wetness.	Probable	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
Aquic Udipsamments	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
255B*:				
Aquic Udipsamments	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Entic Haplorthods	Good	Probable	Improbable: too sandy.	Poor: too sandy.
256*:				
Medisaprists	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
256*:				
Mollic Psammaquents	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
262A* Aeric Haplaquods	Poor: wetness.	Probable	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
263A* Aquic Udipsamments	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
272* Typic Haplaquods	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
273* Mollic Psammaquents	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
274* Typic Haplaquolls	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
280*:				
Aquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Histosols	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
281 Medisaprists	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
282 Medisaprists	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Grassed waterways
1. Beaches						
2A Del Rey	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, erodes easily, percs slowly.
5F*:						
Udorthents	Variable	Variable	Variable	Variable	Variable	Variable.
Udipsamments	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
6 Kinross	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
7 Sloan	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Wetness, flooding.	Wetness, erodes easily.
8B Epworth	Severe: seepage.	Severe: piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Slope, wetness, droughty.	Droughty.
9*:						
Kerston	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, flooding, subsides.	Ponding, soil blowing, flooding.	Wetness.
Carlisle	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, flooding, subsides.	Ponding, soil blowing, flooding.	Wetness.
Glendora	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, flooding.	Wetness, droughty.
10B Perrinton	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Erodes easily, percs slowly.
10B2 Perrinton	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Percs slowly.
10C Perrinton	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily, percs slowly.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
10C2: Perrinton	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, percs slowly.
10D: Perrinton	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily, percs slowly.
10D2: Perrinton	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, percs slowly.
10E: Perrinton	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily, percs slowly.
11A: Ithaca	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness	Wetness, percs slowly.
12: Ziegenfuss	Slight	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, percs slowly.
13B: Marlette	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Rooting depth.
13B2: Marlette	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Rooting depth.
13C: Marlette	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, rooting depth.
13C2: Marlette	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope, rooting depth.
13D, 13E, 13F: Marlette	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, rooting depth.
14A: Capac	Slight	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Wetness.
15: Parkhill	Slight	Severe: thin layer, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness, erodes easily.
16B: Remus	Moderate: slope.	Slight	Severe: no water.	Deep to water	Slope, droughty.	Droughty, rooting depth.
16C, 16D: Remus	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, droughty.	Slope, droughty, rooting depth.
18B*:						
Fern	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Erodes easily, droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
18B*:						
Spinks	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty, percs slowly.
18C*, 18D*, 18E*:						
Fern	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, erodes easily, droughty.
Spinks	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty, percs slowly.
19A Kibbie	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness, erodes easily.
20 Bono	Slight	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
22B Arkport	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Droughty.
22C Arkport	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, droughty.
23A Freesoil	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
24 Lamson	Severe: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Ponding, frost action.	Ponding, soil blowing.	Wetness.
26A Kibbie	Severe: seepage.	Severe: wetness.	Severe: cutbanks cave.	Frost action	Wetness, soil blowing.	Wetness.
27 Poy	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding	Wetness, rooting depth.
28B Scalley	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope	Favorable.
31B Boyer	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
31C Boyer	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
32B--------------- Fern	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Erodes easily, droughty.
32C, 32D, 32F----- Fern	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, erodes easily, droughty.
34B--------------- Wixom	Severe: seepage.	Severe: wetness.	Severe: no water.	Favorable------	Wetness, droughty.	Wetness, erodes easily, droughty.
36B*:						
Fern--------------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Erodes easily, droughty.
Marlette---------	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Rooting depth.
36C*, 36D*, 36E*:						
Fern--------------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, erodes easily, droughty.
Marlette---------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, rooting depth.
37B*:						
Wixom------------	Severe: seepage.	Severe: wetness.	Severe: no water.	Favorable------	Wetness, droughty.	Wetness, erodes easily, droughty.
Capac------------	Slight---------	Severe: piping, wetness.	Severe: slow refill.	Frost action---	Wetness--------	Wetness.
38B*:						
Remus------------	Moderate: slope.	Slight---------	Severe: no water.	Deep to water	Slope, droughty.	Droughty, rooting depth.
Spinks-----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty, percs slowly.
38C*, 38D*, 38E*:						
Remus------------	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, droughty.	Slope, droughty, rooting depth.
Spinks-----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty, percs slowly.
39B--------------- Tustin	Severe: seepage.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Erodes easily, droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
40B: Arkona	Severe: seepage.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly	Wetness, droughty.	Wetness, droughty, rooting depth.
41: Sickles	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty, rooting depth.
42B: Grattan	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
43B: Covert	Severe: seepage.	Severe: seepage, piping.	Severe: slow refill, cutbanks cave.	Slope, cutbanks cave.	Slope, wetness, droughty.	Droughty.
44B: Pipestone	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.
47B*:						
Spinks	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty, percs slowly.
Coloma	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
47C*, 47D*, 47E*:						
Spinks	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty, percs slowly.
Coloma	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
48B: Thetford	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.
52C: Wallace	Severe: seepage, cemented pan, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty, cemented pan.
53A*:						
Saugatuck	Severe: seepage, cemented pan.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cemented pan, cutbanks cave.	Wetness, droughty.	Wetness, droughty, cemented pan.
Jebavy	Severe: seepage, cemented pan.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cemented pan, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty, cemented pan.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
54B---------------- Grattan	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
54C, 54D---------- Grattan	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
56B*:						
Pipestone--------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.
Saugatuck--------	Severe: seepage, cemented pan.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cemented pan, cutbanks cave.	Wetness, droughty.	Wetness, droughty, cemented pan.
57B, 57B3--------- Grattan	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
57C, 57D, 57E, 57F-------------- Grattan	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
58B--------------- Covert	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Slope, wetness, droughty.	Droughty.
59B--------------- Pipestone	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.
60---------------- Kingsville	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
62D, 62F---------- Nordhouse	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
63B--------------- Coloma	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
63C, 63D, 63E----- Coloma	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
64B--------------- Benona	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
64C, 64D---------- Benona	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
65B--------------- Chelsea	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
65C--------------- Chelsea	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
67B--------------- Plainfield	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
67C, 67E---------- Plainfield	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
72---------------- Glendora	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, flooding.	Wetness, droughty.
76---------------- Houghton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Frost action, subsides, ponding.	Ponding, soil blowing.	Wetness.
77---------------- Adrian	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing, rooting depth.	Wetness, rooting depth.
78---------------- Willette	Severe: seepage.	Severe: ponding.	Severe: no water.	Ponding, percs slowly, subsides.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.
79*:						
Edwards-----------	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, frost action.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.
Martisco----------	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, percs slowly.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.
81*:						
Loxley------------	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing, too acid.	Wetness.
Dawson------------	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, rooting depth.	Wetness, rooting depth.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
83*:						
Histosols	Slight	Severe: excess humus, ponding.	Slight	Ponding, frost action.	Ponding, soil blowing.	Wetness.
Aquents	Slight	Severe: ponding.	Slight	Ponding, frost action.	Ponding	Wetness.
86F*:						
Dune land	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
Quartzipsamments	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
87F*:						
Dune land	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
Quartzipsamments	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
Psammaquents	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
88B Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
89D, 89F Udorthents	Variable	Variable	Variable	Variable	Variable	Variable.
90B Epworth	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty, rooting depth.
90C, 90D Epworth	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty, rooting depth.
91*. Pits						
93B Tuscola	Moderate: seepage, slope.	Severe: piping.	Severe: cutbanks cave.	Frost action, slope, cutbanks cave.	Slope, wetness.	Favorable.
94B*:						
Coloma	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
94B*:						
Scalley	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope	Favorable.
94C*, 94D*:						
Coloma	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
Scalley	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope	Slope.
95A*:						
Ithaca	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness	Wetness, percs slowly.
Arkona	Severe: seepage.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly	Wetness, droughty.	Wetness, droughty, rooting depth.
97B*:						
Urban land	Variable	Variable	Variable	Variable	Variable	Variable.
Epworth	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty, rooting depth.
98F*:						
Udorthents	Variable	Variable	Variable	Variable	Variable	Variable.
Fluvaquents	Slight	Severe: ponding.	Slight	Ponding, flooding.	Ponding, flooding.	Wetness.
99B Tekenink	Moderate: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
99C, 99D Tekenink	Severe: slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
210B* Typic Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
210C*, 210D* Typic Udipsamments	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
211B* Typic Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Droughty.
211C* Typic Udipsamments	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
212B*: Typic Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
213B*: Alfic Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
214B*: Typic Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake.	Droughty.
220B*: Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
220C*, 220D*, 220E*: Entic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
221B*: Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
221C*, 221D*: Entic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
222B*: Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
224B*: Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Slope, droughty, fast intake.	Droughty.
225B*: Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
225C*: Entic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
231B*:						
Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
Alfic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Erodes easily, droughty.
231C*, 231D*, 231E*:						
Entic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
231C*, 231D*, 231E*:						
Alfic Haplorthods----	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, erodes easily, droughty.
233B*:						
Alfic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Erodes easily, droughty.
Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
235B*:						
Alfic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Erodes easily, droughty.
Alfic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
235C*, 235D*:						
Alfic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, erodes easily, droughty.
Alfic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
236B*------------- Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
236C*, 236D*, 236E*------------ Entic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
237B*------------- Haplic Glossudalfs	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, soil blowing.	Erodes easily.
237C*, 237D*------ Haplic Glossudalfs	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, erodes easily.
240B*------------- Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
240C*, 240D*, 240E*------------ Entic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
245B*: Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
245C*, 245D*: Entic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
250*:						
Mollic Psammaquents	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, flooding, cutbanks cave.	Ponding, droughty, flooding.	Wetness, droughty.
Aquic Udipsamments	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty.	Droughty.
Medisaprists	Slight	Severe: excess humus, ponding.	Slight	Ponding, flooding, frost action.	Ponding, soil blowing, flooding.	Wetness.
251A*:						
Aeric Haplaquods	Severe: seepage, cemented pan.	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Cemented pan, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty, cemented pan.
Typic Haplaquods	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
252*:						
Typic Haplaquods	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
Medisaprists	Severe: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding, soil blowing.	Wetness.
253A*:						
Aeric Haplaquods	Severe: seepage, cemented pan.	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Cemented pan, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty, cemented pan.
Aquic Udipsamments	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
255B*:						
Aquic Udipsamments----	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Slope, cutbanks cave.	Slope, wetness, droughty.	Droughty.
Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Slope, droughty, fast intake.	Droughty.
256*:						
Medisaprists-----	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding, soil blowing.	Wetness.
Mollic Psammaquents----	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty.	Wetness, droughty.
262A*------------- Aeric Haplaquods	Severe: seepage, cemented pan.	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Cemented pan, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty, cemented pan.
263A*------------- Aquic Udipsamments	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Droughty.
272*-------------- Typic Haplaquods	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
273*-------------- Mollic Psammaquents	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty.	Wetness, droughty.
274*-------------- Typic Haplaquolls	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, frost action.	Ponding, soil blowing.	Wetness, erodes easily.
280*:						
Aquents----------	Slight---------	Severe: ponding.	Slight---------	Ponding, frost action.	Ponding--------	Wetness.
Histosols--------	Slight---------	Severe: excess humus, ponding.	Slight---------	Ponding, frost action.	Ponding, soil blowing.	Wetness.
281--------------- Medisaprists	Severe: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding, soil blowing.	Wetness.
282--------------- Medisaprists	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding, soil blowing.	Wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
1. Beaches											
2A----------------	0-8	Silty clay loam	CL	A-6, A-7	0	95-100	95-100	90-100	70-95	30-45	10-25
Del Rey	8-18	Silty clay loam, silty clay, clay.	CH, CL	A-7	0	95-100	95-100	90-100	85-95	40-55	20-30
	18-60	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	95-100	95-100	90-100	70-95	30-55	10-30
5F*:											
Udorthents-------	0-60	Loam-------------	---	---	---	---	---	---	---	---	---
	60-80	Variable----------	---	---	---	---	---	---	---	---	---
Udipsamments-----	0-60	Sand-------------	SP, SP-SM, SM	A-1, A-2, A-3	0	85-100	80-100	30-75	0-25	---	NP
6-----------------	0-9	Mucky fine sand	SP-SM, SM	A-3, A-2-4	0	100	90-100	50-80	15-30	---	NP
Kinross	9-30	Sand, fine sand, loamy sand.	SP-SM, SM	A-3, A-2-4	0	100	90-100	50-80	5-30	---	NP
	30-60	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	90-100	50-80	5-30	---	NP
7-----------------	0-18	Silt loam---------	CL, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	25-40	7-20
Sloan	18-36	Silt loam---------	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-90	25-45	7-20
	36-60	Stratified silt loam, clay loam, silty clay loam.	CL	A-4, A-6, A-7	0	95-100	90-100	80-100	75-90	25-45	7-20
8B----------------	0-6	Fine sand---------	SM	A-2-4	0	100	100	65-80	20-35	---	NP
Epworth	6-30	Fine sand---------	SM	A-2-4	0	100	100	65-80	20-35	---	NP
	30-60	Fine sand---------	SM	A-2-4	0	100	100	65-80	20-35	---	NP
9*:											
Kerston----------	0-18	Muck-------------	PT	A-8	0	---	---	---	---	---	---
	18-21	Stratified fine sand or sand.	SM, ML	A-2, A-4, A-6, A-7	0	100	100	65-100	15-80	20-45	NP-15
	21-46	Muck-------------	PT	A-8	0	---	---	---	---	---	---
	46-58	Stratified fine sand or sand.	SM, ML, SP-SM	A-2, A-4, A-6, A-7	0	100	95-100	55-95	10-75	20-45	NP-15
	58-72	Muck-------------	PT	A-8	0	---	---	---	---	---	---
Carlisle---------	0-60	Muck-------------	PT	A-8	0-30	---	---	---	---	---	---
Glendora---------	0-9	Mucky silt loam	CL-ML	A-4	0-5	95-100	90-100	80-95	65-85	<25	2-7
	9-60	Sand-------------	SP-SM, SP, SM	A-3, A-2-4, A-1-b	0-5	95-100	90-100	45-70	0-15	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
10B------------- Perrinton	0-7	Loam------------	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	70-100	60-75	20-35	4-15
	7-15	Fine sandy loam, clay loam, clay.	SC, CL-ML, CL, SC-SM	A-2-4, A-4, A-6, A-7	0-5	95-100	85-100	50-100	25-90	20-60	4-35
	15-60	Clay loam, silty clay loam, clay.	CL, CH	A-7	0-5	95-100	85-100	80-100	60-90	40-60	20-35
10B2------------ Perrinton	0-7	Clay loam--------	CL	A-6, A-7	0-5	95-100	85-100	75-100	60-75	35-50	15-25
	7-11	Fine sandy loam, clay loam, clay.	SC, CL-ML, CL, SC-SM	A-2-4, A-4, A-6, A-7	0-5	95-100	85-100	50-100	25-90	20-60	4-35
	11-60	Clay loam, silty clay loam, clay.	CL, CH	A-7	0-5	95-100	85-100	80-100	60-90	40-60	20-35
10C------------- Perrinton	0-7	Loam------------	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	70-100	60-75	20-35	4-15
	7-15	Fine sandy loam, clay loam, clay.	SC, CL-ML, CL, SC-SM	A-2-4, A-4, A-6, A-7	0-5	95-100	85-100	50-100	25-90	20-60	4-35
	15-60	Clay loam, silty clay loam, clay.	CL, CH	A-7	0-5	95-100	85-100	80-100	60-90	40-60	20-35
10C2------------ Perrinton	0-7	Clay loam--------	CL	A-6, A-7	0-5	95-100	85-100	75-100	55-80	35-50	15-25
	7-11	Fine sandy loam, clay loam, clay.	SC, CL-ML, CL, SC-SM	A-2-4, A-4, A-6, A-7	0-5	95-100	85-100	50-100	25-90	20-60	4-35
	11-60	Clay loam, silty clay loam, clay.	CL, CH	A-7	0-5	95-100	85-100	80-100	60-90	40-60	20-35
10D------------- Perrinton	0-7	Loam------------	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	70-100	60-75	20-35	4-15
	7-15	Fine sandy loam, clay loam, clay.	SC, CL-ML, CL, SC-SM	A-2-4, A-4, A-6, A-7	0-5	95-100	85-100	50-100	25-90	20-60	4-35
	15-60	Clay loam, silty clay loam, clay.	CL, CH	A-7	0-5	95-100	85-100	80-100	60-90	40-60	20-35
10D2------------ Perrinton	0-4	Clay loam--------	CL	A-6, A-7	0-5	95-100	85-100	75-100	55-80	35-50	15-25
	4-11	Fine sandy loam, clay loam, clay.	SC, CL-ML, CL, SC-SM	A-2-4, A-4, A-6, A-7	0-5	95-100	85-100	50-100	25-90	20-60	4-35
	11-60	Clay loam, silty clay loam, clay.	CL, CH	A-7	0-5	95-100	85-100	80-100	60-90	40-60	20-35
10E------------- Perrinton	0-7	Loam------------	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	70-100	65-75	20-35	4-15
	7-15	Fine sandy loam, clay loam, clay.	SC, CL-ML, CL, SC-SM	A-2-4, A-4, A-6, A-7	0-5	95-100	85-100	50-100	25-90	20-60	4-35
	15-60	Clay loam, silty clay loam, clay.	CL, CH	A-7	0-5	95-100	85-100	80-100	60-90	40-60	20-35
11A------------- Ithaca	0-10	Loam------------	CL, CL-ML	A-4, A-6	0-3	95-100	85-100	70-95	50-75	20-35	4-15
	10-15	Fine sandy loam, loam, silty clay loam.	SC, CL	A-4, A-6, A-7-6	0-3	95-100	85-100	55-100	35-95	25-50	7-30
	15-24	Clay loam, silty clay loam, clay.	CL, CH	A-7	0-3	95-100	85-100	85-100	60-90	40-55	20-30
	24-60	Clay loam, silty clay loam, clay.	CL, CH	A-7	0-3	95-100	85-100	85-100	60-90	40-55	20-30

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
12---------------Ziegenfuss	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-95	60-75	25-35	5-15
	7-23	Clay loam, silty clay loam, clay.	CL, CH	A-7	0-5	95-100	90-100	90-95	65-85	40-55	20-32
	23-60	Clay loam, silty clay loam, silty clay.	CL, CH	A-7	0-5	95-100	90-100	90-95	70-85	40-55	20-32
13B--------------Marlette	0-9	Fine sandy loam	SC-SM, SC	A-4, A-2-4	0-5	95-100	85-95	50-70	30-50	20-30	4-10
	9-18	Sandy loam, loam, clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6, A-7, A-2-4	0-5	95-100	85-95	50-95	30-80	20-45	4-25
	18-38	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	85-95	80-95	55-90	30-45	11-25
	38-60	Loam, clay loam	CL	A-4, A-6	0-5	95-100	85-95	75-95	50-75	25-40	7-20
13B2-------------Marlette	0-9	Loam-------------	CL, CL-ML	A-4	0-5	95-100	85-95	70-95	50-70	20-30	4-10
	9-14	Sandy loam, loam, clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6, A-7, A-2-4	0-5	95-100	85-95	50-95	30-80	20-45	4-25
	14-34	Loam, clay loam, silty clay loam.	CL	A-4, A-6, A-7-6	0-5	95-100	85-95	80-95	55-90	30-45	11-25
	34-60	Loam, clay loam	CL	A-4, A-6	0-5	95-100	85-95	75-95	50-75	25-40	7-25
13C--------------Marlette	0-9	Fine sandy loam	SC-SM, SC	A-4, A-2-4	0-5	95-100	85-95	50-70	30-50	20-30	4-10
	9-18	Sandy loam, loam, clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6, A-7, A-2-4	0-5	95-100	85-95	50-95	30-80	20-45	4-25
	18-38	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	85-95	80-95	55-90	30-45	11-25
	38-60	Loam, clay loam	CL	A-4, A-6	0-5	95-100	85-95	75-95	50-75	25-40	7-20
13C2-------------Marlette	0-9	Loam-------------	CL, CL-ML	A-4	0-5	95-100	85-95	70-95	50-70	20-30	4-10
	9-14	Sandy loam, loam, clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6, A-7, A-2-4	0-5	95-100	85-95	50-95	30-80	20-45	4-25
	14-34	Loam, clay loam, silty clay loam.	CL	A-4, A-6, A-7-6	0-5	95-100	85-95	80-95	55-90	30-45	11-25
	34-60	Loam, clay loam	CL	A-4, A-6	0-5	95-100	85-95	75-95	50-75	25-40	7-25
13D--------------Marlette	0-9	Fine sandy loam	SC-SM, SC	A-4, A-2-4	0-5	95-100	85-95	50-70	30-50	20-30	4-10
	9-18	Sandy loam, loam, clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6, A-7, A-2-4	0-5	95-100	85-95	50-95	30-80	20-45	4-25
	18-38	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	85-95	80-95	55-90	30-45	11-25
	38-60	Loam, clay loam	CL	A-4, A-6	0-5	95-100	85-95	75-95	50-75	25-40	7-20
13E, 13F---------Marlette	0-4	Fine sandy loam	SC-SM, SC	A-4, A-2-4	0-5	95-100	85-95	50-70	30-50	20-30	4-10
	4-13	Sandy loam, loam, clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6, A-7, A-2-4	0-5	95-100	85-95	50-95	30-90	20-45	4-25
	13-33	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	85-95	80-95	55-90	30-45	11-25
	33-60	Loam, clay loam	CL	A-4, A-6	0-5	95-100	85-95	75-95	50-75	25-40	7-20

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
14A-------------- Capac	0-9	Loam-------------	CL, ML, CL-ML	A-4	0-5	95-100	90-100	70-95	50-75	<25	3-10
	9-21	Sandy loam, clay loam.	CL, CL-ML, SM, SC	A-4, A-6, A-7, A-2-4	0-5	95-100	90-100	50-100	30-85	25-45	5-20
	21-60	Clay loam--------	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	90-100	70-95	55-75	20-45	5-20
15--------------- Parkhill	0-8	Loam-------------	CL-ML, CL	A-4, A-6	0-5	95-100	85-100	70-95	50-75	20-30	5-15
	8-35	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	85-100	70-100	60-95	25-45	10-25
	35-60	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	70-95	50-90	20-35	5-15
16B, 16C, 16D---- Remus	0-6	Fine sandy loam	SM, SC-SM	A-2, A-4	0-10	85-100	85-95	55-75	25-45	<25	NP-7
	6-34	Sandy clay loam, loamy fine sand, fine sandy loam.	SM, SC-SM	A-2, A-4, A-1-b	0-10	85-100	85-95	55-75	30-45	<30	NP-11
	34-60	Sandy clay loam, loam.	SC, CL	A-2, A-6	0-10	85-100	85-95	65-80	30-65	20-30	10-15
18B*, 18C*, 18D*, 18E*:											
Fern-----------	0-13	Fine sand--------	SM	A-2-4	0	95-100	85-100	65-90	15-35	<20	NP
	13-23	Sand, fine sand, loamy fine sand.	SP-SM, SM, SC-SM	A-1-b, A-3, A-2-4	0	95-100	85-100	40-90	5-50	<25	NP-6
	23-50	Sand, loamy fine sand, clay loam.	SP-SM, CL, ML, SC	A-4, A-2-4, A-6	0	95-100	85-100	40-95	10-70	20-40	2-20
	50-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	95-100	85-100	70-95	50-80	20-40	4-20
Spinks---------	0-4	Sand-------------	SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	80-100	35-70	5-15	<20	NP-4
	4-28	Loamy sand, sand, loamy fine sand.	SM, SP-SM, SC-SM	A-2-4, A-3, A-1-b	0	95-100	80-100	35-90	5-35	<25	NP-7
	28-60	Fine sand, loamy fine sand, sand.	SM, SP-SM, SC-SM	A-2-4, A-1-b	0	95-100	80-100	40-90	10-35	<25	NP-7
19A-------------- Kibbie	0-9	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	60-75	<35	NP-15
	9-37	Silt loam, silty clay loam.	CL	A-4, A-6, A-7	0	90-100	85-100	80-100	55-90	25-45	9-25
	37-60	Stratified silt loam to silty clay loam.	ML, CL	A-4, A-6	0	100	95-100	80-95	60-80	20-40	2-20
20--------------- Bono	0-11	Silty clay loam	CH, CL	A-7	0	100	95-100	95-100	80-95	40-60	20-35
	11-32	Silty clay, clay, silty clay loam.	CH, CL	A-7	0	100	95-100	95-100	90-100	40-66	26-44
	32-60	Silty clay loam, silty clay.	CH, CL	A-7, A-6	0	100	95-100	95-100	90-100	35-60	20-40

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
22B, 22C--------- Arkport	0-6	Loamy fine sand	SM	A-2, A-4	0	95-100	95-100	65-85	20-45	---	NP
	6-22	Very fine sandy loam, loamy very fine sand, loamy fine sand.	SM, ML	A-2, A-4	0	95-100	95-100	70-95	30-65	<15	NP-4
	22-60	Very fine sand, loamy fine sand, very fine sandy loam.	SM, ML	A-2, A-4	0	95-100	95-100	65-95	20-80	---	NP
23A-------------- Freesoil	0-8	Loamy very fine sand.	SM, SC-SM, ML, CL-ML	A-4	0	100	100	90-95	40-60	<25	NP-7
	8-50	Stratified fine sand to silt loam.	SM, SC, ML, CL	A-4, A-2-4, A-2-6	0	100	100	65-100	20-80	<30	NP-11
	50-60	Stratified fine sand to silty clay loam.	SM, ML	A-4, A-2, A-6	0	100	100	65-100	20-90	<45	NP-18
24--------------- Lamson	0-13	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	70-90	40-85	<20	NP-4
	13-40	Loamy fine sand to sandy clay loam.	SM, ML	A-4	0	95-100	80-100	55-95	45-65	<20	NP-4
	40-60	Fine sand, very fine sand, silt loam.	SM, ML	A-2, A-4	0	95-100	80-100	60-90	20-90	---	NP
26A-------------- Kibbie	0-9	Fine sandy loam	SM, SC-SM, SC	A-4, A-6	0	100	100	70-85	40-50	<30	2-11
	9-13	Clay loam, fine sandy loam.	CL	A-6, A-7, A-4	0	100	100	70-100	50-80	25-45	7-25
	13-42	Loam, silty clay loam.	CL	A-4, A-6, A-7	0	100	100	85-100	60-90	30-50	11-25
	42-60	Sand, fine sand	SP-SM, SM	A-2-4	0	100	100	50-95	10-35	---	NP
27--------------- Poy	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-80	35-50	15-25
	8-23	Silty clay, silty clay loam.	CH, CL	A-7	0	100	100	90-100	70-100	40-90	20-60
	23-60	Sand, loamy sand	SM, SP-SM, ML, SP	A-2, A-3, A-4	0	80-100	75-100	35-100	4-35	---	NP
28B-------------- Scalley	0-6	Fine sandy loam	SC-SM, SC	A-2, A-4	0-5	95-100	85-100	50-85	30-50	20-30	4-10
	6-9	Sandy loam, loam, clay loam.	SC-SM, SC, CL, CL-ML	A-2, A-4, A-6, A-7	0-5	95-100	85-100	50-95	25-80	20-45	4-20
	9-23	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	85-100	70-95	50-85	30-45	10-20
	23-60	Sand, loamy fine sand, gravelly loamy sand.	SM, SP-SM	A-2-4, A-1-b, A-3	0-5	80-100	50-100	30-80	5-30	---	NP
31B, 31C--------- Boyer	0-8	Loamy sand-------	SM, SP-SM	A-2, A-1	0-5	95-100	75-95	30-80	10-35	<20	NP-4
	8-18	Loamy sand-------	SM, SP-SM	A-2, A-1	0-5	95-100	75-95	30-80	10-35	<20	NP-4
	18-25	Sandy loam, gravelly sandy loam, gravelly sandy clay loam.	SC, SC-SM, CL, CL-ML	A-2, A-4, A-1-b	0-5	80-100	60-95	35-90	15-75	20-30	5-10
	25-60	Sand, coarse sand, very gravelly sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0-10	40-95	30-85	20-60	0-10	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
32B, 32C, 32D, 32F------------- Fern	0-13	Fine sand--------	SM	A-2-4	0	95-100	85-100	65-90	15-35	<20	NP
	13-23	Sand, fine sand, loamy fine sand.	SP-SM, SM, SC-SM	A-1-b, A-3, A-2-4	0	95-100	85-100	40-90	5-50	<25	NP-6
	23-50	Sand, loamy fine sand, clay loam.	SP-SM, CL, ML, SC	A-4, A-2-4, A-6	0	95-100	85-100	40-95	10-70	20-40	2-20
	50-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	95-100	85-100	70-95	50-80	20-40	4-20
34B-------------- Wixom	0-9	Loamy sand-------	SM	A-2-4, A-4	0	95-100	90-100	50-90	15-30	---	NP
	9-33	Loamy sand, sand, loamy fine sand.	SM, SP-SM, SC-SM	A-2-4, A-3, A-4	0	95-100	90-100	50-95	5-50	<25	NP-7
	33-60	Silty clay loam, clay loam, loam.	CL	A-4, A-6, A-7-6	0	95-100	90-100	85-100	55-95	25-45	9-25
36B*, 36C*:											
Fern------------	0-13	Fine sand--------	SM	A-2-4	0	95-100	85-100	65-90	15-35	<20	NP
	13-23	Sand, fine sand, loamy fine sand.	SP-SM, SM, SC-SM	A-1-b, A-3, A-2-4	0	95-100	85-100	40-90	5-50	<25	NP-6
	23-50	Sand, loamy fine sand, clay loam.	SP-SM, CL, ML, SC	A-4, A-2-4, A-6	0	95-100	85-100	40-95	10-70	20-40	2-20
	50-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	95-100	85-100	70-95	50-80	20-40	4-20
Marlette--------	0-9	Fine sandy loam	SC-SM, SC	A-4, A-2-4	0-5	95-100	85-95	50-70	30-50	20-30	4-10
	9-18	Sandy loam, loam, clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6, A-7, A-2-4	0-5	95-100	85-95	50-95	30-80	20-45	4-25
	18-38	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	85-95	80-95	55-90	30-45	11-25
	38-60	Loam, clay loam	CL	A-4, A-6	0-5	95-100	85-95	75-95	50-75	25-40	7-20
36D*:											
Fern------------	0-8	Fine sand--------	SM	A-2-4	0	95-100	85-100	65-90	15-35	<20	NP
	8-20	Sand, fine sand, loamy fine sand.	SP-SM, SM, SC-SM	A-1-b, A-3, A-2-4	0	95-100	85-100	40-90	5-50	<25	NP-6
	20-47	Sand, loamy fine sand, clay loam.	SP-SM, CL, ML, SC	A-4, A-2-4, A-6	0	95-100	85-100	40-95	10-70	20-40	2-20
	47-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	95-100	85-100	70-95	50-80	20-40	4-20
Marlette--------	0-9	Fine sandy loam	SC-SM, SC	A-4, A-2-4	0-5	95-100	85-95	50-70	30-50	20-30	4-10
	9-18	Sandy loam, loam, clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6, A-7, A-2-4	0-5	95-100	85-95	50-95	30-80	20-45	4-25
	18-38	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	85-95	80-95	55-90	30-45	11-25
	38-60	Loam, clay loam	CL	A-4, A-6	0-5	95-100	85-95	75-95	50-75	25-40	7-20

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
36E*:											
Fern	0-5	Fine sand	SM	A-2-4	0	95-100	85-100	65-90	15-35	<20	NP
	5-20	Sand, fine sand, loamy fine sand.	SP-SM, SM, SC-SM	A-1-b, A-3, A-2-4	0	95-100	85-100	40-90	5-50	<25	NP-6
	20-47	Sand, loamy fine sand, clay loam.	SP-SM, CL, ML, SC	A-4, A-2-4, A-6	0	95-100	85-100	40-95	10-70	20-40	2-20
	47-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	95-100	85-100	70-95	50-80	20-40	4-20
Marlette	0-5	Fine sandy loam	SC-SM, SC	A-4, A-2-4	0-5	95-100	85-95	50-70	30-50	20-30	4-10
	5-14	Sandy loam, loam, clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6, A-7, A-2-4	0-5	95-100	85-95	50-95	30-80	20-45	4-25
	14-34	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	85-95	80-95	55-90	30-45	11-25
	34-60	Loam, clay loam	CL	A-4, A-6	0-5	95-100	85-95	75-95	50-75	25-40	7-20
37B*:											
Wixom	0-9	Loamy sand	SM	A-2-4, A-4	0	95-100	90-100	50-90	15-30	---	NP
	9-33	Loamy sand, sand, loamy fine sand.	SM, SP-SM, SC-SM	A-2-4, A-3, A-4	0	95-100	90-100	50-95	5-50	<25	NP-7
	33-60	Silty clay loam, sandy clay loam, loam.	CL	A-4, A-6, A-7-6	0	95-100	90-100	85-100	55-95	25-45	9-25
Capac	0-9	Loam	CL, ML, CL-ML	A-4	0-5	95-100	90-100	70-95	50-75	<25	3-10
	9-21	Sandy loam, clay loam.	CL, CL-ML, SM, SC	A-4, A-6, A-7, A-2-4	0-5	95-100	90-100	50-100	30-85	25-45	5-20
	21-60	Clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	90-100	70-95	55-75	20-45	5-20
38B*, 38C*, 38D*, 38E*:											
Remus	0-6	Fine sandy loam	SM, SC-SM	A-2, A-4	0-10	85-100	85-95	65-85	30-45	<25	NP-7
	6-34	Sandy clay loam, loamy fine sand, fine sandy loam.	SM, SC-SM, SC	A-2, A-4, A-1-b	0-10	85-100	85-95	65-85	30-45	<30	NP-11
	34-60	Sandy clay loam, loam.	SC, CL	A-2, A-6	0-10	85-100	85-95	45-80	10-65	20-30	10-15
Spinks	0-4	Sand	SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	80-100	35-70	5-15	<20	NP-4
	4-28	Loamy sand, sand, fine sand.	SM, SP-SM, SC-SM	A-2-4, A-3, A-1-b	0	95-100	80-100	35-90	5-35	<25	NP-7
	28-60	Fine sand, loamy fine sand, sand.	SM, SP-SM, SC-SM	A-2-4, A-1-b	0	95-100	80-100	40-90	10-35	<25	NP-7
39B Tustin	0-9	Loamy fine sand	SM	A-2	0	100	100	80-100	20-35	---	NP
	9-29	Loamy fine sand, fine sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	50-100	5-35	---	NP
	29-60	Silty clay, silty clay loam, clay.	CL, CH	A-7	0-3	90-100	90-100	85-100	65-100	40-80	20-50

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
40B-------------- Arkona	0-9	Loamy sand-------	SM, SP-SM	A-2-4, A-1-b	0	95-100	90-100	45-80	10-35	---	NP
	9-33	Sand, loamy sand, loamy fine sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-80	5-35	---	NP
	33-60	Silty clay, clay, silty clay loam.	CH	A-7	0	95-100	90-100	85-100	75-95	50-70	25-40
41--------------- Sickles	0-8	Loamy sand-------	SM, SP-SM, SC-SM	A-2-4	0	95-100	90-100	50-75	10-30	<20	NP-6
	8-22	Sand, fine sand, loamy fine sand.	SP-SM, SM, SC-SM	A-3, A-2-4	0	95-100	90-100	50-75	5-30	<25	NP-6
	22-60	Silty clay loam, silty clay.	CH, CL	A-7	0	95-100	90-100	90-100	75-95	42-60	29-40
42B-------------- Grattan	0-5	Sand-------------	SM, SP-SM, SP	A-2-4, A-3, A-1-b	0	95-100	90-100	45-70	3-15	---	NP
	5-33	Sand, loamy sand	SM, SP-SM, SP	A-2-4, A-3, A-1-b	0	95-100	90-100	45-75	3-30	---	NP
	33-55	Sand, coarse sand	SP, SP-SM, SM	A-1-b, A-2-4, A-3	0	95-100	90-100	40-85	0-15	---	NP
	55-60	Loam, clay loam, fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	75-95	50-80	15-30	3-12
43B-------------- Covert	0-8	Sand-------------	SM, SP-SM	A-2-4, A-3	0	95-100	90-100	50-75	5-15	---	NP
	8-46	Sand-------------	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-75	5-15	---	NP
	46-60	Loam-------------	CL	A-4, A-6	0-5	90-100	90-100	75-95	60-80	25-35	7-15
44B-------------- Pipestone	0-9	Fine sand--------	SP-SM, SM	A-1, A-2-4, A-3	0	95-100	85-100	40-80	10-35	---	NP
	9-42	Sand, fine sand	SP, SP-SM, SM	A-1, A-2-4, A-3	0	95-100	85-100	40-80	2-30	---	NP
	42-60	Clay loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	85-100	70-100	50-90	20-45	5-20
47B*, 47C*, 47D*, 47E*:											
Spinks---------	0-4	Sand-------------	SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	80-100	35-70	5-15	<20	NP-4
	4-28	Loamy sand, sand, fine sand.	SM, SP-SM, SC-SM	A-2-4, A-3, A-1-b	0	95-100	80-100	35-90	5-35	<25	NP-7
	28-60	Fine sand, loamy fine sand, sand.	SM, SP-SM, SC-SM	A-2-4, A-1-b	0	95-100	80-100	40-90	10-35	<25	NP-7
Coloma---------	0-7	Sand-------------	SP, SM, SP-SM	A-2, A-3	0-7	75-100	75-100	50-70	2-15	---	NP
	7-45	Sand-------------	SP, SM, SP-SM	A-2, A-3	0-7	75-100	75-100	50-70	2-15	---	NP
	45-60	Stratified sand to sandy loam.	SP, SM, SP-SM	A-2, A-3, A-4	0-7	75-100	75-100	50-100	2-40	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
48B-------------- Thetford	0-13	Fine sand--------	SM, SP-SM	A-2, A-3, A-1-b	0	95-100	90-100	45-80	10-35	---	NP
	13-34	Sand, fine sand, loamy fine sand.	SM, SP-SM, SC-SM	A-2, A-3, A-1-b	0	95-100	90-100	45-80	5-35	<25	NP-7
	34-60	Loamy sand, fine sandy loam, sand.	SM, SC-SM, SC	A-2, A-4	0	95-100	90-100	60-80	20-50	<30	NP-10
52C-------------- Wallace	0-15	Fine sand--------	SM	A-2-4	0	95-100	95-100	75-95	10-30	---	NP
	15-19	Fine sand--------	SM, SP-SM, SM	A-2, A-3, A-1-b	0	95-100	90-100	45-95	10-30	---	NP
	19-60	Fine sand--------	SP, SP-SM, SM	A-2, A-3, A-1-b	0	95-100	90-100	45-95	10-30	---	NP
53A*:											
Saugatuck--------	0-2	Sand-------------	SP-SM, SM	A-3, A-2-4	0	100	100	50-70	5-15	---	NP
	2-12	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-95	5-30	---	NP
	12-24	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-95	5-30	---	NP
	24-60	Sand, fine sand	SP, SP-SM, SM	A-3, A-2-4	0	100	100	80-95	0-30	---	NP
Jebavy-----------	0-2	Mucky sand-------	SP-SM, SM	A-3, A-2-4, A-1-b	0	95-100	90-100	45-95	5-30	---	NP
	2-4	Sand, fine sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	95-100	90-100	45-95	5-30	---	NP
	4-22	Sand, fine sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	95-100	90-100	45-95	5-30	---	NP
	22-28	Sand, fine sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	95-100	90-100	45-95	5-30	---	NP
	28-39	Sand, fine sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	95-100	90-100	45-95	5-30	---	NP
	39-60	Sand, fine sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	95-100	90-100	45-95	5-30	---	NP
54B, 54C, 54D---- Grattan	0-7	Sand-------------	SM, SP-SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-70	5-15	---	NP
	7-50	Sand-------------	SM, SP-SM, SP	A-2-4, A-1-b, A-3	0	95-100	90-100	45-70	3-15	---	NP
	50-60	Sand-------------	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	90-100	35-70	0-15	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
56B*:											
Pipestone	0-11	Sand	SM, SP-SM	A-2-4, A-3, A-1-b	0	95-100	85-100	40-70	5-15	---	NP
	11-40	Sand, fine sand	SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	85-100	40-90	5-30	---	NP
	40-60	Sand, fine sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	95-100	85-100	40-90	5-30	---	NP
Saugatuck	0-2	Sand	SP-SM, SM	A-3, A-2-4	0	100	100	50-70	5-15	---	NP
	2-12	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-95	5-30	---	NP
	12-24	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-95	5-30	---	NP
	24-60	Sand, fine sand	SP, SP-SM, SM	A-3, A-2-4	0	100	100	80-95	0-30	---	NP
57B Grattan	0-3	Sand	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-70	3-15	---	NP
	3-45	Sand	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-75	3-15	---	NP
	45-60	Sand	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-70	0-15	---	NP
57B3 Grattan	0-60	Sand	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-70	0-15	---	NP
57C, 57D, 57E, 57F Grattan	0-3	Sand	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-70	3-15	---	NP
	3-45	Sand	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-75	3-15	---	NP
	45-60	Sand	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-70	0-15	---	NP
58B Covert	0-8	Sand	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-75	5-15	---	NP
	8-36	Sand	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-70	5-15	---	NP
	36-60	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-70	5-15	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
59B-------------- Pipestone	0-11	Fine sand--------	SM, SP-SM	A-2-4, A-3, A-1-b	0	95-100	85-100	40-90	10-35	---	NP
	11-40	Sand, fine sand	SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	85-100	40-90	5-30	---	NP
	40-60	Sand, fine sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	95-100	85-100	40-90	5-30	---	NP
60--------------- Kingsville	0-6	Mucky sand-------	SM, SP-SM	A-2, A-1, A-3	0	100	90-100	45-70	5-15	---	NP
	6-25	Fine sand, sand	SM, SP-SM	A-2, A-4	0	100	90-100	50-80	10-30	---	NP
	25-60	Fine sand, sand	SM, SW-SM, SP-SM	A-2, A-3, A-4, A-1	0	95-100	85-100	45-80	5-30	---	NP
62D, 62F--------- Nordhouse	0-6	Fine sand--------	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	6-49	Fine sand--------	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	49-72	Fine sand--------	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
63B, 63C, 63D, 63E------------- Coloma	0-7	Sand-------------	SP, SM, SP-SM	A-2, A-3	0-7	75-100	75-100	50-70	2-15	---	NP
	7-45	Sand, loamy sand	SP, SM, SP-SM	A-2, A-3	0-7	75-100	75-100	50-75	2-30	---	NP
	45-60	Stratified sand to sandy loam.	SP, SM, SP-SM	A-2, A-3, A-4	0-7	75-100	75-100	50-100	2-40	---	NP
64B, 64C, 64D---- Benona	0-7	Sand-------------	SP, SP-SM, SM	A-2, A-3, A-1	0	90-100	75-100	45-70	0-15	---	NP
	7-47	Sand, loamy sand	SP, SP-SM, SM	A-2, A-3, A-1	0	90-100	75-100	45-90	0-30	---	NP
	47-60	Stratified sand to loamy sand.	SP-SM, SM	A-2, A-3, A-1	0	90-100	75-100	45-75	5-30	---	NP
65B, 65C--------- Chelsea	0-9	Fine sand--------	SP, SP-SM, SM	A-3, A-2-4	0	100	100	65-95	3-15	---	NP
	9-60	Fine sand, loamy fine sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
67B, 67C, 67E---- Plainfield	0-3	Sand-------------	SP-SM, SM, SP	A-3, A-2, A-1	0	75-100	75-100	40-80	1-15	---	NP
	3-27	Sand-------------	SP, SM, SP-SM	A-3, A-1, A-2	0	75-100	75-100	40-70	1-15	---	NP
	27-60	Sand, fine sand	SP, SM, SP-SM	A-3, A-1, A-2	0	75-100	75-100	40-90	1-15	---	NP
72--------------- Glendora	0-9	Mucky silt loam	CL-ML	A-4	0-5	95-100	90-100	80-95	65-85	<25	2-7
	9-60	Sand-------------	SP-SM, SP, SM	A-3, A-2-4, A-1-b	0-5	95-100	90-100	45-70	0-15	---	NP
76--------------- Houghton	0-9	Muck-------------	PT	A-8	0	---	---	---	---	---	---
	9-60	Muck-------------	PT	A-8	0	---	---	---	---	---	---
77--------------- Adrian	0-26	Muck-------------	PT	A-8	---	---	---	---	---	---	---
	26-60	Sand, fine sand	SP, SM	A-2, A-3, A-1	0	80-100	60-100	30-80	0-35	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
78--------------- Willette	0-19	Muck--------------	PT	---	---	---	---	---	---	---	---
	19-60	Silty clay, silty clay loam.	CL, CH	A-7	0	100	95-100	90-100	85-95	45-65	25-40
79*:											
Edwards---------	0-18	Muck--------------	PT	---	0	---	---	---	---	---	---
	18-39	Marl--------------	---	---	0	100	95-100	80-90	60-80	---	---
	39-60	Sand--------------	SP-SM, SM, SP	A-2, A-3, A-1	0	95-100	75-100	45-70	0-15	---	NP
Martisco--------	0-8	Muck--------------	PT	A-8	0	---	---	---	---	---	---
	8-60	Marl--------------	---	---	0	---	---	---	---	---	---
81*:											
Loxley----------	0-12	Muck--------------	PT	A-8	0	---	---	---	---	---	---
	12-70	Muck--------------	PT	A-8	0	---	---	---	---	---	---
Dawson----------	0-10	Mucky peat--------	PT	A-8	0	---	---	---	---	---	---
	10-28	Muck--------------	PT	A-8	0	---	---	---	---	---	---
	28-60	Sand, loamy sand	SC-SM, SM, SC, SP-SM	A-2, A-3, A-1, A-4	0	90-100	75-100	45-90	0-30	---	NP
83*:											
Histosols-------	0-60	Muck--------------	PT	A-8	0	---	---	---	---	---	NP
Aquents---------	0-60	Variable----------	---	---	---	---	---	---	---	---	---
86F*:											
Dune land-------	0-60	Fine sand---------	SM	A-2-4	0	100	100	50-100	20-35	<20	NP
Quartzipsamments	0-60	Sand, fine sand	SM, SP-SM	A-2-4, A-3	0	100	100	50-100	5-35	<20	NP
87F*:											
Dune land-------	0-60	Fine sand---------	SM	A-2-4	0	100	100	50-100	20-35	<20	NP
Quartzipsamments	0-60	Sand, fine sand	SM, SP-SM	A-2-4, A-3	0	100	100	50-100	5-35	<20	NP
Psammaquents----	0-60	Sand, fine sand	SP, SP-SM, SM	A-1, A-2, A-3	0-5	85-100	80-100	40-100	2-35	<20	NP
88B-------------- Udipsamments	0-60	Sand, fine sand	SP, SP-SM, SM	A-1, A-2, A-3	0	85-100	80-100	30-100	0-35	<20	NP
89D, 89F--------- Udorthents	0-60	Variable----------	---	---	---	---	---	---	---	---	---
90B, 90C, 90D---- Epworth	0-6	Fine sand---------	SM	A-2-4	0	100	100	65-80	20-35	---	NP
	6-30	Fine sand---------	SM	A-2-4	0	100	100	65-80	20-35	---	NP
	30-60	Fine sand---------	SM	A-2-4	0	100	100	65-80	20-35	---	NP
91*. Pits											

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
93B-------------- Tuscola	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	85-100	60-90	20-30	3-10
	9-30	Silty clay loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	100	80-95	60-90	20-40	6-20
	30-60	Stratified fine sand to silty clay loam.	SM, ML	A-4	0	100	95-100	75-90	40-90	<25	NP-4
94B*, 94C*, 94D*:											
Coloma----------	0-7	Sand-------------	SP, SM, SP-SM	A-2, A-3	0-7	75-100	75-100	50-70	2-15	---	NP
	7-45	Sand, loamy sand	SP, SM, SP-SM	A-2, A-3	0-7	75-100	75-100	50-75	2-30	---	NP
	45-60	Stratified sand to sandy loam.	SP, SM, SP-SM	A-2, A-3, A-4	0-7	75-100	75-100	50-100	2-40	---	NP
Scalley---------	0-6	Sandy loam-------	SC-SM, SC	A-2, A-4	0-5	95-100	85-100	50-85	25-50	20-30	4-10
	6-9	Sandy loam, loam, clay loam.	SC-SM, SC, CL, CL-ML	A-2, A-4, A-6, A-7	0-5	95-100	85-100	50-95	25-85	20-45	4-20
	9-23	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	85-100	70-95	50-85	30-45	10-20
	23-60	Sand, loamy fine sand, gravelly loamy sand.	SM, SP-SM	A-2-4, A-1-b, A-3	0-5	80-100	50-100	30-80	5-30	---	NP
95A*:											
Ithaca----------	0-10	Loam-------------	CL, CL-ML	A-4, A-6	0-3	95-100	85-100	70-95	50-75	20-35	4-15
	10-15	Fine sandy loam, loam, silty clay loam.	SC, CL	A-4, A-6, A-7-6	0-3	95-100	85-100	55-100	35-95	25-50	7-30
	15-24	Clay loam, silty clay loam, clay.	CL, CH	A-7	0-3	95-100	85-100	85-100	60-90	40-55	20-30
	24-60	Clay loam, silty clay loam.	CL, CH	A-7	0-3	95-100	85-100	85-100	60-90	40-55	20-30
Arkona----------	0-9	Loamy sand-------	SM, SP-SM	A-2-4, A-1-b	0	95-100	90-100	45-80	10-35	---	NP
	9-33	Sand, loamy sand, loamy fine sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-80	5-35	---	NP
	33-60	Silty clay, clay, silty clay loam.	CH	A-7	0	95-100	90-100	85-100	75-95	50-70	25-40
97B*:											
Urban land------	0-60	Variable---------	---	---	---	---	---	---	---	---	---
Epworth---------	0-6	Fine sand--------	SM	A-2-4	0	100	100	65-80	20-35	---	NP
	6-30	Fine sand--------	SM	A-2-4	0	100	100	65-80	20-35	---	NP
	30-60	Fine sand--------	SM	A-2-4	0	100	100	65-80	20-35	---	NP
98F*:											
Udorthents------	0-60	Variable---------	---	---	---	---	---	---	---	---	---
Fluvaquents-----	0-60	Variable---------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
99B, 99C, 99D---- Tekenink	0-4	Loamy fine sand	SM, SC-SM	A-2-4, A-4, A-1-b	0-10	95-100	80-100	45-95	20-40	<25	NP-6
	4-17	Loamy fine sand, loamy sand.	SM, SC-SM, SC	A-4, A-2-4	0-10	95-100	80-100	50-85	20-50	<25	NP-10
	17-62	Loamy sand, fine sandy loam, sandy clay loam.	SM, SC, CL, ML	A-4, A-2-4, A-1-b	0-10	95-100	80-100	35-95	10-75	<25	NP-10
	62-72	Sandy loam, sandy clay loam, loam.	SC-SM, SC, CL, CL-ML	A-4, A-2-4, A-2-6	0-10	95-100	80-100	45-95	20-75	<30	4-15
210B*, 210C*, 210D*----------- Typic Udipsamments	0-2	Sand-------------	SM, SP-SM	A-3, A-1, A-2	0	90-100	85-100	40-70	5-15	---	NP
	2-40	Sand-------------	SM, SP-SM	A-3, A-1, A-2	0	90-100	85-100	40-70	5-15	---	NP
	40-99	Sand, coarse sand	SP, SM, SP-SM	A-3, A-1, A-2	0	90-100	85-100	40-70	0-15	---	NP
211B*, 211C*----- Typic Udipsamments	0-2	Sand-------------	SM, SP-SM	A-3, A-1, A-2	0	90-100	85-100	40-70	5-15	---	NP
	2-30	Sand-------------	SM, SP-SM	A-3, A-1, A-2	0	90-100	85-100	40-70	5-15	---	NP
	30-45	Sand-------------	SM, SP-SM	A-3, A-1, A-2	0	90-100	85-100	40-70	5-15	---	NP
	45-180	Stratified sand to sandy loam.	SM, SC-SM, SC, SP-SM	A-3, A-1, A-2, A-4	0	90-100	85-100	40-70	5-40	<30	NP-10
212B*------------ Typic Udipsamments	0-3	Sand-------------	SM, SP-SM	A-3, A-1, A-2	0	90-100	85-100	40-70	5-15	---	NP
	3-25	Sand-------------	SM, SP-SM	A-3, A-1, A-2	0	90-100	85-100	40-70	5-15	---	NP
	25-180	Sand, coarse sand	SP, SM, SP-SM	A-3, A-1, A-2	0	90-100	85-100	40-70	0-15	---	NP
213B*------------ Alfic Udipsamments	0-3	Sand-------------	SP-SM, SM	A-3, A-1, A-2	0	90-100	85-100	40-70	5-15	---	NP
	3-30	Sand, coarse sand	SP, SP-SM, SM	A-3, A-1, A-2	0	90-100	85-100	40-70	0-15	---	NP
	30-99	Stratified sand to sandy loam.	SP-SM, SM	A-3, A-2	0	90-100	85-100	50-75	5-30	---	NP
214B*------------ Typic Udipsamments	0-2	Sand-------------	SM, SP-SM	A-3, A-1, A-2	0	90-100	85-100	40-70	5-15	---	NP
	2-45	Sand-------------	SM, SP-SM	A-3, A-1, A-2	0	90-100	85-100	40-70	5-15	---	NP
	45-180	Sand, coarse sand	SP, SM, SP-SM	A-3, A-1, A-2	0	90-100	85-100	40-70	0-15	---	NP
220B*, 220C*, 220D*, 220E*---- Entic Haplorthods	0-3	Sand-------------	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	3-15	---	NP
	3-35	Sand, fine sand, loamy sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	3-25	---	NP
	35-180	Sand, coarse sand	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	35-70	0-15	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
221B*, 221C*, 221D*: Entic Haplorthods	0-2	Sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	45-70	1-15	---	NP
	2-30	Sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	45-70	1-15	---	NP
	30-60	Sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	45-70	1-15	---	NP
	60-180	Stratified sand to sandy loam.	SP, SM, SC-SM, SC	A-3, A-1, A-2, A-4	0	95-100	85-100	40-70	1-40	0-30	NP-10
222B*: Entic Haplorthods	0-3	Sand	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	3-15	---	NP
	3-35	Sand	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	3-15	---	NP
	35-180	Sand, coarse sand	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	0-15	---	NP
224B*: Entic Haplorthods	0-4	Sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	40-70	3-15	---	NP
	4-30	Sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	40-70	3-15	---	NP
	30-180	Sand, coarse sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	40-70	0-15	---	NP
225B*, 225C*: Entic Haplorthods	0-2	Sand	SP-SM, SM	A-2, A-1, A-3	0	95-100	90-100	45-70	5-15	---	NP
	2-35	Sand	SP, SP-SM, SM	A-2, A-1, A-3	0	95-100	90-100	45-70	3-15	---	NP
	35-55	Sand	SP, SP-SM, SM	A-2, A-1, A-3	0	95-100	90-100	45-70	0-15	---	NP
	55-180	Sandy clay loam, clay loam.	SC, CL	A-6, A-7, A-2-6	0	95-100	85-100	65-95	30-80	30-50	10-25
231B*, 231C*, 231D*, 231E*:											
Entic Haplorthods	0-3	Sand	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	3-15	---	NP
	3-35	Sand, fine sand, loamy sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	3-25	---	NP
	35-180	Sand, coarse sand	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	35-70	0-15	---	NP
Alfic Haplorthods	0-3	Sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	3-36	Sand, fine sand, loamy sand.	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-95	5-35	---	NP
	36-50	Sandy clay loam, clay loam, silty clay loam.	SC, CL	A-2, A-6, A-7	0	95-100	90-100	70-100	30-95	30-50	11-25
	50-65	Stratified sand to sandy clay loam.	SM, SC, CL, SC-SM	A-2, A-3, A-4, A-6	0	95-100	90-100	45-90	5-55	0-40	NP-20

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
233B*:											
Alfic Haplorthods----	0-3	Sand-------------	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	3-36	Sand, fine sand, loamy sand.	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-95	5-35	---	NP
	36-50	Sandy clay loam, clay loam, silty clay loam.	SC, CL	A-2, A-6, A-7	0	95-100	90-100	70-100	30-95	30-50	11-25
	50-65	Stratified sand to sandy clay loam.	SM, SC, CL, SC-SM	A-2, A-3, A-4, A-6	0	95-100	90-100	45-90	5-55	0-40	NP-20
Entic Haplorthods----	0-3	Sand-------------	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	3-15	---	NP
	3-35	Sand, fine sand, loamy sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	3-25	---	NP
	35-180	Sand, coarse sand	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	35-70	0-15	---	NP
235B*:											
Alfic Haplorthods----	0-3	Sand-------------	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	3-36	Sand, fine sand, loamy sand.	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-95	5-35	---	NP
	36-50	Sandy clay loam, clay loam, silty clay loam.	SC, CL	A-2, A-6, A-7	0	95-100	90-100	70-100	30-95	30-50	11-25
	50-65	Stratified sand to sandy clay loam.	SM, SC, CL, SC-SM	A-2, A-3, A-4, A-6	0	95-100	90-100	45-90	5-55	0-40	NP-20
Alfic Haplorthods----	0-3	Sand-------------	SM, SP-SM, SM	A-2, A-1	0	95-100	75-100	35-75	10-30	---	NP
	3-42	Sand, loamy sand	SP, SP-SM, SM	A-2, A-1, A-3	0	95-100	75-100	35-75	0-30	---	NP
	42-50	Sandy loam, fine sandy loam, sandy clay loam.	SC-SM, SC, CL-ML, CL	A-2-4, A-4, A-6	0	95-100	75-100	45-90	20-55	20-40	4-18
	50-180	Sand, loamy sand, coarse sand.	SP, SP-SM, SM	A-2, A-1, A-3	0	95-100	75-100	35-75	0-30	---	NP
235C*, 235D*:											
Alfic Haplorthods----	0-3	Sand-------------	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	3-36	Sand, fine sand, loamy sand.	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-95	5-35	---	NP
	36-50	Sandy clay loam, clay loam, silty clay loam.	SC, CL	A-2, A-6, A-7	0	95-100	90-100	70-100	30-95	30-50	11-25
	50-65	Stratified sand to sandy clay loam.	SM, SC, CL, SC-SM	A-2, A-3, A-4, A-6	0	95-100	90-100	45-90	5-55	0-40	NP-20

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
235C*, 235D*:											
Alfic Haplorthods----	0-3	Sand-------------	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	3-20	Sand, loamy sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-75	5-30	---	NP
	20-55	Sandy clay loam, clay loam, silty clay loam.	SC, CL	A-2-6, A-2-7, A-6, A-7	0	95-100	90-100	70-100	30-95	30-50	11-25
	55-90	Sand, loamy fine sand, sandy loam.	SP-SM, SM, SC, SC-SM	A-1, A-2, A-3, A-4	0	95-100	90-100	40-70	5-40	<30	NP-9
	90-180	Sandy clay loam, silt loam, silty clay loam.	SC, CL	A-2-6, A-2-7, A-6	0	95-100	90-100	70-100	30-95	30-50	11-25
236B*, 236C*, 236D*, 236E*---- Entic Haplorthods	0-3	Sand-------------	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	3-15	---	NP
	3-36	Sand-------------	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	3-15	---	NP
	36-180	Sand, coarse sand	SP, SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	35-70	0-15	---	NP
237B*, 237C*, 237D*----------- Haplic Glossudalfs	0-4	Sandy loam-------	SM	A-2, A-4, A-1-b	0	95-100	75-100	45-70	20-40	<20	NP-4
	4-10	Sandy loam, fine sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-2, A-4, A-1	0	95-100	75-100	35-85	10-50	<25	NP-7
	10-20	Sandy loam, loam	SM, SC, CL, ML	A-2, A-4, A-6	0	95-100	75-100	45-95	20-70	<30	NP-11
	20-45	Sandy clay loam, clay loam, silty clay loam.	SC, CL	A-6, A-7, A-2-7	0	95-100	75-100	60-100	25-95	30-50	11-25
	45-60	Sandy loam, sandy clay loam, clay loam.	SC-SM, CL-ML, CL, SC	A-2, A-4, A-6, A-7	0	95-100	75-100	45-100	20-80	20-45	4-20
240B*, 240C*, 240D*, 240E*---- Entic Haplorthods	0-1	Sand-------------	SM, SP-SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-70	5-15	---	NP
	1-30	Sand-------------	SM, SP-SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-70	5-15	---	NP
	30-180	Sand, coarse sand	SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	90-100	35-70	5-15	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
245B*, 245C*, 245D*: Entic Haplorthods	0-2	Sand	SP-SM, SM	A-2-4, A-1-b, A-3	0	95-100	90-100	45-70	5-15	---	NP
	2-40	Sand	SP, SP-SM, SM	A-2-4, A-1-b, A-3	0	95-100	90-100	45-70	3-15	---	NP
	40-45	Sand	SP, SP-SM, SM	A-2-4, A-1-b, A-3	0	95-100	90-100	45-70	0-15	---	NP
	45-60	Sandy clay loam, clay loam.	SC, CL	A-6, A-7, A-2-6	0	95-100	85-100	65-95	30-80	30-50	10-25
250*: Mollic Psammaquents	0-3	Muck	---	---	---	---	---	---	---	---	---
	3-6	Fine sandy loam, sandy loam.	SM, SC-SM, SC	A-2, A-4	0	95-100	85-100	50-85	30-50	<25	NP-10
	6-9	Loamy sand, sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	40-90	2-30	---	NP
	9-60	Sand, loamy sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	40-90	2-30	---	NP
Aquic Udipsamments	0-2	Sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	2-7	Sand, loamy sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-25	---	NP
	7-45	Sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	45-60	Sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
Medisaprists	0-60	Muck	PT	A-8	---	---	---	---	---	---	---
251A*: Aeric Haplaquods	0-3	Sand	SP-SM, SM	A-3, A-1, A-2	0	95-100	90-100	45-70	5-15	---	NP
	3-8	Sand	SP-SM, SM	A-3, A-1, A-2	0	95-100	90-100	45-70	5-15	---	NP
	8-20	Sand	SP-SM, SM	A-3, A-1, A-2	0	95-100	90-100	45-70	5-15	---	NP
	20-60	Sand	SP-SM, SM	A-3, A-1, A-2	0	95-100	90-100	45-70	5-15	---	NP
Typic Haplaquods	0-4	Mucky sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	4-25	Sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	25-60	Sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
252*:											
Typic Haplaquods	0-4	Mucky sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	4-25	Sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	25-60	Sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
Medisaprists	0-33	Muck	---	---	---	---	---	---	---	---	---
	33-60	Variable	---	---	---	---	---	---	---	---	---
253A*:											
Aeric Haplaquods	0-3	Sand	SP-SM, SM	A-3, A-1, A-2	0	95-100	90-100	45-70	5-15	---	NP
	3-8	Sand	SP-SM, SM	A-3, A-1, A-2	0	95-100	90-100	45-70	5-15	---	NP
	8-30	Sand	SP-SM, SM	A-3, A-1, A-2	0	95-100	90-100	45-70	5-15	---	NP
	30-60	Sand	SP-SM, SM	A-3, A-1, A-2	0	95-100	90-100	45-70	5-15	---	NP
Aquic Udipsamments	0-2	Sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	2-7	Sand, loamy sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-75	5-25	---	NP
	7-45	Sand	SM, SM, SP-SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	45-60	Sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
255B*:											
Aquic Udipsamments	0-2	Sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	2-7	Sand, loamy sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-75	5-25	---	NP
	7-45	Sand	SM, SM, SP-SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	45-60	Sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
Entic Haplorthods	0-4	Sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	40-70	3-15	---	NP
	4-30	Sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	40-70	3-15	---	NP
	30-99	Sand, coarse sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	40-70	0-15	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
256*:											
Medisaprists----	0-60	Muck-------------	PT	A-8	---	---	---	---	---	---	---
Mollic Psammaquents---	0-3	Muck-------------	---	---	---	---	---	---	---	---	---
	3-6	Fine sandy loam	SM, SC-SM, SC	A-2, A-4	0	95-100	85-100	55-85	30-50	<25	NP-10
	6-9	Loamy sand, sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	40-90	2-30	---	NP
	9-60	Sand, loamy sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	40-90	2-30	---	NP
262A*------------ Aeric Haplaquods	0-3	Sand-------------	SP-SM, SM	A-3, A-1, A-2	0	95-100	90-100	45-70	5-15	---	NP
	3-8	Sand-------------	SP-SM, SM	A-3, A-1, A-2	0	95-100	90-100	45-70	5-15	---	NP
	8-30	Sand-------------	SP-SM, SM	A-3, A-1, A-2	0	95-100	90-100	45-70	5-15	---	NP
	30-60	Sand-------------	SP-SM, SM	A-3, A-1, A-2	0	95-100	90-100	45-70	5-15	---	NP
263A*------------ Aquic Udipsamments	0-2	Sand-------------	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	2-7	Sand, loamy sand	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-75	5-25	---	NP
	7-45	Sand-------------	SM, SM, SP-SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	45-60	Sand-------------	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
272*------------- Typic Haplaquods	0-4	Mucky sand-------	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	4-25	Sand-------------	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
	25-60	Sand-------------	SP-SM, SM	A-1, A-2, A-3	0	95-100	85-100	40-70	5-15	---	NP
273*------------- Mollic Psammaquents	0-3	Muck-------------	---	---	---	---	---	---	---	---	---
	3-6	Fine sandy loam	SM, SC-SM, SC	A-2, A-4	0	95-100	85-100	55-85	30-50	<25	NP-10
	6-9	Loamy sand, sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	40-90	2-30	---	NP
	9-60	Sand, loamy sand	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	85-100	40-90	2-30	---	NP
274*------------- Typic Haplaquolls	0-4	Muck-------------	PT	A-8	0	---	---	---	---	---	---
	4-14	Loamy fine sand	SM	A-4	0	95-100	90-100	80-95	40-50	---	NP
	14-29	Fine sand, sand, loamy fine sand.	SM, SP-SM	A-3, A-4, A-2, A-1	0	95-100	90-100	45-95	5-50	---	NP
	29-60	Sandy clay loam, silt loam, silty clay loam.	SC-SM, SC, CL-ML, CL	A-2-6, A-6, A-7	0	95-100	90-100	70-100	30-95	20-50	6-25
280*:											
Aquents---------	0-60	Variable---------	---	---	---	---	---	---	---	---	---
Histosols-------	0-60	Muck-------------	PT	A-8	0	---	---	---	---	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
281-------------- Medisaprists	0-33	Muck-------------	---	---	---	---	---	---	---	---	---
	33-60	Variable---------	---	---	---	---	---	---	---	---	---
282-------------- Medisaprists	0-60	Muck-------------	PT	A-8	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
1. Beaches											
2A---------------- Del Rey	0-8	27-30	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	3	7	2-3
	8-18	35-45	1.40-1.65	0.06-0.2	0.12-0.20	4.5-8.4	Moderate-----	0.43			
	18-60	25-45	1.50-1.70	0.06-0.2	0.09-0.11	7.9-8.4	Moderate-----	0.43			
5F*:											
Udorthents------	0-60	2-18	1.50-1.70	0.6-2.0	0.11-0.18	---	Low----------	0.24	5	3	---
	60-80	---	---	---	---	---	-------------	----			
Udipsamments----	0-60	0-10	1.35-1.65	>6.0	0.05-0.09	5.1-6.5	Low----------	0.15	5	1	<1
6---------------- Kinross	0-9	0-10	1.10-1.20	6.0-20	0.12-0.17	3.6-5.0	Low----------	0.15	5	1	10-15
	9-30	0-10	1.40-1.70	6.0-20	0.04-0.09	3.6-6.0	Low----------	0.15			
	30-60	0-10	1.40-1.70	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15			
7---------------- Sloan	0-18	15-27	1.20-1.40	0.6-2.0	0.19-0.24	6.1-7.8	Low----------	0.28	5	6	3-6
	18-36	15-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.37			
	36-60	15-35	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low----------	0.37			
8B--------------- Epworth	0-6	0-10	1.35-1.60	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	1-2
	6-30	0-10	1.40-1.65	6.0-20	0.06-0.08	4.5-6.0	Low----------	0.15			
	30-60	0-10	1.55-1.70	6.0-20	0.05-0.07	5.6-6.5	Low----------	0.15			
9*:											
Kerston---------	0-18	---	0.25-0.45	0.2-6.0	0.35-0.45	5.1-8.4	-------------	----	5	2	60-85
	18-21	0-10	1.45-1.70	0.6-2.0	0.08-0.20	5.1-8.4	Low----------	----			
	21-46	---	0.12-0.25	0.2-6.0	0.35-0.45	5.1-8.4	-------------	----			
	46-58	0-10	1.55-1.70	0.6-20	0.06-0.20	5.1-8.4	Low----------	----			
	58-72	---	0.25-0.45	0.2-6.0	0.35-0.45	5.1-8.4	-------------	----			
Carlisle--------	0-60	---	0.13-0.23	0.2-6.0	0.35-0.45	4.5-7.8	-------------	----	5	2	>70
Glendora--------	0-9	12-20	1.00-1.35	0.6-6.0	0.24-0.30	5.6-7.8	Low----------	0.28	5	5	10-15
	9-60	0-10	1.40-1.65	6.0-20	0.05-0.11	5.6-7.8	Low----------	0.17			
10B-------------- Perrinton	0-7	10-27	1.35-1.55	0.6-2.0	0.17-0.24	5.6-7.8	Low----------	0.37	3	5	1-3
	7-15	10-50	1.35-1.65	0.2-0.6	0.11-0.20	5.6-7.8	Moderate-----	0.32			
	15-60	35-50	1.50-1.70	0.06-0.2	0.10-0.20	5.6-8.4	Moderate-----	0.32			
10B2------------- Perrinton	0-7	27-40	1.50-1.70	0.2-0.6	0.16-0.19	5.6-7.8	Moderate-----	0.32	2	6	.5-1
	7-11	10-50	1.35-1.65	0.2-0.6	0.11-0.20	5.6-7.8	Moderate-----	0.32			
	11-60	35-50	1.50-1.70	0.06-0.2	0.10-0.20	5.6-8.4	Moderate-----	0.32			
10C-------------- Perrinton	0-7	10-27	1.35-1.55	0.6-2.0	0.17-0.24	5.6-7.8	Low----------	0.37	3	5	1-3
	7-15	10-50	1.35-1.65	0.2-0.6	0.11-0.20	5.6-7.8	Moderate-----	0.32			
	15-60	35-50	1.50-1.70	0.06-0.2	0.10-0.20	5.6-8.4	Moderate-----	0.32			
10C2------------- Perrinton	0-7	27-40	1.50-1.70	0.2-0.6	0.16-0.19	5.6-7.8	Moderate-----	0.32	2	6	.5-1
	7-11	10-50	1.35-1.65	0.2-0.6	0.11-0.20	5.6-7.8	Moderate-----	0.32			
	11-60	35-50	1.50-1.70	0.06-0.2	0.10-0.20	5.6-8.4	Moderate-----	0.32			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
10D-------------- Perrinton	0-7	10-27	1.35-1.55	0.6-2.0	0.17-0.24	5.6-7.8	Low-----------	0.37	3	5	1-3
	7-15	10-50	1.35-1.65	0.2-0.6	0.11-0.20	5.6-7.8	Moderate------	0.32			
	15-60	35-50	1.50-1.70	0.06-0.2	0.10-0.20	5.6-8.4	Moderate------	0.32			
10D2------------- Perrinton	0-4	27-40	1.50-1.70	0.2-0.6	0.16-0.19	5.6-7.8	Moderate------	0.32	2	6	.5-1
	4-11	10-50	1.35-1.65	0.2-0.6	0.11-0.20	5.6-7.8	Moderate------	0.32			
	11-60	35-50	1.50-1.70	0.06-0.2	0.10-0.20	5.6-8.4	Moderate------	0.32			
10E-------------- Perrinton	0-7	10-27	1.35-1.55	0.6-2.0	0.17-0.24	5.6-7.8	Low-----------	0.37	3	5	1-3
	7-15	10-50	1.35-1.65	0.2-0.6	0.11-0.20	5.6-7.8	Moderate------	0.32			
	15-60	35-50	1.50-1.70	0.06-0.2	0.10-0.20	5.6-8.4	Moderate------	0.32			
11A-------------- Ithaca	0-10	8-27	1.40-1.70	0.6-2.0	0.18-0.22	5.1-7.3	Low-----------	0.32	3	5	1-4
	10-15	12-40	1.40-1.60	0.2-0.6	0.14-0.18	5.1-7.3	Low-----------	0.28			
	15-24	35-50	1.40-1.65	0.06-0.2	0.10-0.20	5.1-7.8	Moderate------	0.32			
	24-60	30-50	1.50-1.65	0.06-0.2	0.13-0.20	7.9-8.4	Moderate------	0.32			
12--------------- Ziegenfuss	0-7	15-27	1.35-1.55	0.6-2.0	0.18-0.22	5.6-7.8	Low-----------	0.28	3	6	1-4
	7-23	35-50	1.40-1.65	0.06-0.2	0.14-0.20	5.6-7.8	Moderate------	0.32			
	23-60	35-50	1.50-1.65	0.06-0.2	0.13-0.20	7.4-8.4	Moderate------	0.32			
13B-------------- Marlette	0-9	10-18	1.50-1.65	2.0-6.0	0.11-0.18	5.6-7.3	Low-----------	0.24	5	3	1-3
	9-18	10-35	1.50-1.65	0.2-2.0	0.11-0.20	5.6-7.3	Low-----------	0.28			
	18-38	25-35	1.50-1.70	0.2-0.6	0.18-0.20	5.6-7.8	Low-----------	0.32			
	38-60	15-30	1.50-1.75	0.2-0.6	0.12-0.19	6.6-8.4	Low-----------	0.32			
13B2------------- Marlette	0-9	10-18	1.50-1.65	0.6-2.0	0.16-0.18	5.6-7.3	Low-----------	0.32	5	5	1-2
	9-14	10-35	1.50-1.75	0.2-2.0	0.11-0.20	5.6-7.3	Low-----------	0.28			
	14-34	25-35	1.50-1.75	0.2-0.6	0.18-0.20	5.6-7.8	Low-----------	0.32			
	34-60	15-30	1.50-1.75	0.2-0.6	0.12-0.19	6.6-8.4	Low-----------	0.32			
13C-------------- Marlette	0-9	10-18	1.50-1.65	2.0-6.0	0.11-0.18	5.6-7.3	Low-----------	0.24	5	3	1-3
	9-18	10-35	1.50-1.65	0.2-2.0	0.11-0.20	5.6-7.3	Low-----------	0.28			
	18-38	25-35	1.50-1.70	0.2-0.6	0.18-0.20	5.6-7.8	Low-----------	0.32			
	38-60	15-30	1.50-1.75	0.2-0.6	0.12-0.19	6.6-8.4	Low-----------	0.32			
13C2------------- Marlette	0-9	10-18	1.50-1.65	0.6-2.0	0.16-0.18	5.6-7.3	Low-----------	0.32	5	5	1-2
	9-14	10-35	1.50-1.75	0.2-2.0	0.11-0.20	5.6-7.3	Low-----------	0.28			
	14-34	25-35	1.50-1.75	0.2-0.6	0.18-0.20	5.6-7.8	Low-----------	0.32			
	34-60	15-30	1.50-1.75	0.2-0.6	0.12-0.19	6.6-8.4	Low-----------	0.32			
13D-------------- Marlette	0-9	10-18	1.50-1.65	2.0-6.0	0.11-0.18	5.6-7.3	Low-----------	0.24	5	3	1-3
	9-18	10-35	1.50-1.65	0.2-2.0	0.11-0.20	5.6-7.3	Low-----------	0.28			
	18-38	25-35	1.50-1.70	0.2-0.6	0.18-0.20	5.6-7.8	Low-----------	0.32			
	38-60	15-30	1.50-1.75	0.2-0.6	0.12-0.19	6.6-8.4	Low-----------	0.32			
13E, 13F--------- Marlette	0-4	10-18	1.50-1.65	2.0-6.0	0.11-0.18	5.6-7.3	Low-----------	0.24	5	3	1-3
	4-13	10-35	1.50-1.65	0.2-2.0	0.11-0.20	5.6-7.3	Low-----------	0.28			
	13-33	25-35	1.50-1.70	0.2-0.6	0.18-0.20	5.6-7.8	Low-----------	0.32			
	33-60	15-30	1.50-1.75	0.2-0.6	0.12-0.19	6.6-8.4	Low-----------	0.32			
14A-------------- Capac	0-9	10-18	1.40-1.70	0.6-2.0	0.18-0.22	5.6-7.3	Low-----------	0.32	5	5	2-6
	9-21	18-35	1.45-1.70	0.2-0.6	0.14-0.18	5.6-7.3	Low-----------	0.32			
	21-60	10-35	1.50-1.70	0.2-0.6	0.14-0.17	7.4-8.4	Low-----------	0.32			
15--------------- Parkhill	0-8	10-20	1.10-1.60	0.6-2.0	0.20-0.22	6.1-7.3	Low-----------	0.24	5	5	3-5
	8-35	18-35	1.45-1.70	0.2-0.6	0.15-0.19	6.1-7.8	Low-----------	0.32			
	35-60	12-25	1.50-1.70	0.2-0.6	0.17-0.19	7.4-8.4	Low-----------	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
16B, 16C, 16D---- Remus	0-6	8-18	1.10-1.60	2.0-6.0	0.10-0.18	5.1-7.3	Low----------	0.24	3	3	1-2
	6-34	5-22	1.30-1.75	2.0-6.0	0.08-0.17	5.1-7.3	Low----------	0.24			
	34-60	10-30	1.65-1.80	0.2-0.6	0.08-0.16	5.1-7.3	Low----------	0.28			
18B*, 18C*, 18D*, 18E*:											
Fern-----------	0-13	0-10	1.30-1.55	6.0-20	0.08-0.10	5.6-7.3	Low----------	0.15	5	1	1-3
	13-23	1-12	1.30-1.60	6.0-20	0.06-0.11	5.6-7.3	Low----------	0.17			
	23-50	5-30	1.40-1.70	0.6-6.0	0.08-0.18	5.6-7.3	Low----------	0.37			
	50-60	18-30	1.50-1.70	0.6-2.0	0.15-0.18	6.1-7.3	Low----------	0.37			
Spinks---------	0-4	0-10	1.40-1.70	0.01-0.06	0.06-0.08	5.1-7.3	Low----------	0.15	5	1	.5-3
	4-28	0-15	1.40-1.70	2.0-20	0.05-0.10	5.6-7.3	Low----------	0.17			
	28-60	3-15	1.40-1.70	2.0-6.0	0.04-0.08	5.6-7.8	Low----------	0.17			
19A-------------- Kibbie	0-9	5-25	1.40-1.65	0.6-2.0	0.16-0.24	5.6-7.3	Low----------	0.28	5	5	2-3
	9-37	18-35	1.40-1.65	0.6-2.0	0.17-0.22	5.6-7.3	Low----------	0.43			
	37-60	10-30	1.40-1.70	0.6-2.0	0.18-0.22	7.4-8.4	Low----------	0.43			
20--------------- Bono	0-11	35-40	1.20-1.45	0.2-0.6	0.20-0.23	6.1-7.3	High---------	0.28	5	4	4-8
	11-32	40-55	1.35-1.55	0.06-0.2	0.10-0.14	6.1-8.4	High---------	0.28			
	32-60	35-60	1.45-1.60	<0.2	0.08-0.12	7.4-8.4	High---------	0.28			
22B, 22C--------- Arkport	0-6	5-15	1.10-1.40	2.0-6.0	0.08-0.09	4.5-7.3	Low----------	0.17	3	2	.5-2
	6-22	3-15	1.25-1.55	2.0-6.0	0.06-0.16	4.5-7.3	Low----------	0.28			
	22-60	1-5	1.25-1.55	2.0-6.0	0.06-0.12	5.1-7.3	Low----------	0.28			
23A-------------- Freesoil	0-8	5-15	1.35-1.55	0.6-2.0	0.11-0.13	6.1-8.4	Low----------	0.24	5	2	2-4
	8-50	5-20	1.35-1.60	0.6-2.0	0.08-0.22	7.9-8.4	Low----------	0.24			
	50-60	5-30	1.50-1.65	0.6-6.0	0.07-0.20	7.9-8.4	Low----------	0.24			
24--------------- Lamson	0-13	5-18	1.10-1.40	0.6-6.0	0.15-0.22	5.6-7.8	Low----------	0.28	5	3	3-10
	13-40	5-18	1.25-1.55	0.6-6.0	0.12-0.17	6.1-8.4	Low----------	0.20			
	40-60	1-10	1.45-1.65	0.6-6.0	0.02-0.04	6.1-8.4	Low----------	0.20			
26A-------------- Kibbie	0-9	5-20	1.30-1.60	0.6-2.0	0.16-0.18	5.6-7.3	Low----------	0.20	5	3	2-3
	9-13	15-35	1.45-1.60	0.6-2.0	0.15-0.19	5.6-7.3	Low----------	0.32			
	13-42	20-35	1.55-1.70	0.6-2.0	0.17-0.20	5.6-7.3	Low----------	0.32			
	42-60	0-10	1.50-1.65	6.0-20	0.04-0.07	6.1-7.3	Low----------	0.15			
27--------------- Poy	0-8	27-40	1.35-1.55	0.2-0.6	0.17-0.19	6.1-7.8	Moderate-----	0.24	3	6	3-12
	8-23	35-85	1.55-1.65	0.06-0.2	0.09-0.13	5.6-8.4	High---------	0.28			
	23-60	2-9	1.55-1.80	6.0-20	0.04-0.10	6.6-8.4	Low----------	0.15			
28B-------------- Scalley	0-6	10-18	1.30-1.60	2.0-6.0	0.12-0.15	5.6-7.3	Low----------	0.24	4	3	1-3
	6-9	10-35	1.30-1.60	0.2-0.6	0.11-0.20	5.6-7.3	Low----------	0.28			
	9-23	25-35	1.35-1.55	0.2-0.6	0.14-0.20	5.6-7.3	Low----------	0.32			
	23-60	0-15	1.55-1.70	>6.0	0.02-0.10	5.6-7.8	Low----------	0.15			
31B, 31C--------- Boyer	0-8	0-10	1.35-1.60	6.0-20	0.08-0.12	5.6-7.3	Low----------	0.17	4	2	.5-3
	8-18	2-15	1.30-1.60	2.0-6.0	0.08-0.16	5.6-7.3	Low----------	0.17			
	18-25	10-18	1.35-1.60	2.0-6.0	0.11-0.13	5.6-7.8	Low----------	0.24			
	25-60	0-10	1.40-1.55	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
32B, 32C, 32D, 32F------------ Fern	0-13	0-10	1.30-1.55	6.0-20	0.08-0.10	5.6-7.3	Low----------	0.15	5	1	1-3
	13-23	1-12	1.30-1.60	6.0-20	0.06-0.11	5.6-7.3	Low----------	0.17			
	23-50	5-30	1.40-1.70	0.6-6.0	0.08-0.18	5.6-7.3	Low----------	0.37			
	50-60	18-30	1.50-1.70	0.6-2.0	0.15-0.18	6.1-7.3	Low----------	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
34B--------------	0-9	2-12	1.20-1.60	6.0-20	0.10-0.12	5.1-6.5	Low-----------	0.17	5	2	2-4
Wixom	9-33	2-14	1.40-1.70	6.0-20	0.06-0.11	5.1-7.3	Low-----------	0.15			
	33-60	18-35	1.50-1.70	0.2-0.6	0.14-0.20	7.4-8.4	Low-----------	0.43			
36B*, 36C*:											
Fern------------	0-13	0-10	1.30-1.55	6.0-20	0.08-0.10	5.6-7.3	Low-----------	0.15	5	1	1-3
	13-23	1-12	1.30-1.60	6.0-20	0.06-0.11	5.6-7.3	Low-----------	0.17			
	23-50	5-30	1.40-1.70	0.6-6.0	0.08-0.18	5.6-7.3	Low-----------	0.37			
	50-60	18-30	1.50-1.70	0.6-2.0	0.15-0.18	6.1-7.3	Low-----------	0.37			
Marlette--------	0-9	10-18	1.50-1.65	2.0-6.0	0.11-0.18	5.6-7.3	Low-----------	0.24	5	3	1-3
	9-18	10-35	1.50-1.65	0.2-2.0	0.11-0.20	5.6-7.3	Low-----------	0.28			
	18-38	25-35	1.50-1.70	0.2-0.6	0.18-0.20	5.6-7.8	Low-----------	0.32			
	38-60	15-30	1.50-1.75	0.2-0.6	0.12-0.19	6.6-8.4	Low-----------	0.32			
36D*:											
Fern------------	0-8	0-10	1.30-1.55	6.0-20	0.08-0.10	5.6-7.3	Low-----------	0.15	5	1	1-3
	8-20	1-12	1.30-1.60	6.0-20	0.06-0.11	5.6-7.3	Low-----------	0.17			
	20-47	5-30	1.40-1.70	0.6-6.0	0.08-0.18	5.6-7.3	Low-----------	0.37			
	47-60	18-30	1.50-1.70	0.6-2.0	0.15-0.18	6.1-7.3	Low-----------	0.37			
Marlette--------	0-9	10-18	1.50-1.65	2.0-6.0	0.11-0.18	5.6-7.3	Low-----------	0.24	5	3	1-3
	9-18	10-35	1.50-1.65	0.2-2.0	0.11-0.20	5.6-7.3	Low-----------	0.28			
	18-38	25-35	1.50-1.70	0.2-0.6	0.18-0.20	5.6-7.8	Low-----------	0.32			
	38-60	15-30	1.50-1.75	0.2-0.6	0.12-0.19	6.6-8.4	Low-----------	0.32			
36E*:											
Fern------------	0-5	0-10	1.30-1.55	6.0-20	0.08-0.10	5.6-7.3	Low-----------	0.15	5	1	1-3
	5-20	1-12	1.30-1.60	6.0-20	0.06-0.11	5.6-7.3	Low-----------	0.17			
	20-47	5-30	1.40-1.70	0.6-6.0	0.08-0.18	5.6-7.3	Low-----------	0.37			
	47-60	18-30	1.50-1.70	0.6-2.0	0.15-0.18	6.1-7.3	Low-----------	0.37			
Marlette--------	0-5	10-18	1.50-1.65	2.0-6.0	0.11-0.18	5.6-7.3	Low-----------	0.24	5	3	1-3
	5-14	10-35	1.50-1.65	0.2-2.0	0.11-0.20	5.6-7.3	Low-----------	0.28			
	14-34	25-35	1.50-1.70	0.2-0.6	0.18-0.20	5.6-7.8	Low-----------	0.32			
	34-60	15-30	1.50-1.75	0.2-0.6	0.12-0.19	6.6-8.4	Low-----------	0.32			
37B*:											
Wixom-----------	0-9	2-12	1.20-1.60	6.0-20	0.10-0.12	5.1-6.5	Low-----------	0.17	5	2	2-4
	9-33	2-14	1.40-1.70	6.0-20	0.06-0.11	5.1-7.3	Low-----------	0.15			
	33-60	18-35	1.50-1.70	0.2-0.6	0.14-0.20	7.4-8.4	Low-----------	0.43			
Capac-----------	0-9	10-18	1.40-1.70	0.6-2.0	0.18-0.22	5.6-7.3	Low-----------	0.32	5	5	2-6
	9-21	15-35	1.45-1.70	0.2-0.6	0.14-0.18	5.6-7.3	Low-----------	0.32			
	21-60	10-35	1.50-1.70	0.2-0.6	0.14-0.17	7.4-8.4	Low-----------	0.32			
38B*, 38C*, 38D*, 38E*:											
Remus----------	0-6	8-18	1.10-1.60	2.0-6.0	0.10-0.18	5.1-7.3	Low-----------	0.24	3	3	1-2
	6-34	5-25	1.30-1.75	2.0-6.0	0.08-0.17	5.1-7.3	Low-----------	0.24			
	34-60	10-30	1.65-1.80	0.2-0.6	0.08-0.16	5.1-7.3	Low-----------	0.28			
Spinks---------	0-4	0-10	1.40-1.70	0.01-0.06	0.06-0.08	5.1-7.3	Low-----------	0.15	5	1	.5-3
	4-28	0-15	1.40-1.70	2.0-20	0.05-0.10	5.6-7.3	Low-----------	0.17			
	28-60	3-15	1.40-1.70	2.0-6.0	0.04-0.08	5.6-7.8	Low-----------	0.17			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
39B-------------- Tustin	0-9	4-10	1.55-1.70	6.0-20	0.09-0.13	5.1-7.3	Low----------	0.17	4	2	.5-2
	9-29	2-10	1.55-1.70	6.0-20	0.06-0.11	5.1-7.3	Low----------	0.17			
	29-60	35-60	1.45-1.55	0.06-0.2	0.07-0.20	5.6-8.4	High---------	0.43			
40B-------------- Arkona	0-9	1-12	1.25-1.40	2.0-20	0.10-0.12	5.1-7.3	Low----------	0.17	4	2	1-3
	9-33	3-15	1.35-1.45	6.0-20	0.06-0.11	5.1-7.3	Low----------	0.17			
	33-60	35-50	1.50-1.75	<0.06	0.08-0.12	5.6-8.4	High---------	0.28			
41--------------- Sickles	0-8	2-12	1.35-1.50	2.0-6.0	0.10-0.12	5.6-6.5	Low----------	0.17	4	2	4-6
	8-22	2-12	1.40-1.55	6.0-20	0.06-0.11	6.1-7.3	Low----------	0.17			
	22-60	35-50	1.50-1.75	<0.06	0.08-0.12	7.9-8.4	High---------	0.32			
42B-------------- Grattan	0-5	0-10	1.35-1.55	6.0-20	0.07-0.09	4.5-6.5	Low----------	0.15	5	1	1-3
	5-33	0-10	1.40-1.60	6.0-20	0.04-0.10	4.5-6.5	Low----------	0.15			
	33-55	0-10	1.50-1.65	6.0-20	0.02-0.04	5.6-7.3	Low----------	0.15			
	55-60	8-25	1.45-1.70	0.06-0.6	0.17-0.19	6.6-7.8	Low----------	0.32			
43B-------------- Covert	0-8	2-12	1.30-1.55	6.0-20	0.06-0.09	4.5-7.3	Low----------	0.15	5	1	1-2
	8-46	2-10	1.30-1.60	6.0-20	0.05-0.08	4.5-7.3	Low----------	0.15			
	46-60	12-27	1.40-1.70	0.06-0.6	0.17-0.19	7.4-8.4	Low----------	0.32			
44B-------------- Pipestone	0-9	2-10	1.30-1.50	6.0-20	0.06-0.10	4.5-7.3	Low----------	0.15	5	1	3-4
	9-42	2-12	1.20-1.60	6.0-20	0.04-0.08	4.5-7.3	Low----------	0.17			
	42-60	12-35	1.40-1.70	0.06-0.6	0.16-0.18	7.4-8.4	Low----------	0.32			
47B*, 47C*, 47D*, 47E*:											
Spinks---------	0-4	0-10	1.40-1.70	0.01-0.06	0.06-0.08	5.1-7.3	Low----------	0.15	5	1	.5-3
	4-28	0-15	1.40-1.70	2.0-20	0.05-0.10	5.6-7.3	Low----------	0.17			
	28-60	3-15	1.40-1.70	2.0-6.0	0.04-0.08	5.6-7.8	Low----------	0.17			
Coloma---------	0-7	0-10	1.35-1.65	6.0-20	0.05-0.09	4.5-7.3	Low----------	0.15	5	1	.5-2
	7-45	0-10	1.35-1.65	6.0-20	0.05-0.12	4.5-6.5	Low----------	0.15			
	45-60	2-12	1.50-1.65	6.0-20	0.03-0.08	4.5-6.0	Low----------	0.15			
48B-------------- Thetford	0-13	0-10	1.30-1.60	6.0-20	0.08-0.10	5.6-7.3	Low----------	0.15	5	1	1-4
	13-34	2-15	1.30-1.60	2.0-20	0.07-0.11	5.6-7.3	Low----------	0.17			
	34-60	8-18	1.45-1.65	2.0-6.0	0.06-0.08	5.6-7.8	Low----------	0.17			
52C-------------- Wallace	0-15	0-8	1.35-1.45	6.0-20	0.07-0.12	4.5-5.5	Low----------	0.15	1	1	.5-1
	15-19	2-10	1.75-2.05	0.6-2.0	0.01-0.04	4.5-6.0	Low----------	0.15			
	19-60	0-8	1.45-1.60	6.0-20	0.04-0.05	5.1-6.5	Low----------	0.15			
53A*:											
Saugatuck-------	0-2	2-12	1.20-1.50	6.0-20	0.07-0.09	3.6-5.5	Low----------	0.15	2	1	2-10
	2-12	2-12	1.30-1.55	6.0-20	0.06-0.08	3.6-5.5	Low----------	0.15			
	12-24	2-12	1.75-2.00	0.6-2.0	0.06-0.08	3.6-5.5	Low----------	0.15			
	24-60	2-12	1.50-1.65	6.0-20	0.04-0.06	5.1-6.5	Low----------	0.15			
Jebavy----------	0-2	0-10	0.90-1.20	6.0-20	0.12-0.17	3.6-5.5	Low----------	0.15	5	1	10-15
	2-4	0-10	1.20-1.50	6.0-20	0.07-0.09	3.6-5.5	Low----------	0.15			
	4-22	0-10	1.30-1.55	6.0-20	0.06-0.08	3.6-5.5	Low----------	0.15			
	22-28	0-10	1.75-2.00	0.6-2.0	0.02-0.06	3.6-5.5	Low----------	0.15			
	28-39	0-10	1.45-1.70	6.0-20	0.02-0.04	3.6-5.5	Low----------	0.15			
	39-60	0-10	1.50-1.70	6.0-20	0.02-0.04	5.1-6.5	Low----------	0.15			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
54B, 54C, 54D---- Grattan	0-7	0-10	1.35-1.55	6.0-20	0.07-0.09	4.5-6.5	Low----------	0.15	5	1	.5-1
	7-50	0-10	1.40-1.60	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15			
	50-60	0-10	1.50-1.65	6.0-20	0.02-0.04	5.6-7.3	Low----------	0.15			
56B*:											
Pipestone-------	0-11	2-12	1.30-1.50	6.0-20	0.07-0.10	3.6-7.3	Low----------	0.15	5	1	3-4
	11-40	2-12	1.40-1.70	6.0-20	0.06-0.09	3.6-7.3	Low----------	0.15			
	40-60	2-12	1.40-1.65	6.0-20	0.05-0.07	3.6-7.3	Low----------	0.15			
Saugatuck-------	0-2	2-12	1.20-1.50	6.0-20	0.07-0.09	3.6-5.5	Low----------	0.15	2	1	2-10
	2-12	2-12	1.30-1.55	6.0-20	0.06-0.08	3.6-5.5	Low----------	0.15			
	12-24	2-12	1.75-2.00	0.6-2.0	0.06-0.08	3.6-5.5	Low----------	0.15			
	24-60	2-12	1.50-1.65	6.0-20	0.04-0.06	5.1-6.5	Low----------	0.15			
57B-------------- Grattan	0-3	0-10	1.35-1.55	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15	5	1	1-3
	3-45	0-10	1.40-1.60	6.0-20	0.05-0.10	4.5-6.5	Low----------	0.15			
	45-60	0-10	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
57B3------------- Grattan	0-60	0-10	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15	---	---	---
57C, 57D, 57E, 57F------------- Grattan	0-3	0-10	1.35-1.55	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15	5	1	1-3
	3-45	0-10	1.40-1.60	6.0-20	0.05-0.10	4.5-6.5	Low----------	0.15			
	45-60	0-10	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
58B-------------- Covert	0-8	2-10	1.30-1.55	6.0-20	0.06-0.09	4.5-7.3	Low----------	0.15	5	1	1-2
	8-36	2-10	1.30-1.60	6.0-20	0.05-0.08	4.5-7.3	Low----------	0.15			
	36-60	0-10	1.45-1.65	6.0-20	0.04-0.07	5.1-7.3	Low----------	0.15			
59B-------------- Pipestone	0-11	2-12	1.30-1.50	6.0-20	0.07-0.10	3.6-7.3	Low----------	0.15	5	1	3-4
	11-40	2-12	1.40-1.70	6.0-20	0.06-0.09	3.6-7.3	Low----------	0.15			
	40-60	2-12	1.40-1.65	6.0-20	0.05-0.07	3.6-7.3	Low----------	0.15			
60--------------- Kingsville	0-6	2-10	0.60-1.00	6.0-20	0.16-0.18	4.5-6.0	Low----------	0.15	5	1	15-25
	6-25	2-10	1.20-1.50	6.0-20	0.07-0.12	4.5-6.5	Low----------	0.17			
	25-60	2-10	1.45-1.65	6.0-20	0.05-0.10	5.6-7.3	Low----------	0.17			
62D, 62F--------- Nordhouse	0-6	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.5	Low----------	0.15	5	1	1-2
	6-49	0-5	1.40-1.65	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15			
	49-72	0-5	1.40-1.65	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
63B, 63C, 63D, 63E------------- Coloma	0-7	0-10	1.35-1.65	6.0-20	0.05-0.09	4.5-7.3	Low----------	0.15	5	1	.5-2
	7-45	0-10	1.35-1.65	6.0-20	0.05-0.12	4.5-6.5	Low----------	0.15			
	45-60	2-12	1.50-1.65	6.0-20	0.03-0.08	4.5-6.0	Low----------	0.15			
64B, 64C, 64D---- Benona	0-7	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-5.5	Low----------	0.15	5	1	.5-2
	7-47	0-10	1.40-1.60	6.0-20	0.06-0.10	4.5-6.0	Low----------	0.15			
	47-60	2-12	1.55-1.65	6.0-20	0.05-0.10	5.1-7.3	Low----------	0.17			
65B, 65C--------- Chelsea	0-9	3-8	1.50-1.55	6.0-20	0.06-0.08	5.6-7.3	Low----------	0.15	5	1	.5-1
	9-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.5	Low----------	0.17			
67B, 67C, 67E---- Plainfield	0-3	2-5	1.50-1.65	6.0-20	0.04-0.09	5.1-7.3	Low----------	0.15	5	1	.5-2
	3-27	1-7	1.50-1.65	6.0-20	0.04-0.07	4.5-6.5	Low----------	0.15			
	27-60	0-4	1.50-1.70	6.0-20	0.03-0.07	4.5-6.5	Low----------	0.15			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
72: Glendora	0-9	12-20	1.00-1.35	0.6-6.0	0.24-0.30	5.6-7.8	Low	0.28	5	5	10-15
	9-60	0-10	1.40-1.65	6.0-20	0.05-0.11	5.6-7.8	Low	0.17			
76: Houghton	0-9	---	0.20-0.35	0.2-6.0	0.35-0.45	4.5-7.8	-----	----	5	2	>70
	9-60	---	0.15-0.25	0.2-6.0	0.35-0.45	4.5-7.8	-----	----			
77: Adrian	0-26	---	0.30-0.55	0.2-6.0	0.35-0.45	5.1-7.3	-----	----	4	2	55-75
	26-60	2-10	1.40-1.75	6.0-20	0.03-0.08	5.6-8.4	Low	0.15			
78: Willette	0-19	---	0.25-0.45	0.2-6.0	0.35-0.45	5.6-7.8	-----	----	4	2	>60
	19-60	40-60	1.40-1.65	0.06-0.2	0.12-0.16	7.4-8.4	High	----			
79*:											
Edwards	0-18	---	0.30-0.55	0.2-6.0	0.35-0.45	5.1-7.8	-----	----	4	2	55-75
	18-39	3-6	---	0.01-0.06	---	7.4-8.4	-----	----			
	39-60	0-10	1.40-1.65	2.0-20	0.04-0.10	7.4-8.4	Low	0.15			
Martisco	0-8	---	0.25-0.45	0.6-6.0	0.35-0.45	6.1-8.4	-----	----	---	2	25-75
	8-60	---	---	0.06-0.2	---	7.9-8.4	Low	----			
81*:											
Loxley	0-12	---	0.15-0.40	0.2-6.0	0.35-0.45	<4.5	-----	----	5	2	70-90
	12-70	---	0.10-0.35	0.2-6.0	0.35-0.45	<4.5	-----	----			
Dawson	0-10	---	0.20-0.35	0.6-6.0	0.45-0.55	3.6-4.4	-----	----	4	5	65-85
	10-28	---	0.15-0.40	0.2-6.0	0.35-0.45	3.6-4.4	-----	----			
	28-60	0-10	1.55-1.75	6.0-20	0.03-0.10	4.5-6.5	Low	0.15			
83*:											
Histosols	0-60	---	---	0.2-6.0	---	---	-----	----	---	2	50-70
Aquents	0-60	---	---	---	---	---	-----	----	---	---	---
86F*:											
Dune land	0-60	0	1.50-1.60	>20	0.05-0.07	5.1-7.8	Low	0.15	5	1	---
Quartzipsamments	0-60	0-5	1.50-1.70	6.0-20	0.03-0.06	5.1-6.5	Low	0.15	5	1	0-.1
87F*:											
Dune land	0-60	0	1.50-1.60	>20	0.05-0.07	5.1-7.8	Low	0.15	5	1	---
Quartzipsamments	0-60	0-5	1.50-1.70	6.0-20	0.03-0.06	5.1-6.5	Low	0.15	5	1	0-.1
Psammaquents	0-60	0-10	1.50-1.70	>6.0	0.05-0.07	5.1-7.3	Low	0.15	5	1	---
88B: Udipsamments	0-60	0-10	1.35-1.65	>6.0	0.05-0.09	5.1-6.5	Low	0.15	5	1	<1
89D, 89F: Udorthents	0-60	---	---	---	---	---	-----	----	---	---	---
90B, 90C, 90D: Epworth	0-6	0-10	1.35-1.65	6.0-20	0.07-0.09	4.5-6.0	Low	0.15	5	1	1-2
	6-30	0-10	1.30-1.70	6.0-20	0.06-0.08	4.5-6.0	Low	0.15			
	30-60	0-10	1.55-1.75	6.0-20	0.05-0.07	5.6-6.5	Low	0.15			
91*. Pits											

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
93B--------------	0-9	8-20	1.30-1.65	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.32	5	5	1-3
Tuscola	9-30	18-35	1.30-1.70	0.6-2.0	0.15-0.20	5.6-7.3	Moderate-----	0.32			
	30-60	5-45	1.30-1.70	0.6-2.0	0.14-0.18	7.4-8.4	Low-----------	0.32			
94B*, 94C*, 94D*:											
Coloma-----------	0-7	0-10	1.35-1.65	6.0-20	0.05-0.09	4.5-7.3	Low-----------	0.15	5	1	.5-2
	7-45	0-10	1.35-1.65	6.0-20	0.05-0.12	4.5-6.5	Low-----------	0.15			
	45-60	2-12	1.50-1.65	6.0-20	0.03-0.08	4.5-6.0	Low-----------	0.15			
Scalley----------	0-6	10-18	1.30-1.60	2.0-6.0	0.12-0.15	5.6-7.3	Low-----------	0.24	4	3	1-3
	6-9	10-35	1.30-1.60	0.2-0.6	0.11-0.20	5.6-7.3	Low-----------	0.28			
	9-23	25-35	1.35-1.55	0.2-0.6	0.14-0.20	5.6-7.3	Low-----------	0.32			
	23-60	0-15	1.55-1.70	>6.0	0.02-0.10	5.6-7.8	Low-----------	0.15			
95A*:											
Ithaca-----------	0-10	8-27	1.40-1.70	0.6-2.0	0.18-0.22	5.1-7.3	Low-----------	0.32	3	5	1-4
	10-15	12-40	1.40-1.60	0.2-0.6	0.14-0.18	5.1-7.3	Low-----------	0.28			
	15-24	35-50	1.40-1.65	0.06-0.2	0.10-0.20	5.1-7.8	Moderate-----	0.32			
	24-60	30-50	1.50-1.65	0.06-0.2	0.13-0.20	7.9-8.4	Moderate-----	0.32			
Arkona-----------	0-9	1-12	1.25-1.40	2.0-20	0.10-0.12	5.1-7.3	Low-----------	0.17	4	2	1-3
	9-33	3-15	1.35-1.45	6.0-20	0.06-0.11	5.1-7.3	Low-----------	0.17			
	33-60	35-50	1.50-1.75	<0.06	0.08-0.12	5.6-8.4	High----------	0.28			
97B*:											
Urban land-------	0-60	---	---	---	---	---	--------------	----	---	---	---
Epworth----------	0-6	0-10	1.35-1.65	6.0-20	0.07-0.09	4.5-6.0	Low-----------	0.15	5	1	1-2
	6-30	0-10	1.30-1.70	6.0-20	0.06-0.08	4.5-6.0	Low-----------	0.15			
	30-60	0-10	1.55-1.75	6.0-20	0.05-0.07	5.6-6.5	Low-----------	0.15			
98F*:											
Udorthents-------	0-60	---	---	---	---	---	--------------	----	---	---	---
Fluvaquents------	0-60	---	---	---	---	---	--------------	----	---	---	---
99B, 99C, 99D----	0-4	2-12	1.30-1.60	2.0-6.0	0.08-0.12	5.1-7.3	Low-----------	0.17	5	2	1-3
Tekenink	4-17	2-15	1.45-1.60	0.6-2.0	0.08-0.17	5.1-7.3	Low-----------	0.24			
	17-62	2-18	1.45-1.60	0.6-2.0	0.08-0.17	5.1-7.3	Low-----------	0.24			
	62-72	10-18	1.55-1.70	0.6-2.0	0.10-0.17	5.1-7.3	Low-----------	0.24			
210B*, 210C*, 210D*------------ Typic Udipsamments	0-2	0-4	1.30-1.55	6.0-20	0.06-0.08	4.5-6.5	Low-----------	0.15	5	1	1-5
	2-40	0-4	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low-----------	0.15			
	40-99	0-4	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low-----------	0.15			
211B*, 211C*----- Typic Udipsamments	0-2	0-4	1.30-1.55	6.0-20	0.06-0.08	4.5-6.5	Low-----------	0.15	5	1	1-5
	2-30	0-4	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low-----------	0.15			
	30-45	0-4	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low-----------	0.15			
	45-99	0-20	1.55-1.70	0.6-20	0.04-0.12	4.5-6.5	Low-----------	0.20			
212B*------------ Typic Udipsamments	0-3	0-4	1.30-1.55	6.0-20	0.06-0.08	4.5-6.5	Low-----------	0.15	5	1	1-5
	3-25	0-4	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low-----------	0.15			
	25-99	0-4	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low-----------	0.15			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
213B*------------	0-3	0-4	1.30-1.55	6.0-20	0.07-0.09	4.5-6.5	Low----------	0.15	5	1	1-5
Alfic	3-30	0-4	1.40-1.60	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15			
Udipsamments	30-99	2-12	1.50-1.65	6.0-20	0.04-0.08	4.5-6.5	Low----------	0.15			
214B*------------	0-2	0-4	1.30-1.55	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15	5	1	1-5
Typic	2-45	0-4	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
Udipsamments	45-99	0-4	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15			
220B*, 220C*,											
220D*, 220E*----	0-3	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	1-5
Entic	3-35	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
Haplorthods	35-99	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
221B*, 221C*,											
221D*-----------	0-2	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.5	Low----------	0.15	5	1	1-5
Entic	2-30	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
Haplorthods	30-60	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
	60-99	0-20	1.55-1.70	0.6-20	0.07-0.10	5.6-7.3	Low----------	0.17			
222B*------------	0-3	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	1-5
Entic	3-35	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
Haplorthods	35-99	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
224B*------------	0-4	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	1-5
Entic	4-30	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
Haplorthods	30-99	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
225B*, 225C*-----	0-2	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.5	Low----------	0.15	5	1	1-5
Entic	2-35	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
Haplorthods	35-55	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
	55-99	20-40	1.30-1.65	0.2-0.6	0.14-0.16	5.6-8.4	Moderate-----	0.37			
231B*, 231C*,											
231D*, 231E*:											
Entic											
Haplorthods---	0-3	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	1-5
	3-35	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	35-99	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
Alfic											
Haplorthods---	0-3	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	1-5
	3-36	0-10	1.40-1.65	6.0-20	0.06-0.11	5.1-7.3	Low----------	0.15			
	36-50	20-40	1.45-1.60	0.2-2.0	0.16-0.20	6.1-8.4	Moderate-----	0.37			
	50-65	5-20	1.50-1.65	0.2-20	0.04-0.17	6.1-8.4	Low----------	0.28			
233B*:											
Alfic											
Haplorthods----	0-3	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	1-5
	3-36	0-10	1.40-1.65	6.0-20	0.06-0.11	5.1-7.3	Low----------	0.15			
	36-50	20-40	1.45-1.60	0.2-2.0	0.16-0.20	6.1-8.4	Moderate-----	0.37			
	50-65	5-20	1.50-1.65	0.2-20	0.04-0.17	6.1-8.4	Low----------	0.28			
Entic											
Haplorthods----	0-3	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	1-5
	3-35	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	35-99	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
235B*:											
Alfic Haplorthods----	0-3	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	1-5
	3-36	0-10	1.40-1.65	6.0-20	0.06-0.11	5.1-7.3	Low----------	0.15			
	36-50	20-40	1.45-1.60	0.2-2.0	0.16-0.20	6.1-8.4	Moderate-----	0.37			
	50-65	5-20	1.50-1.65	0.2-20	0.04-0.17	6.1-8.4	Low----------	0.28			
Alfic Haplorthods----	0-3	2-10	1.35-1.65	6.0-20	0.10-0.12	5.1-6.5	Low----------	0.17	5	2	1-5
	3-42	0-10	1.35-1.65	6.0-20	0.06-0.10	5.1-6.5	Low----------	0.15			
	42-50	10-22	1.50-1.70	0.2-2.0	0.11-0.18	5.1-6.5	Low----------	0.28			
	50-99	0-10	1.55-1.70	6.0-20	0.04-0.10	6.1-7.3	Low----------	0.15			
235C*, 235D*:											
Alfic Haplorthods----	0-3	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	1-5
	3-36	0-10	1.40-1.65	6.0-20	0.06-0.11	5.1-7.3	Low----------	0.15			
	36-50	20-40	1.45-1.60	0.2-2.0	0.16-0.20	6.1-8.4	Moderate-----	0.37			
	50-65	5-20	1.50-1.65	0.2-20	0.04-0.17	6.1-8.4	Low----------	0.28			
Alfic Haplorthods----	0-3	1-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	2-5
	3-20	1-10	1.35-1.65	6.0-20	0.06-0.11	5.6-7.3	Low----------	0.15			
	20-55	20-40	1.45-1.60	0.2-0.6	0.16-0.20	5.6-7.3	Moderate-----	0.32			
	55-90	1-18	1.40-1.60	6.0-20	0.05-0.13	5.6-7.3	Low----------	0.17			
	90-99	20-40	1.30-1.65	0.2-0.6	0.15-0.20	6.6-8.4	Moderate-----	0.37			
236B*, 236C*, 236D*, 236E*---- Entic Haplorthods	0-3	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	1-5
	3-36	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.0	Low----------	0.15			
	36-99	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
237B*, 237C*, 237D*----------- Haplic Glossudalfs	0-4	5-10	1.30-1.60	2.0-6.0	0.12-0.15	6.1-7.3	Low----------	0.24	5	3	1-5
	4-10	5-15	1.30-1.60	2.0-6.0	0.08-0.16	6.1-7.3	Low----------	0.24			
	10-20	5-20	1.35-1.65	0.6-2.0	0.12-0.19	6.1-7.3	Low----------	0.28			
	20-45	20-40	1.45-1.65	0.2-0.6	0.16-0.20	6.1-8.4	Moderate-----	0.37			
	45-60	10-35	1.50-1.70	0.2-2.0	0.11-0.17	6.1-8.4	Moderate-----	0.37			
240B*, 240C*, 240D*, 240E*---- Entic Haplorthods	0-1	5-10	1.30-1.55	6.0-20	0.07-0.09	4.5-6.5	Low----------	0.15	5	1	1-5
	1-30	5-10	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	30-99	5-10	1.50-1.65	6.0-20	0.02-0.04	5.6-7.3	Low----------	0.15			
245B*, 245C*, 245D*----------- Entic Haplorthods	0-2	5-10	1.30-1.55	6.0-20	0.07-0.09	4.5-6.5	Low----------	0.15	5	1	1-5
	2-40	5-10	1.40-1.60	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15			
	40-45	5-10	1.50-1.65	6.0-20	0.02-0.04	5.6-7.3	Low----------	0.15			
	45-60	20-40	1.30-1.65	0.2-0.6	0.14-0.16	5.6-8.4	Moderate-----	0.37			
250*:											
Mollic Psammaquents---	0-3	---	0.30-0.50	2.0-6.0	0.35-0.45	4.5-6.0	-------------	----	5	5	50-60
	3-6	5-15	1.30-1.60	2.0-6.0	0.16-0.18	4.5-6.0	Low----------	0.24			
	6-9	1-10	1.45-1.65	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15			
	9-60	1-10	1.50-1.70	6.0-20	0.05-0.07	5.6-7.3	Low----------	0.15			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
250*:											
Aquic Udipsamments---	0-2	0-5	1.20-1.55	6.0-20	0.08-0.10	5.6-6.5	Low-----------	0.15	5	1	2-6
	2-7	0-10	1.40-1.60	6.0-20	0.07-0.09	5.1-6.0	Low-----------	0.15			
	7-45	0-5	1.40-1.60	6.0-20	0.06-0.08	5.1-6.0	Low-----------	0.15			
	45-60	0-5	1.50-1.65	6.0-20	0.04-0.06	5.1-6.0	Low-----------	0.15			
Medisaprists----	0-60	---	---	---	---	4.5-7.8	-------------	----	5	2	70-90
251A*:											
Aeric Haplaquods	0-3	0-5	1.20-1.50	6.0-20	0.07-0.09	3.6-5.5	Low-----------	0.15	2	1	2-7
	3-8	0-5	1.35-1.50	6.0-20	0.06-0.08	3.6-5.5	Low-----------	0.15			
	8-20	0-5	1.75-2.00	0.2-0.6	0.02-0.06	3.6-5.5	Low-----------	0.15			
	20-60	0-5	1.50-1.60	6.0-20	0.02-0.06	4.5-6.0	Low-----------	0.15			
Typic Haplaquods	0-4	0-5	0.90-1.50	6.0-20	0.15-0.20	4.5-6.5	Low-----------	0.15	5	1	10-15
	4-25	0-5	1.45-1.65	6.0-20	0.06-0.08	4.5-6.5	Low-----------	0.15			
	25-60	0-5	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low-----------	0.15			
252*:											
Typic Haplaquods	0-4	0-5	0.90-1.50	6.0-20	0.15-0.20	4.5-6.5	Low-----------	0.15	5	1	10-15
	4-25	0-5	1.45-1.65	6.0-20	0.06-0.08	4.5-6.5	Low-----------	0.15			
	25-60	0-5	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low-----------	0.15			
Medisaprists----	0-33	---	0.15-0.25	0.2-6.0	0.35-0.45	3.6-4.4	-------------	----	5	2	>70
	33-60	---	---	---	---	---	-------------	----			
253A*:											
Aeric Haplaquods	0-3	0-5	1.20-1.50	6.0-20	0.07-0.09	3.6-5.5	Low-----------	0.15	2	1	2-7
	3-8	0-5	1.35-1.50	6.0-20	0.06-0.08	3.6-5.5	Low-----------	0.15			
	8-30	0-5	1.75-2.00	0.2-0.6	0.02-0.06	3.6-5.5	Low-----------	0.15			
	30-60	0-5	1.50-1.60	6.0-20	0.02-0.06	4.5-6.0	Low-----------	0.15			
Aquic Udipsamments---	0-2	0-5	1.20-1.55	6.0-20	0.08-0.10	5.1-6.5	Low-----------	0.15	5	1	2-6
	2-7	0-10	1.40-1.60	6.0-20	0.07-0.09	5.1-6.0	Low-----------	0.15			
	7-45	0-5	1.40-1.60	6.0-20	0.06-0.08	5.1-6.0	Low-----------	0.15			
	45-60	0-5	1.50-1.65	6.0-20	0.04-0.06	5.1-6.0	Low-----------	0.15			
255B*:											
Aquic Udipsamments---	0-2	0-5	1.20-1.55	6.0-20	0.08-0.10	5.1-6.5	Low-----------	0.15	5	1	2-6
	2-7	0-10	1.40-1.60	6.0-20	0.07-0.09	5.1-6.0	Low-----------	0.15			
	7-45	0-5	1.40-1.60	6.0-20	0.06-0.08	5.1-6.0	Low-----------	0.15			
	45-60	0-5	1.50-1.65	6.0-20	0.04-0.06	5.1-6.0	Low-----------	0.15			
Entic Haplorthods----	0-4	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low-----------	0.15	5	1	1-5
	4-30	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low-----------	0.15			
	30-99	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low-----------	0.15			
256*:											
Medisaprists----	0-60	---	0.15-0.25	0.2-6.0	0.35-0.45	4.5-7.8	-------------	----	5	2	>70
Mollic Psammaquents---	0-3	---	0.30-0.50	2.0-6.0	0.35-0.45	4.5-6.0	-------------	----	5	5	50-60
	3-6	5-18	1.30-1.60	2.0-6.0	0.16-0.18	4.5-6.0	Low-----------	0.24			
	6-9	2-10	1.45-1.65	6.0-20	0.06-0.08	4.5-6.5	Low-----------	0.15			
	9-60	2-10	1.50-1.70	6.0-20	0.05-0.07	5.6-7.3	Low-----------	0.15			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
262A*------------ Aeric Haplaquods	0-3	0-5	1.20-1.50	6.0-20	0.07-0.09	3.6-5.5	Low----------	0.15	2	1	2-7
	3-8	0-5	1.35-1.50	6.0-20	0.06-0.08	3.6-5.5	Low----------	0.15			
	8-30	0-5	1.75-2.00	0.2-0.6	0.02-0.06	3.6-5.5	Low----------	0.15			
	30-60	0-5	1.50-1.60	6.0-20	0.02-0.06	4.5-6.0	Low----------	0.15			
263A*------------ Aquic Udipsamments	0-2	0-5	1.20-1.55	6.0-20	0.08-0.10	5.1-6.5	Low----------	0.15	5	1	2-6
	2-7	0-10	1.40-1.60	6.0-20	0.07-0.09	5.1-6.0	Low----------	0.15			
	7-45	0-5	1.40-1.60	6.0-20	0.06-0.08	5.1-6.0	Low----------	0.15			
	45-60	0-5	1.50-1.65	6.0-20	0.04-0.06	5.1-6.0	Low----------	0.15			
272*------------- Typic Haplaquods	0-4	0-5	0.90-1.50	6.0-20	0.15-0.20	4.5-6.5	Low----------	0.15	5	1	10-15
	4-25	0-5	1.45-1.65	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15			
	25-60	0-5	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15			
273*------------- Mollic Psammaquents	0-3	---	0.30-0.50	2.0-6.0	0.35-0.45	4.5-6.0	-------------	----	5	5	50-60
	3-6	5-18	1.30-1.60	2.0-6.0	0.16-0.18	4.5-6.0	Low----------	0.24			
	6-9	2-10	1.45-1.65	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15			
	9-60	2-10	1.50-1.70	6.0-20	0.05-0.07	5.6-7.3	Low----------	0.15			
274*------------- Typic Haplaquolls	0-4	---	0.30-0.40	6.0-20	0.35-0.45	6.1-8.4	-------------	----	5	2	50-70
	4-14	0-10	1.30-1.50	6.0-20	0.10-0.12	6.1-8.4	Low----------	0.17			
	14-29	0-10	1.40-1.55	6.0-20	0.06-0.11	6.1-8.4	Low----------	0.17			
	29-60	12-40	1.50-1.70	0.2-0.6	0.18-0.20	7.4-8.4	Moderate-----	0.37			
280*:											
Aquents---------	0-60	---	---	---	---	---	-------------	----	---	---	---
Histosols-------	0-60	---	---	0.2-6.0	---	---	-------------	----	---	2	50-70
281-------------- Medisaprists	0-33	---	0.15-0.25	0.2-6.0	0.35-0.45	3.6-4.4	-------------	----	5	2	>70
	33-60	---	---	---	---	---	-------------	----			
282-------------- Medisaprists	0-60	---	0.15-0.25	0.2-6.0	0.35-0.45	4.5-7.8	-------------	----	5	2	>70

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
1. Beaches										
2A: Del Rey	C	None	---	---	1.0-3.0	Apparent	Jan-May	High	High	Moderate.
5F*:										
Udorthents	---	None	---	---	>6.0	---	---	---	---	---
Udipsamments	A	None	---	---	>6.0	---	---	Low	Low	Moderate.
6: Kinross	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	Moderate	High	Moderate.
7: Sloan	B/D	Frequent	Brief	Nov-Jun	0-1.0	Apparent	Nov-Jun	High	High	Low.
8B: Epworth	A	None	---	---	2.0-3.5	Apparent	Nov-Apr	Low	Low	Moderate.
9*:										
Kerston	A/D	Frequent	Long	Mar-May	+1-1.0	Apparent	Sep-Jun	High	High	Low.
Carlisle	A/D	Frequent	Very brief to long.	Nov-Apr	+.5-1.0	Apparent	Sep-Jun	High	High	Low.
Glendora	A/D	Frequent	Long	Jan-Dec	0-1.0	Apparent	Nov-Jun	Moderate	High	Moderate.
10B, 10B2, 10C, 10C2, 10D, 10D2, 10E: Perrinton	C	None	---	---	>6.0	---	---	Moderate	High	Moderate.
11A: Ithaca	C	None	---	---	1.0-2.0	Apparent	Oct-May	High	High	Moderate.
12: Ziegenfuss	D	None	---	---	+1-1.0	Apparent	Nov-May	High	High	Low.
13B, 13B2, 13C, 13C2, 13D, 13E, 13F: Marlette	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
14A: Capac	C	None	---	---	1.0-2.0	Apparent	Nov-May	High	High	Low.
15: Parkhill	B/D	None	---	---	+1-1.0	Apparent	Nov-May	High	High	Low.
16B, 16C, 16D: Remus	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
18B*, 18C*, 18D*, 18E*:										
Fern	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
Spinks	A	None	---	---	>6.0	---	---	Low	Low	Low.
19A Kibbie	B	None	---	---	1.0-2.0	Apparent	Nov-May	High	High	Moderate.
20 Bono	D	None	---	---	+1-1.0	Apparent	Nov-May	Moderate	High	Low.
22B, 22C Arkport	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
23A Freesoil	B	None	---	---	0.5-1.5	Apparent	Nov-May	High	High	Low.
24 Lamson	B/D	None	---	---	+1-0.5	Apparent	Nov-May	High	High	Low.
26A Kibbie	B	None	---	---	1.0-2.0	Apparent	Nov-May	High	High	Moderate.
27 Poy	D	None	---	---	+1-1.0	Perched	Nov-May	High	High	Low.
28B Scalley	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
31B, 31C Boyer	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
32B, 32C, 32D, 32F Fern	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
34B Wixom	B	None	---	---	0.5-1.5	Perched	Nov-Jun	Moderate	Moderate	High.
36B*, 36C*, 36D*, 36E*:										
Fern	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
Marlette	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
37B*:										
Wixom	B	None	---	---	0.5-1.5	Perched	Nov-May	Moderate	Moderate	High.
Capac	C	None	---	---	1.0-2.0	Apparent	Nov-May	High	High	Low.
38B*, 38C*, 38D*, 38E*:										
Remus	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
Spinks	A	None	---	---	>6.0	---	---	Low	Low	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
39B--------------- Tustin	B	None--------	---	---	>6.0	---	---	Moderate	High-----	Low.
40B--------------- Arkona	B	None--------	---	---	1.0-2.0	Perched	Nov-May	Moderate	High-----	Moderate.
41---------------- Sickles	B/D	None--------	---	---	+1-1.0	Apparent	Nov-May	Moderate	High-----	Low.
42B--------------- Grattan	A	None--------	---	---	>6.0	---	---	Low------	Low------	High.
43B--------------- Covert	A	None--------	---	---	2.0-3.5	Apparent	Nov-May	Low------	Low------	Moderate.
44B--------------- Pipestone	B	None--------	---	---	0.5-1.5	Apparent	Nov-May	Moderate	Low------	Moderate.
47B*, 47C*, 47D*, 47E*:										
Spinks----------	A	None--------	---	---	>6.0	---	---	Low------	Low------	Low.
Coloma----------	A	None--------	---	---	>6.0	---	---	Low------	Low------	Moderate.
48B--------------- Thetford	A	None--------	---	---	1.0-2.0	Apparent	Nov-May	Moderate	Low------	Moderate.
52C--------------- Wallace	B	None--------	---	---	>6.0	---	---	Low------	Low------	High.
53A*:										
Saugatuck--------	C	None--------	---	---	0.5-2.0	Apparent	Nov-May	Moderate	Low------	Moderate.
Jebavy-----------	A/D	None--------	---	---	+1-1.0	Apparent	Oct-Jun	Moderate	High-----	High.
54B, 54C, 54D----- Grattan	A	None--------	---	---	>6.0	---	---	Low------	Low------	High.
56B*:										
Pipestone--------	B	None--------	---	---	0.5-1.5	Apparent	Nov-May	Moderate	Low------	Moderate.
Saugatuck--------	C	None--------	---	---	0.5-2.0	Apparent	Nov-May	Moderate	Low------	Moderate.
57B, 57B3, 57C, 57D, 57E, 57F---- Grattan	A	None--------	---	---	>6.0	---	---	Low------	Low------	High.
58B--------------- Covert	A	None--------	---	---	2.0-3.5	Apparent	Nov-Apr	Low------	Low------	Moderate.
59B--------------- Pipestone	B	None--------	---	---	0.5-1.5	Apparent	Oct-Jun	Moderate	Low------	Moderate.
60---------------- Kingsville	A/D	None--------	---	---	+1-1.0	Apparent	Nov-May	Moderate	High-----	High.
62D, 62F---------- Nordhouse	A	None--------	---	---	>6.0	---	---	Low------	Low------	Moderate.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
63B, 63C, 63D, 63E: Coloma	A	None	---	---	>6.0	---	---	Low	Low	Moderate.
64B, 64C, 64D: Benona	A	None	---	---	>6.0	---	---	Low	Low	High.
65B, 65C: Chelsea	A	None	---	---	>6.0	---	---	Low	Low	Low.
67B, 67C, 67E: Plainfield	A	None	---	---	>6.0	---	---	Low	Low	High.
72: Glendora	A/D	Frequent	Long	Jan-Dec	0-1.0	Apparent	Nov-Jun	Moderate	High	Moderate.
76: Houghton	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	High	High	Moderate.
77: Adrian	A/D	None	---	---	+1-1.0	Apparent	Nov-May	High	High	Moderate.
78: Willette	A/D	None	---	---	+1-1.0	Perched	Nov-May	High	High	Low.
79*:										
Edwards	D	None	---	---	+1-1.0	Apparent	Sep-Jun	High	High	Low.
Martisco	B/D	None	---	---	+1-0.5	Apparent	Oct-Jun	High	High	Low.
81*:										
Loxley	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	High	High	High.
Dawson	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	High	High	High.
83*:										
Histosols	D	None	---	---	+1-1.0	Apparent	Jan-Dec	High	---	---
Aquents	D	None	---	---	+1-1.0	Apparent	Jan-Dec	High	---	---
86F*:										
Dune land	A	None	---	---	>6.0	---	---	Low	Low	Moderate.
Quartzipsamments	A	None	---	---	>6.0	---	---	---	Low	Moderate.
87F*:										
Dune land	A	None	---	---	>6.0	---	---	Low	Low	Moderate.
Quartzipsamments	A	None	---	---	>6.0	---	---	---	Low	Moderate.
Psammaquents	D	None	---	---	+1-1.0	Apparent	Oct-May	Moderate	High	High.
88B: Udipsamments	A	None	---	---	>6.0	---	---	Low	Low	Moderate.
89D, 89F: Udorthents	---	None	---	---	>6.0	---	---	---	---	---

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
90B, 90C, 90D: Epworth	A	None	---	---	>6.0	---	---	Low	Low	Moderate.
91*. Pits										
93B: Tuscola	B	None	---	---	2.0-3.5	Apparent	Nov-Apr	High	Moderate	Low.
94B*, 94C*, 94D*:										
Coloma	A	None	---	---	>6.0	---	---	Low	Low	Moderate.
Scalley	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
95A*:										
Ithaca	C	None	---	---	1.0-2.0	Apparent	Oct-May	High	High	Moderate.
Arkona	B	None	---	---	1.0-2.0	Perched	Nov-May	Moderate	High	Moderate.
97B*:										
Urban land	---	None	---	---	---	---	---	---	---	---
Epworth	A	None	---	---	>6.0	---	---	Low	Low	Moderate.
98F*:										
Udorthents	---	None	---	---	>6.0	---	---	---	---	---
Fluvaquents	---	Frequent	Long	Jan-Dec	+1-1.0	Apparent	Oct-Jun	---	---	---
99B, 99C, 99D: Tekenink	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
210B*, 210C*, 210D*, 211B*, 211C*: Typic Udipsamments	A	None	---	---	>15	---	---	Low	Low	High.
212B*: Typic Udipsamments	A	None	---	---	5.0-15	Apparent	Jan-Dec	Low	Low	High.
213B*: Alfic Udipsamments	A	None	---	---	>15	---	---	Low	Low	High.
214B*: Typic Udipsamments	A	None	---	---	3.5-6.0	Apparent	Jan-Dec	Low	Low	High.
220B*, 220C*, 220D*, 220E*, 221B*, 221C*, 221D*: Entic Haplorthods	A	None	---	---	>15	---	---	Low	Low	High.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
222B*: Entic Haplorthods	A	None	---	---	5.0-15	Apparent	Jan-Dec	Low	Low	High.
224B*: Entic Haplorthods	A	None	---	---	3.0-5.0	Apparent	Jan-Dec	Low	Low	High.
225B*, 225C*: Entic Haplorthods	A	None	---	---	>15	---	---	Low	Low	High.
231B*, 231C*, 231D*, 231E*:										
Entic Haplorthods	A	None	---	---	>15	---	---	Low	Low	High.
Alfic Haplorthods	A	None	---	---	>15	---	---	Low	Moderate	Moderate.
233B*:										
Alfic Haplorthods	A	None	---	---	>15	---	---	Low	Moderate	Moderate.
Entic Haplorthods	A	None	---	---	>15	---	---	Low	Low	High.
235B*:										
Alfic Haplorthods	A	None	---	---	>15	---	---	Low	Moderate	Moderate.
Alfic Haplorthods	A	None	---	---	>15	---	---	Low	Low	High.
235C*, 235D*:										
Alfic Haplorthods	A	None	---	---	>15	---	---	Low	Moderate	Moderate.
Alfic Haplorthods	A	None	---	---	>15	---	---	Low	Low	Moderate.
236B*, 236C*, 236D*, 236E*: Entic Haplorthods	A	None	---	---	>15	---	---	Low	Low	High.
237B*, 237C*, 237D*: Haplic Glossudalfs	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
240B*, 240C*, 240D*, 240E*, 245B*, 245C*, 245D*: Entic Haplorthods	A	None	---	---	>15	---	---	Low	Low	High.
250*:										
Mollic Psammaquents	D	Frequent	Brief	Oct-May	+1-1.0	Apparent	Nov-May	Moderate	High	High.
Aquic Udipsamments	A	Frequent	Brief	Oct-May	1.5-3.5	Apparent	Nov-Apr	Low	Low	High.
Medisaprists	D	Frequent	Brief	Oct-May	+1-1.0	Apparent	Sep-Jun	High	High	Moderate.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
251A*:										
Aeric Haplaquods-	C	None--------	---	---	0.5-2.5	Apparent	Oct-Jun	Moderate	High-----	High.
Typic Haplaquods-	D	None--------	---	---	+1-1.5	Apparent	Nov-May	Moderate	Moderate	High.
252*:										
Typic Haplaquods-	D	None--------	---	---	+1-1.5	Apparent	Nov-May	Moderate	Moderate	High.
Medisaprists-----	D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	High-----	High-----	High.
253A*:										
Aeric Haplaquods-	C	None--------	---	---	0.5-2.5	Apparent	Oct-Jun	Moderate	High-----	High.
Aquic Udipsamments----	A	None--------	---	---	1.5-3.5	Apparent	Nov-May	Low------	Low------	High.
255B*:										
Aquic Udipsamments----	A	None--------	---	---	1.5-3.5	Apparent	Nov-May	Low------	Low------	High.
Entic Haplorthods	A	None--------	---	---	3.0-5.0	Apparent	Jan-Dec	Low------	Low------	High.
256*:										
Medisaprists-----	D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	High-----	High-----	Moderate.
Mollic Psammaquents----	D	None--------	---	---	+1-1.0	Apparent	Nov-May	Moderate	High-----	High.
262A*------------- Aeric Haplaquods	C	None--------	---	---	0.5-2.5	Apparent	Oct-Jun	Moderate	High-----	High.
263A*------------- Aquic Udipsamments	A	None--------	---	---	1.5-3.5	Apparent	Nov-May	Low------	Low------	High.
272*-------------- Typic Haplaquods	D	None--------	---	---	+1-1.5	Apparent	Nov-May	Moderate	Moderate	High.
273*-------------- Mollic Psammaquents	D	None--------	---	---	+1-1.0	Apparent	Nov-May	Moderate	High-----	High.
274*-------------- Typic Haplaquolls	D	None--------	---	---	+1-1.0	Apparent	Nov-May	High-----	Moderate	Low.
280*:										
Aquents----------	D	None--------	---	---	+1-1.0	Apparent	Jan-Dec	High-----	---	---
Histosols--------	D	None--------	---	---	+1-1.0	Apparent	Jan-Dec	High-----	---	---
281--------------- Medisaprists	D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	High-----	High-----	High.
282--------------- Medisaprists	D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	High-----	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Adrian	Sandy or sandy-skeletal, mixed, euic, mesic Terric Medisaprists
Aeric Haplaquods	Sandy, mixed, mesic, ortstein Aeric Haplaquods
Alfic Haplorthods	Sandy or sandy over loamy, mixed, mesic Alfic Haplorthods
Alfic Udipsamments	Mixed, mesic Alfic Udipsamments
Aquents	Aquents
Aquic Udipsamments	Mixed, mesic Aquic Udipsamments
Arkona	Sandy over clayey, mixed, mesic Alfic Haplaquods
Arkport	Coarse-loamy, mixed, mesic Psammentic Hapludalfs
Benona	Sandy, mixed, mesic Entic Haplorthods
Bono	Fine, illitic, mesic Typic Haplaquolls
*Boyer	Coarse-loamy, mixed, mesic Typic Hapludalfs
*Capac	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Carlisle	Euic, mesic Typic Medisaprists
Chelsea	Mixed, mesic Argic Udipsamments
Coloma	Mixed, mesic Argic Udipsamments
Covert	Sandy, mixed, mesic Entic Haplorthods
*Dawson	Sandy or sandy-skeletal, mixed, dysic Terric Borosaprists
Del Rey	Fine, illitic, mesic Aeric Ochraqualfs
Edwards	Marly, euic, mesic Limnic Medisaprists
Entic Haplorthods	Sandy, mixed, mesic Entic Haplorthods
Epworth	Sandy, siliceous, mesic Entic Haplorthods
Fern	Sandy over loamy, mixed, mesic Psammentic Argiudolls
Fluvaquents	Fluvaquents
Freesoil	Coarse-loamy, mixed, mesic Aquic Eutrochrepts
Glendora	Mixed, mesic Mollic Psammaquents
Grattan	Sandy, mixed, mesic Entic Haplorthods
Haplic Glossudalfs	Fine-loamy, mixed, mesic Haplic Glossudalfs
Histosols	Histosols
Houghton	Euic, mesic Typic Medisaprists
Ithaca	Fine, mixed, mesic Aquic Glossudalfs
Jebavy	Sandy, mixed, mesic, ortstein Aeric Haplaquods
Kerston	Euic, mesic Fluvaquentic Medisaprists
*Kibbie	Fine-loamy, mixed, mesic Aquollic Hapludalfs
Kingsville	Mixed, mesic Mollic Psammaquents
*Kinross	Sandy, mixed, frigid Typic Haplaquods
Lamson	Coarse-loamy, mixed, nonacid, mesic Aeric Haplaquepts
*Loxley	Dysic Typic Borosaprists
Marlette	Fine-loamy, mixed, mesic Haplic Glossudalfs
Martisco	Fine-silty, carbonatic, mesic Histic Humaquepts
Medisaprists	Medisaprists
Mollic Psammaquents	Mixed, mesic Mollic Psammaquents
Nordhouse	Mesic, uncoated Spodic Quartzipsamments
Parkhill	Fine-loamy, mixed, nonacid, mesic Mollic Haplaquepts
Perrinton	Fine, mixed, mesic Haplic Glossudalfs
Pipestone	Sandy, mixed, mesic Entic Haplaquods
Plainfield	Mixed, mesic Typic Udipsamments
Poy	Clayey over sandy or sandy-skeletal, mixed, mesic Typic Haplaquolls
Psammaquents	Psammaquents
Quartzipsamments	Quartzipsamments
Remus	Fine-loamy, mixed, mesic Haplic Glossudalfs
Saugatuck	Sandy, mixed, mesic, ortstein Aeric Haplaquods
Scalley	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Haplic Glossudalfs
*Sickles	Sandy over clayey, mixed, nonacid, mesic Mollic Haplaquepts
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Spinks	Sandy, mixed, mesic Psammentic Hapludalfs
Tekenink	Coarse-loamy, mixed, mesic Typic Glossudalfs
Thetford	Sandy, mixed, mesic Psammaquentic Hapludalfs

TABLE 19.--CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
Tuscola	Fine-loamy, mixed, mesic Aquic Hapludalfs
Tustin	Clayey, mixed, mesic Arenic Hapludalfs
Typic Haplaquods	Sandy, mixed, mesic Typic Haplaquods
Typic Haplaquolls	Sandy over loamy, mixed, mesic Typic Haplaquolls
Typic Udipsamments	Mixed, mesic Typic Udipsamments
Udipsamments	Udipsamments
Udorthents	Udorthents
*Wallace	Sandy, mixed, frigid, ortstein Typic Haplorthods
Willette	Clayey, illitic, euic, mesic Terric Medisaprists
Wixom	Sandy over loamy, mixed, mesic Alfic Haplaquods
*Ziegenfuss	Fine, mixed, nonacid, mesic Mollic Haplaquepts

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