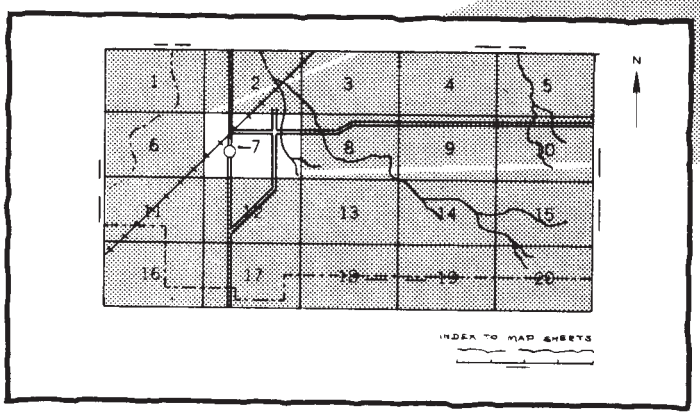
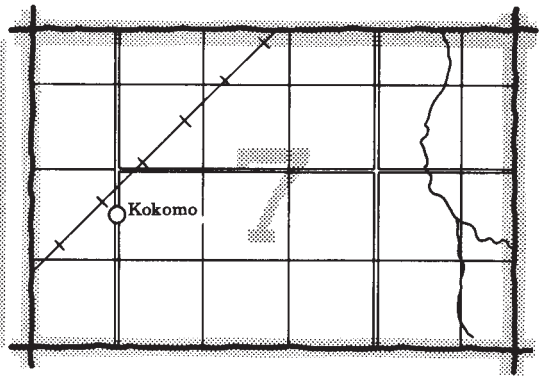
United States Department of Agriculture
Soil Conservation Service
in cooperation with
Michigan Agricultural Experiment Station

soil survey of Oakland County Michigan

HOW TO USE

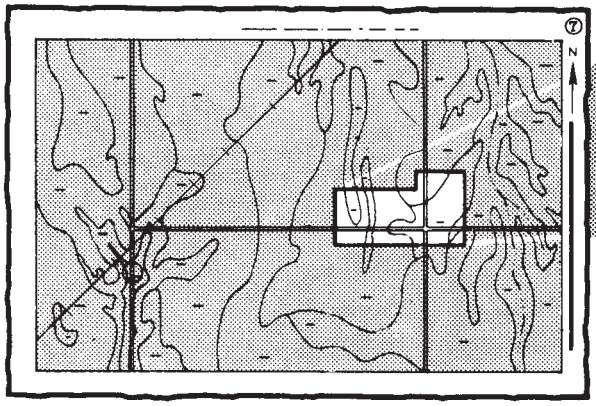
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

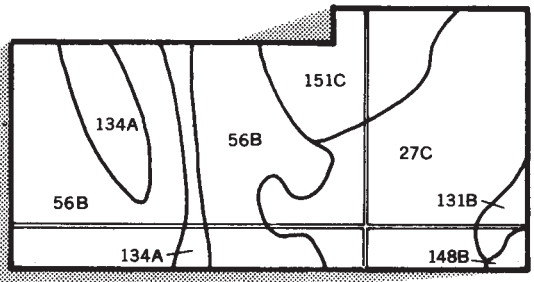




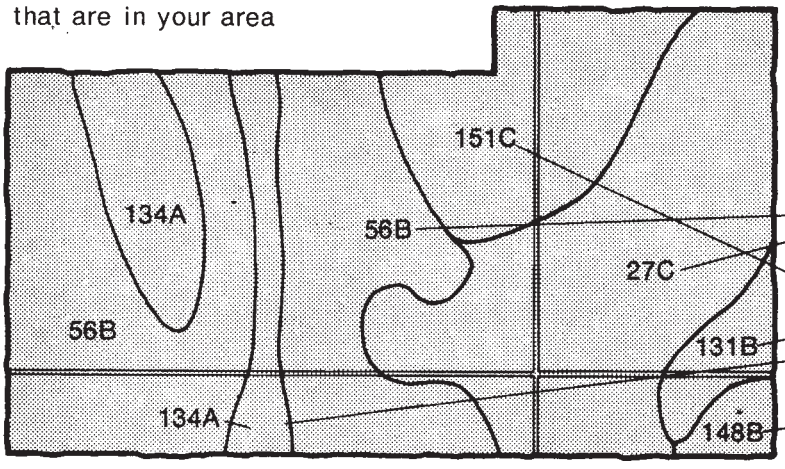
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area

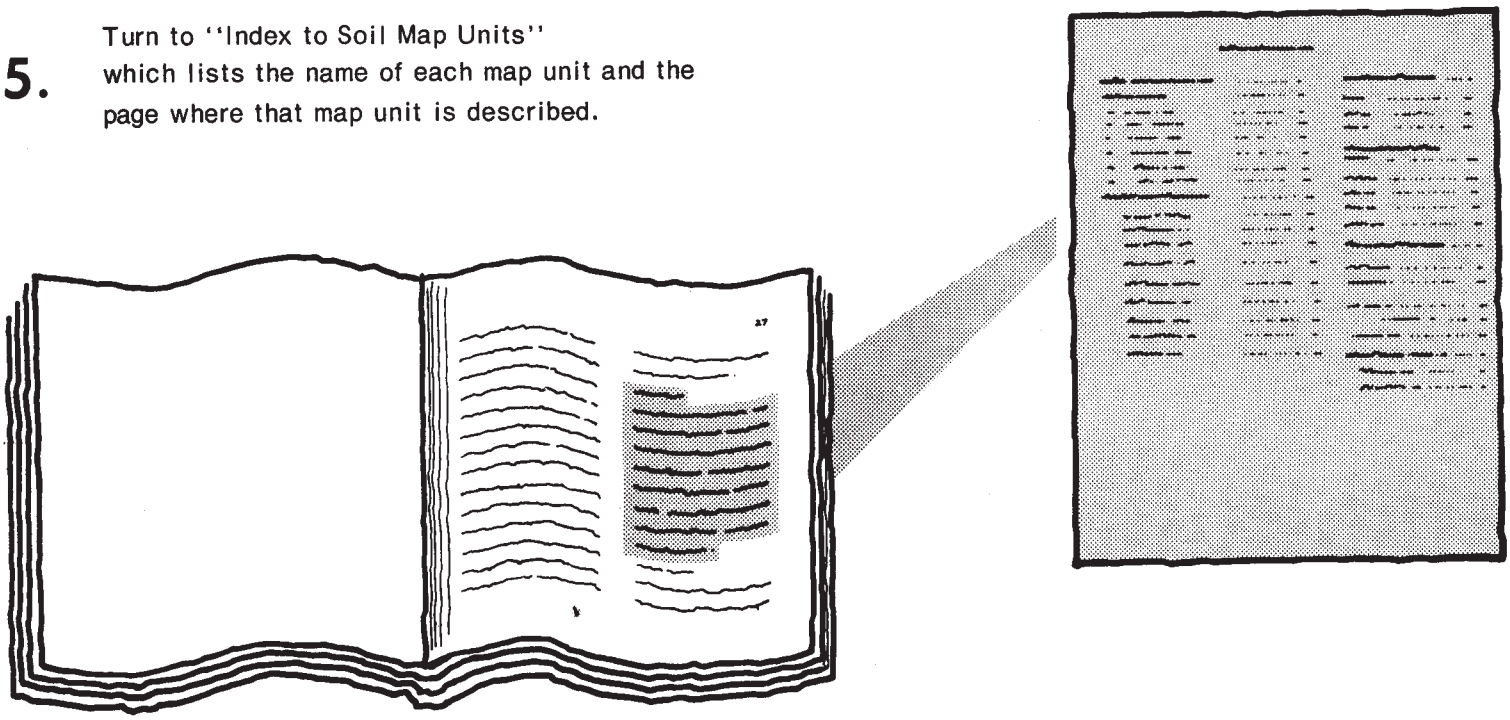


Symbols

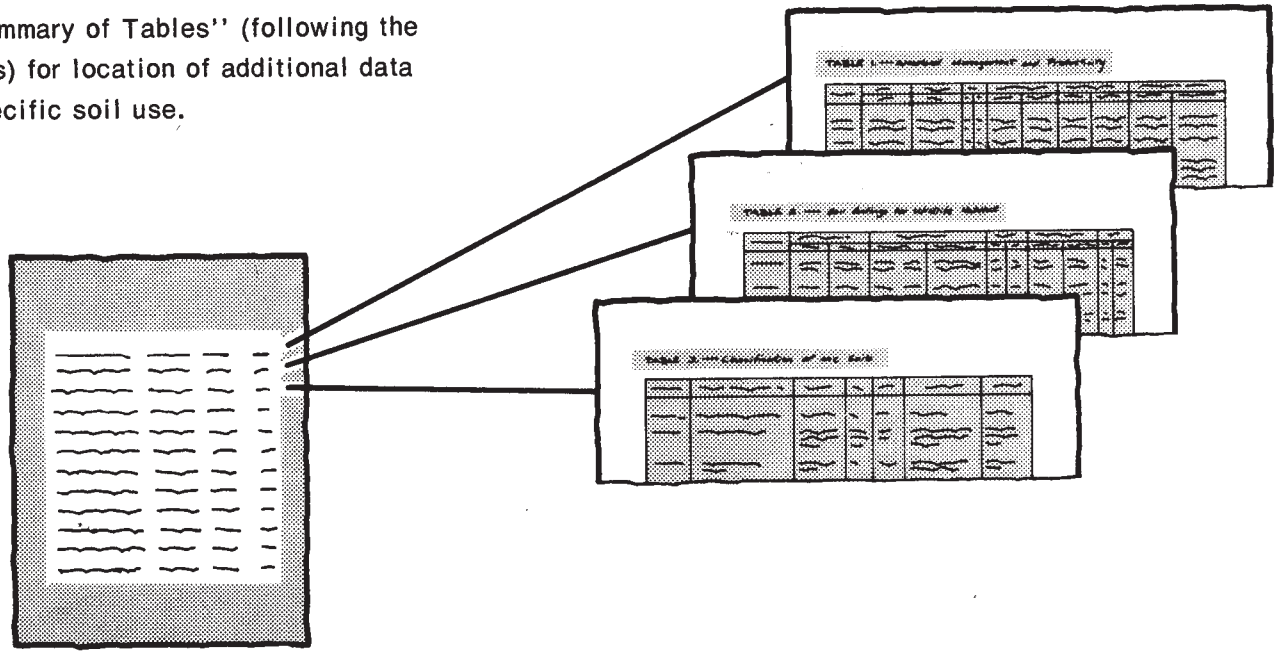
27C
56B
131B
134A
148B
151C

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

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 Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1975-79. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1980. This survey was made cooperatively by the Soil Conservation Service and the Michigan Agricultural Experiment Station. It is part of the technical assistance furnished to the Oakland County Soil and Water Conservation District. Financial assistance was made available by the Oakland County Board of Commissioners with funds provided by the Department of Housing and Urban Development through the Oakland County Soil and Water 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.

Cover: Typical area of Urban land-Capac complex, 0 to 3 percent slopes.

Contents

Soil series

Issued March 1982

Index to soil map units

Summary of tables

Foreword

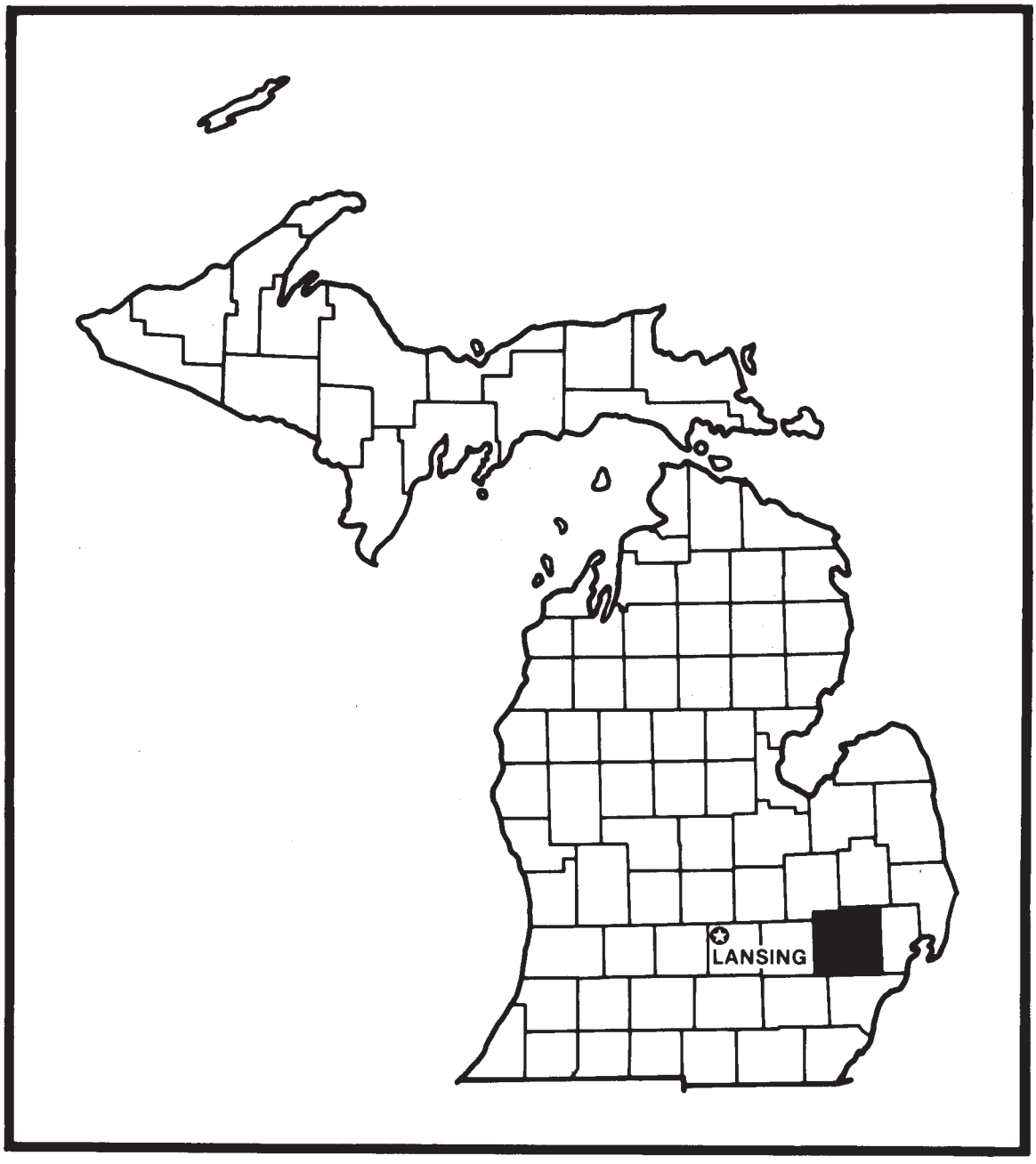
This soil survey contains information that can be used in land-planning programs in Oakland County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact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

This soil survey is designed for many different users. Farmers, ranchers, 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 insure 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 shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

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

Homer R. Hilner
State Conservationist
Soil Conservation Service



Location of Oakland County in Michigan.

soil survey of
Oakland County, Michigan

By James E. Feenstra, Soil Conservation Service

Fieldwork by James E. Feenstra, Willard C. Ryland, Ronald W. Olson, and William E. Frederick, Soil Conservation Service; Richard R. Romano Christine E. Lietzau, Michael D. Oja, Ghazanfar Ali Shah and Saiid Mahjoory, Oakland County Soil and Water Conservation District; and Greg Thoen, Peter Lumbert, and Hussein Asady Michigan Agricultural Experiment Station

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Michigan Agricultural Experiment Station

OAKLAND COUNTY is in the southeastern part of the state. It has an area of about 899 square miles, or 575,360 acres. The population of the county in 1979 was 1,005,500 and that of Pontiac, the county seat, was 79,778.

The southeastern corner of the county consists of a nearly level glacial lake plain. The rest of the county consists of two gently undulating to very hilly end moraine bands separated by three major outwash plains. The moraines are of the Saginaw and Huron-Erie systems, and the outwash plains are the Commerce, Drayton, and Oxford plains. These landforms have a northeast to southwest orientation. Five major rivers have their headwaters within Oakland County. The Clinton and Huron Rivers have their headwaters in the north-central part of the county. The River Rouge has its headwaters in the southeastern part of the county; the Shiawassee River, in the northwestern part; and the Flint River, in the northern part (fig. 1).

The automotive industry is the main economic enterprise in the county. Although large parts of the county have been developed into urban and industrial areas, much of the northern two-thirds of the county is still undeveloped. Such varied land uses as urban development, farming, and recreation are competing for this area. The major farm crops are corn, small grain, alfalfa, and hay. In a few areas, such specialty crops as sweet corn, lettuce, tomatoes, and other table vegetables (fig. 2) and commercial sod and nursery stock are produced. Other areas are in pasture for dairy cattle, for beef cattle, and for horses that are raised for racing and pleasure. About 220 horse farms, varying in size from about 5 to 200 acres, are in the county.

About 39 different kinds of soil are in Oakland County. These soils range widely in texture, natural drainage, and other characteristics.

In the southeastern corner of the county, the undisturbed soils are mostly nearly level to gently sloping; poorly drained to moderately well drained; and sandy, loamy, or clayey throughout. Wetness is the major limitation to the use of the soils in this area.

In the northern two-thirds of the county, the soils are mostly undulating to very hilly. They are dominantly moderately well drained to well drained and are loamy or loamy and sandy throughout. Some are underlain by gravelly sand. The hazard of erosion is generally moderate to severe in this area. Measures are needed to control erosion and thereby reduce sedimentation in streams. If well managed, the less sloping soils are fairly suited to well suited to field crops, pasture, and trees.

Descriptions, names, and delineations of soils in this survey do not fully agree with those on soil maps for adjacent counties. Differences are the result of better knowledge of soils, modifications in series concepts, or extent of soils within the survey area.

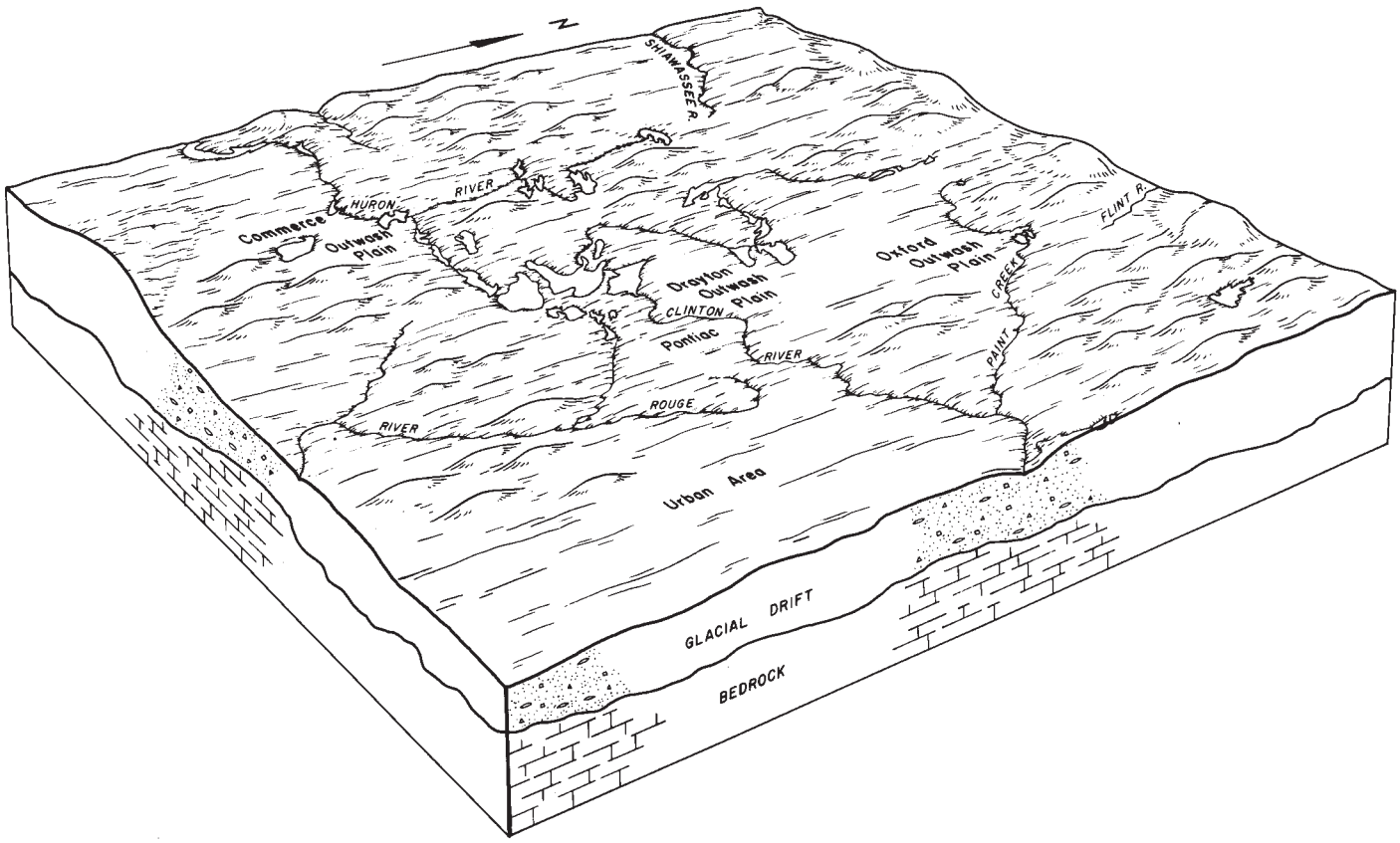


Figure 1.—Physiography and drainage in Oakland County, Michigan.

General nature of the survey area

This section gives general information concerning the county. It discusses history and development, climate, farming, industry and transportation, and lakes and streams.

History and development

The settlement of the area that is now Oakland County was delayed for 10 to 20 years by a false report that the area was an impenetrable morass. In 1816, surveyors ventured beyond the swampy belt that encircled Detroit and found the area fit for habitation. The first settlement in the survey area, now known as the township of Avon, was established in 1817. In 1819, this survey area officially became a county—the first established in the interior of the state.

Early settlers found the land nearly all forested, and the first settlements were made in small "oak openings." Upland forests consisted chiefly of oak, hickory, beech, and sugar maple. Tamarack, aspen, elm, cottonwood, ash, red maple, and eastern white-cedar occupied the lower swampy areas. As soon as the land was cleared, a system of general agriculture was developed. For a time, wheat was the chief crop; but the danger of continuous cropping on the more sloping soils was early recognized and other crops—corn, oats, rye, and potatoes—were planted.

Population has increased almost continuously since the first census period. At present it is 1,005,500. Expansion of the Detroit metropolitan area has contributed significantly to the rapid increase in the county population over the last 20 years.

Climate

Prepared by the Michigan Department of Agriculture, Michigan Weather Service, East Lansing, Michigan.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Pontiac in the period 1949 to 1978. Table 2 shows probable dates of the first

freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 25.3 degrees F, and the average daily minimum temperature is 17.9 degrees. The lowest temperature on record, which occurred at Pontiac on February 5, 1918, is -22 degrees. In summer the average temperature is 70.2 degrees, and the average daily maximum temperature is 81.7 degrees. The highest recorded temperature, which occurred at Pontiac on July 5, 1911 and July 24, 1934, is 104 degrees.

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

The total annual precipitation is 29.6 inches. Of this, 17.2 inches, or 58 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 14.2 inches. The heaviest 1-day rainfall during the period of record was 6.7 inches at Birmingham on June 25, 1968. Thunderstorms occur on about 34 days each year, and most occur in June and July.

Average seasonal snowfall is 34.6 inches. The greatest snow depth at any one time during the period of record was 28 inches. On an average of 60 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night. The average humidity at dawn, as recorded in 1978 at Flint and Detroit, is about 80 percent. The sun shines 67 percent of the time possible in summer and 38 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in March.

Industry and transportation

The automobile is responsible for a great deal of the employment in Oakland County, both directly in its construction and indirectly in the businesses that supply parts, advertising, and transportation. Important to the county economy also are financial institutions and industries that produce plastic, metal, chemicals, pharmaceuticals, building materials, and electricity. The national headquarters and regional offices of many large corporations are in southern Oakland County.

Oakland County is served by four interstate, two federal, and five state highways as well as a large number of county and municipal roads.

Figure 2.—Garden vegetables on Kibbie fine sandy loam, 0 to 4 percent slopes.

Air and rail transportation are available also. The Oakland-Pontiac Airport is the second busiest airport in the Great Lakes Area. The Chesapeake and Ohio and the Grand Trunk Western Railroads serve the county. The Chesapeake and Ohio extends north to south in the western part of the county and runs through Northville and Holly. The Grand Trunk Western connects Pontiac with Flint to the northwest and Detroit to the southeast, as well as Ann Arbor to the southwest and Port Huron to the northeast.

Lakes and streams

Oakland County has more natural lakes than any other county in the state. It contains about 1,468 lakes and the headwaters of 5 major rivers—the Clinton, Huron, Rouge, Shiawassee, and Flint Rivers. Also included in the county's water resources are some artificial lakes and many streams, creeks, gravel pits, wetlands, and ponds. Water bodies that cover more than 40 acres make up about 14,080 acres of the survey area.

Oakland County's many lakes, both natural and artificial, contribute to the economy primarily as sites for fishing and other forms of recreation and as sites for houses.

How this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; and the kinds of native plants or crops. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

General soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units 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 map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil descriptions

1. Marlette-Capac-Houghton

Nearly level to hilly, well drained to very poorly drained loamy and mucky soils; on till plains and moraines and in bogs

This map unit makes up about 9 percent of the county. It is about 50 percent Marlette soils, 20 percent Capac soils, 12 percent Houghton soils, and 18 percent soils of minor extent.

The Marlette soils are on knolls, ridges, and side slopes. The Capac soils are in broad areas that have some low knolls, ridges, and side slopes. The Houghton soils are in depressions (fig. 3).

The Marlette soils are nearly level to hilly and are well drained or moderately well drained. The surface layer is dark grayish brown sandy loam about 8 inches thick. The firm subsoil, which is about 23 inches thick, is dark yellowish brown clay loam in the upper part and yellowish brown, mottled clay loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown and pale brown, mottled, calcareous loam.

The Capac soils are nearly level and gently undulating and are somewhat poorly drained. The surface layer is very dark grayish brown sandy loam about 8 inches thick. The subsoil, which is about 24 inches thick, is brown and grayish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is pale brown, mottled, calcareous loam.

The Houghton soils are nearly level and are very poorly drained. The surface layer is black muck about 8 inches thick. The underlying layers to a depth of about 60 inches are black muck.

Of minor extent in this map unit are the very poorly drained, loamy Brookston soils; the poorly drained Sebewa soils; the very poorly drained, more acid Napoleon soils; the poorly drained Colwood soils; the more droughty, well drained Fox soils; the coarser textured, well drained Owosso soils; the somewhat poorly drained Selfridge soils; and the somewhat poorly drained, sandy Metamora soils. The Brookston, Colwood, Napoleon, and Sebewa soils are on landscape positions similar to those of the Houghton soils. The Fox and Owosso soils are on landscape positions similar to those of the Marlette soils, and the Metamora and Selfridge soils are on positions similar to those of the Capac soils.

The soils in this map unit are used mainly as woodland, wildlife habitat, or pasture or they are idle land. In some areas they are used as building sites. In a few areas they are used for farming, including vegetable gardens, fruit orchards, and commercial sod. The Marlette and Capac soils are well suited to use as cropland, pasture, and woodland. The Houghton soils are poorly suited to cropland use. Water erosion is the main limitation to the use of the Marlette and Capac soils as cropland.

The use of the less sloping Marlette soils and the Capac soils as building sites is limited by wetness. The use of these soils as septic tank absorption fields is limited by wetness and moderately slow permeability. The Houghton soils are severely limited for these uses.

2. Riddles-Marlette-Houghton

Nearly level to steep, well drained, moderately well drained, and very poorly drained loamy and mucky soils; on moraines and till plains and in bogs

This map unit makes up about 15 percent of the county. It is about 48 percent Riddles soils, 32 percent Marlette soils, 11 percent Houghton soils, and 9 percent soils of minor extent.

The Riddles and Marlette soils are on knolls and ridges and on side slopes along drainageways, streams, lakes, and depressions. The Houghton soils are in depressions and drainageways.

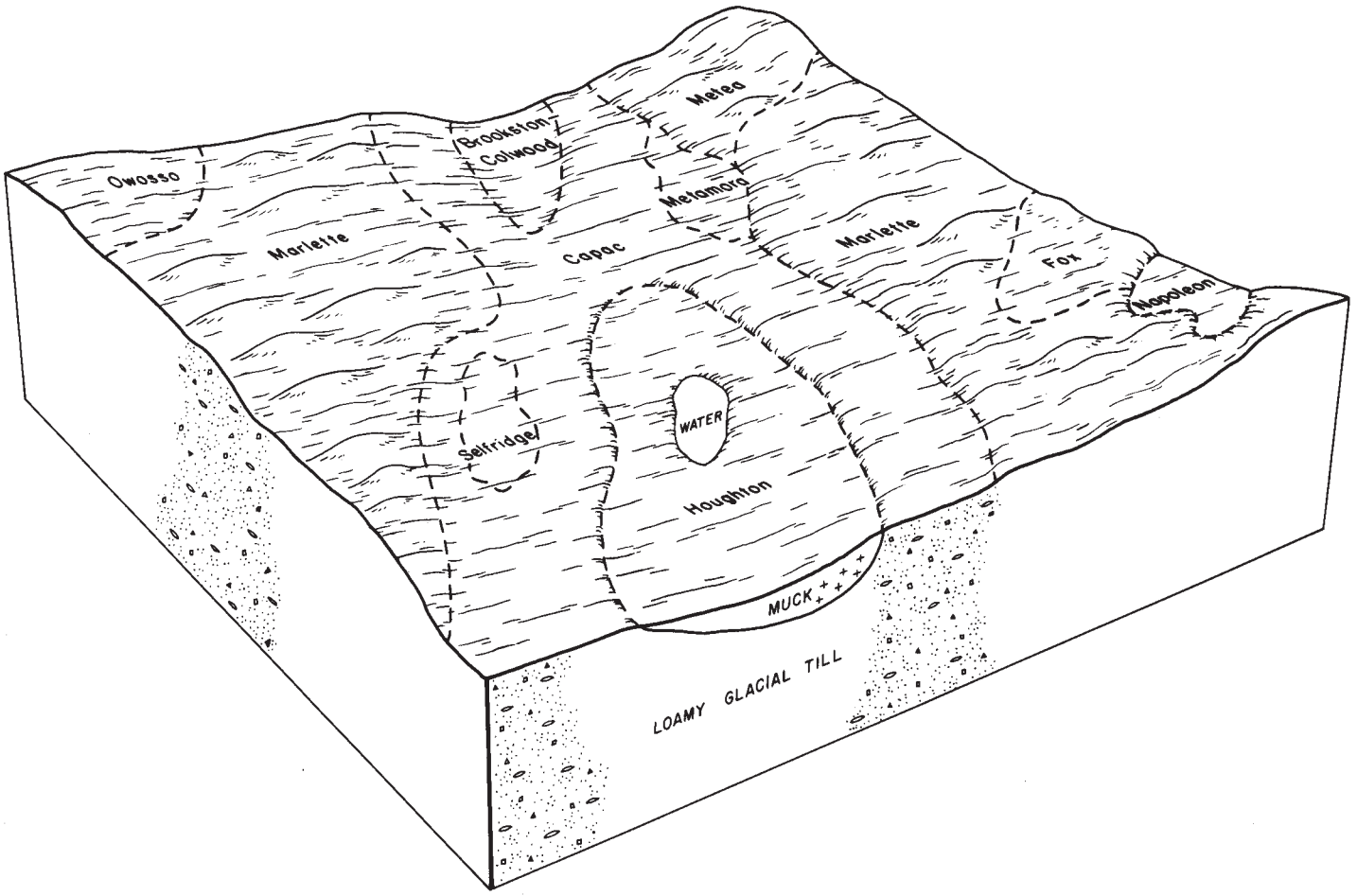


Figure 3.—Typical pattern of soils and underlying material in the Marlette-Capac-Houghton map unit.

The Riddles soils are nearly level to rolling and are well drained. The surface layer is dark grayish brown sandy loam about 8 inches thick. The subsurface layer is brown sandy loam about 4 inches thick. The subsoil is sandy clay loam about 34 inches thick. In the upper part it is yellowish brown and friable; in the middle part it is dark yellowish brown and firm; and in the lower part it is yellowish brown, mottled, and friable. The substratum to a depth of about 60 inches is brown, calcareous sandy loam.

The Marlette soils are nearly level to steep and are well drained or moderately well drained. The surface layer is dark grayish brown sandy loam about 8 inches thick. The firm subsoil is about 23 inches thick. It is dark yellowish brown clay loam in the upper part and yellowish brown, mottled clay loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown and pale brown, mottled, calcareous loam.

The Houghton soils are nearly level and are very poorly drained. The surface layer is black muck about 8 inches thick. The underlying layers to a depth of 60 inches are black muck.

Of minor extent in this map unit are the very poorly drained, loamy Brookston soils and the poorly drained Sebewa soils; the more droughty, well drained Metea and Oshtemo soils; and the somewhat poorly drained Capac, Metamora, and Selfridge soils. The Brookston and Sebewa soils are on landscape positions similar to those of the Houghton soils. The Metea and Oshtemo soils are on positions similar to those of the Riddles and Marlette soils. The Capac, Metamora, and Selfridge soils are slightly higher on the landscape than the Houghton soils.

The soils in this map unit are used mainly as woodland, wildlife habitat, and pasture or are idle land. In some areas they are used as building sites. In a few areas they are used for farming, including vegetable gardens and fruit orchards.

The upland soils that are nearly level to undulating are well suited to use as cropland or pasture, and those that

are rolling to hilly are poorly suited to these uses. If the upland soils are used as cropland or pasture, controlling water erosion is the main concern of management. The muck soils generally are not suited to use as cropland or pasture because they generally do not have adequate drainage outlets.

The upland soils can be used for building site development; however, the shrink-swell potential of the Riddles soils and slope are limitations. The use of the upland soils as septic tank absorption fields is limited by the moderately slow permeability of the Marlette soils and by slope. The muck soils generally are not suited to use as building sites or septic tank absorption fields.

3. Fox-Oshtemo-Houghton

Nearly level to hilly, well drained and very poorly drained loamy, sandy, and mucky soils; on outwash plains, moraines, and beach ridges and in bogs

This map unit makes up about 10 percent of the county. It is about 50 percent Fox soils, 30 percent Oshtemo soils, 12 percent Houghton soils, and 8 percent soils of minor extent.

The Fox and Oshtemo soils are on knolls, ridges, and side slopes along drainageways, streams, lakes, and depressions. The Houghton soils are in depressions and drainageways.

The Fox soils are nearly level to hilly and are well drained. The surface layer is very dark grayish brown sandy loam about 9 inches thick. The subsurface layer is brown gravelly sandy loam about 7 inches thick. The subsoil is dark brown, firm gravelly sandy clay loam about 14 inches thick. The substratum to a depth of 60 inches is brown, calcareous gravelly sand.

The Oshtemo soils are nearly level to hilly and are well drained. The surface layer is dark brown loamy sand about 7 inches thick. The subsurface layer is yellowish brown loamy sand about 11 inches thick. The subsoil is about 37 inches thick. In the upper part it is reddish brown, friable sandy loam, and in the lower part it is yellowish brown, very friable loamy sand. The substratum to a depth of about 60 inches is pale brown, calcareous stratified sand and gravelly sand.

The Houghton soils are nearly level and are very poorly drained. The surface layer is black muck about 8 inches thick. The underlying layers to a depth of 60 inches are black muck.

Of minor extent in this map unit are the loamy, very poorly drained Gilford soils; the somewhat poorly drained Wasepi and Thetford soils; and the sandy, well drained Spinks, Arkport, and Oakville soils. The Gilford soils are on landscape positions similar to those of the Houghton soils. The Wasepi, Thetford, and Matherton soils are on slightly higher positions on the landscape. The Spinks, Arkport, and Oakville soils are on landscape positions similar to those of the Fox and Oshtemo soils.

The soils in this map unit are used mainly as pasture or hayland, woodland, and wildlife habitat or are idle land. In some areas the soils are used as building sites, orchards, cropland, and gravel pits. There are many swampy, undrained areas. The Houghton soils are well suited to wetland wildlife habitat.

The upland soils that are nearly level to undulating are fairly well suited to use as cropland or pasture, and those that are rolling to hilly are poorly suited to those uses. If these soils are used as cropland, controlling water erosion and soil blowing, maintaining the content of organic matter, and overcoming droughtiness are concerns of management. The muck soils generally are not suited to use as cropland or pasture.

The upland soils are suited to use as septic tank absorption fields or building sites; in some areas, however, they are limited for these uses. Steepness of slope is a limitation for building site development, and poor filtering capacity and slope are limitations for septic tank absorption fields. Muck soils generally are not suited to use as building sites or septic tank absorption fields.

4. Oshtemo-Spinks-Houghton

Nearly level to steep, well drained and very poorly drained sandy and mucky soils; on outwash plains, beach ridges, and moraines and in bogs

This map unit makes up about 12 percent of the county. It is about 40 percent Oshtemo soils, 30 percent Spinks soils, 14 percent Houghton soils, and 16 percent soils of minor extent.

The Oshtemo and Spinks soils are on plains, knolls, and ridges and on side slopes along drainageways, lakes, and swamps. The Houghton soils are in depressions and drainageways (fig. 4).

The Oshtemo soils are nearly level to steep and are well drained. They have a surface layer of dark brown loamy sand about 7 inches thick. The subsurface layer is yellowish brown loamy sand about 11 inches thick. The subsoil is about 37 inches thick. In the upper part it is reddish brown, friable sandy loam; and in the lower part it is yellowish brown, very friable loamy sand. The substratum to a depth of 60 inches is pale brown, calcareous, stratified sand and gravelly sand.

The Spinks soils are nearly level to steep and are well drained. They have a surface layer of dark brown loamy sand about 9 inches thick. The subsurface layer is pale brown sand about 17 inches thick. The next layer to a depth of about 60 inches consists of brown, loose sand and thin strata of reddish brown, very friable loamy sand.

The Houghton soils are nearly level and are very poorly drained. They have a surface layer of black muck about 8 inches thick. The underlying layers to a depth of 60 inches are black muck.

Of minor extent in this map unit are the very poorly drained Gilford and Cohoctah soils; the somewhat poorly drained Wasepi, Thetford, Dixboro, and Matherton soils; and the loamy, well drained Boyer, Leoni, Fox, and Riddles soils. The Cohoctah soils are along streams, and

the Gilford soils are on adjacent uplands. The Wasepi, Thetford, Dixboro, and Matherton soils are on slightly higher positions on the landscape than the Houghton soils. The Boyer, Fox, Leoni, and Riddles soils are on landscape positions similar to those of the Oshtemo and Spinks soils.

The soils in this map unit are mainly used for woodland, pasture, wildlife habitat, or parks or they are idle land. Some are used for building site development. In a few areas the soils are used for farming.

The upland soils that are nearly level to undulating are fairly well suited to use as cropland or pasture, and those that are rolling to steep are poorly suited to these uses. If these upland soils are cropped, controlling erosion and soil blowing, maintaining organic matter content, and overcoming droughtiness are concerns of management. The muck soils generally do not have adequate drainage outlets and are not suited to use as cropland or pasture.

The upland soils that are nearly level to undulating are suitable for use as building sites and septic tank absorption fields, and those that are rolling to steep are poorly suited or are not suited. The upland Oshtemo soils are limited for use as septic tank absorption fields because of poor filtering capacity. The effluent drains satisfactorily, but there is a danger of ground water pollution. The muck soils generally are not suited to use as building sites or septic tank absorption fields.

5. Urban land-Marlette-Capac

Urban land and nearly level to hilly, well drained to somewhat poorly drained loamy soils; on till plains and moraines

This map unit makes up about 18 percent of the county. It is about 60 percent Urban land, 20 percent Marlette soils, 12 percent Capac soils, and 8 percent soils of minor extent.

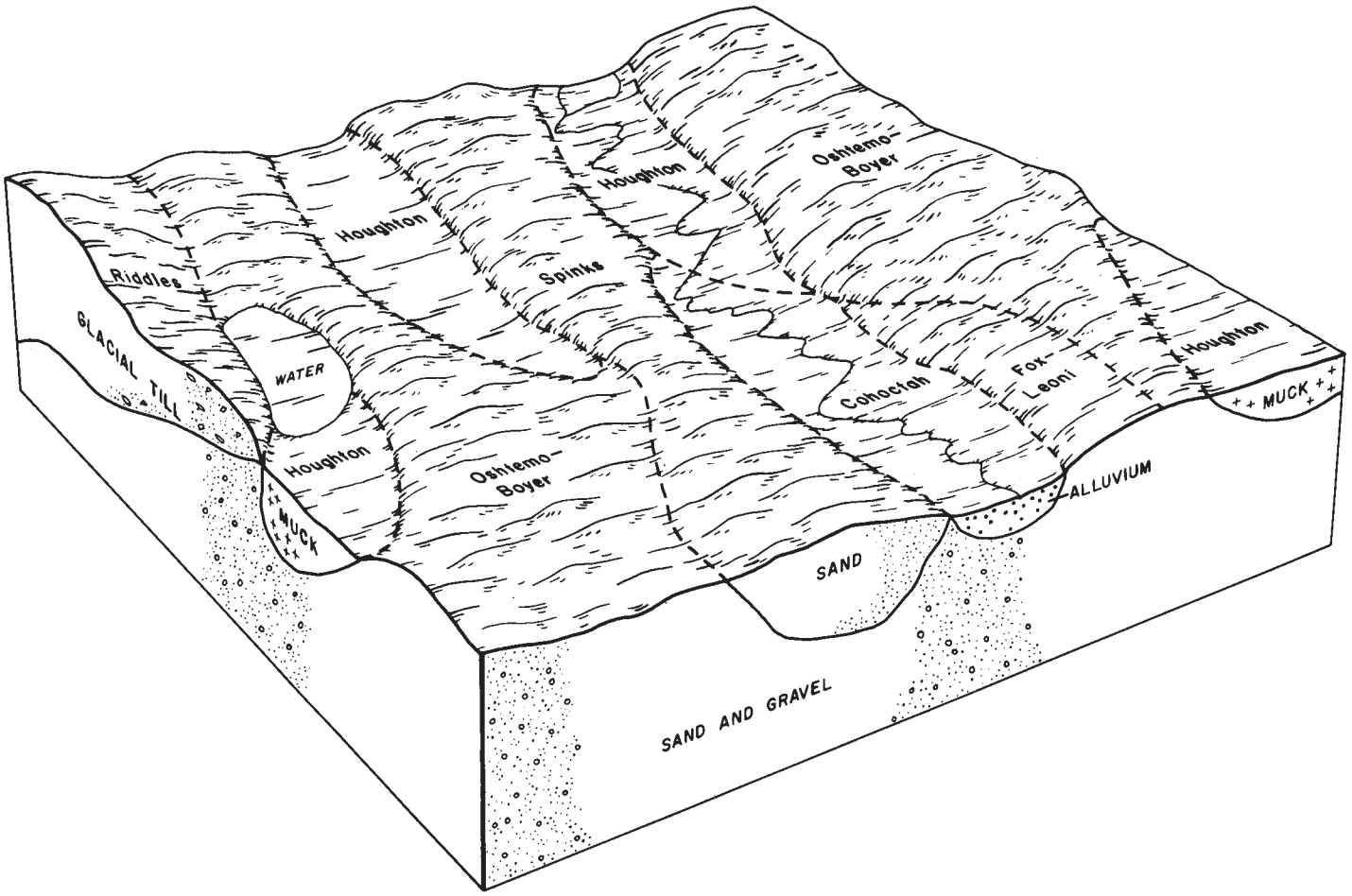


Figure 4.—Typical pattern of soils and underlying material in the Oshtemo-Spinks-Houghton map unit.

Urban land generally is nearly level, but in some places it is gently sloping to sloping. It is covered by streets, sidewalks, driveways, parking lots, houses, and other structures that so obscure or alter the soils that identification of the soils is not possible.

The Marlette soils are on plains, knolls, ridges, and side slopes and are nearly level to hilly. These soils are well drained or moderately well drained. The surface layer is dark grayish brown sandy loam about 8 inches thick. The firm subsoil, which is about 23 inches thick, is dark yellowish brown clay loam in the upper part and yellowish brown, mottled clay loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown and pale brown, mottled, calcareous loam.

The Capac soils are in broad areas that have some low knolls and ridges. They are nearly level or gently sloping. These soils are somewhat poorly drained. The surface layer is very dark grayish brown sandy loam about 8 inches thick. The firm subsoil, which is about 24 inches thick, is brown and grayish brown, mottled clay loam. The substratum to a depth of about 60 inches is pale brown, mottled, calcareous loam.

Of minor extent in this map unit are the very poorly drained Brookston soils; the poorly drained Colwood soils; the more droughty, well drained Fox and Metea soils; and the somewhat poorly drained Selfridge soils. The Brookston and Colwood soils are in depressions and drainageways. The Fox and Metea soils are on landscape positions similar to those of the Marlette soils, and the Selfridge soils are on positions similar to those of the Capac soils.

The soils in this map unit are used mainly for residential and commercial development. In a few areas they are used for gardens, woodland, playgrounds, or parks or are idle land. There are many swampy, undrained areas. Wetness, slope, and moderately slow permeability are the main limitations to the use of the Marlette and Capac soils as sites for sanitary facilities and buildings.

6. Urban Land-Spinks-Oshtemo

Urban land and nearly level to rolling, well drained sandy soils; on outwash plains, beach ridges, and moraines

This map unit makes up about 13 percent of the county. It is about 60 percent Urban land, 20 percent Spinks soils, 10 percent Oshtemo soils, and 10 percent soils of minor extent.

The Oshtemo and Spinks soils are on broad plains, on knolls and ridges, and on side slopes along drainageways, lakes, and swamps.

Urban land is covered by streets, sidewalks, driveways, parking lots, houses, and other structures that so obscure or alter the soils that identification of the soils is not feasible. Urban land is nearly level to sloping.

The well drained Spinks soils are nearly level to rolling. The surface layer is dark brown loamy sand about 9 inches thick. The subsurface layer is pale brown sand about 17 inches thick. The next layer to a depth of about 60 inches consists of brown, loose sand and thin strata of reddish brown, very friable loamy sand.

The well drained Oshtemo soils are nearly level to rolling. The surface layer is dark brown loamy sand about 7 inches thick. The subsurface layer is yellowish brown loamy sand about 11 inches thick. The subsoil is about 37 inches thick. In the upper part it is reddish brown, friable sandy loam; and in the lower part it is yellowish brown, very friable loamy sand. The substratum to a depth of 60 inches is pale brown, calcareous stratified sand and gravelly sand.

Of minor extent in this map unit are the poorly drained Granby soils; the very poorly drained Gilford and Houghton soils; the somewhat poorly drained Wasepi, Thetford, Tedrow, and Matherton soils; and the well drained Fox and Riddles soils. The Gilford, Granby, and Houghton soils are in depressions and drainageways. The Wasepi, Thetford, Tedrow, and Matherton soils are on lower positions on the landscape than the Oshtemo and Spinks soils. The Fox and Riddles soils are on landscape positions similar to those of the Oshtemo and Spinks soils.

The soils in this map unit are used mainly for residential and commercial development. In a few areas they are used for gardens, woodland, playgrounds, parks, or wildlife habitat or are idle land. There are a few swampy, undrained areas and lakes. Slope is the main limitation to the use of these soils for sanitary facilities or building site development.

7. Urban land-Blount-Lenawee

Urban land and nearly level and gently undulating, somewhat poorly drained and poorly drained loamy and silty soils; on lake plains and moraines

This map unit makes up about 8 percent of the county. It is about 65 percent Urban land, 20 percent Blount soils, 10 percent Lenawee soils, and 5 percent soils of minor extent.

Urban land is covered by streets, sidewalks, driveways, parking lots, houses, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

The Blount soils are nearly level and gently undulating and are somewhat poorly drained. The surface layer is dark gray loam about 7 inches thick. The mottled subsoil is about 23 inches thick. In the upper part it is brown, firm silty clay loam; and in the lower part it is grayish brown, very firm clay. The substratum to a depth of 60 inches is brown, mottled, calcareous silty clay loam.

The Lenawee soils are nearly level and are poorly drained. The surface layer is dark gray silty clay loam about 8 inches thick. The mottled subsoil is about 45 inches thick. In the upper part it is dark gray, firm silty clay loam; in the middle part it is gray, very firm silty clay; and in the lower part it is gray, very firm silty clay loam. The substratum to a depth of 60 inches is light yellowish brown, mottled, calcareous silty clay loam.

Of minor extent in this unit are the very poorly drained Cohoctah soils; the sandy, somewhat poorly drained Selfridge soils; the moderately well drained Glynwood soils; and the well drained Metea soils. The nearly level Cohoctah soils are on flood plains. The Selfridge soils are on landscapes similar to those of the Blount soils. The Glynwood soils are in the more moderately sloping places. The Metea soils are on higher positions on the landscape than the Blount soils.

The soils in this map unit are used mainly for residential and commercial development. In a few areas they are used for gardens, woodland, playgrounds, or parks or are idle land. There are a few swampy, undrained areas. Wetness and slow to moderate permeability are the main limitations to the use of the Blount and Lenawee soils for sanitary facilities. Because of wetness, these soils are poorly suited to building site development.

8. Urban Land-Thetford

Urban land and nearly level, somewhat poorly drained sandy soils; on lake plains and outwash plains

This map unit makes up about 6 percent of the county. It is about 60 percent Urban land, 20 percent Thetford soils, and 20 percent soils of minor extent.

Urban land is covered by streets, sidewalks, driveways, parking lots, houses, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

The Thetford soils are nearly level. The surface layer is very dark grayish brown loamy fine sand about 9 inches thick. The subsurface layer is light yellowish brown loamy fine sand about 11 inches thick. The subsoil and the substratum to a depth of about 60 inches are dominantly brown loose fine sand.

Of minor extent in this map unit are the poorly drained Granby soils, the very poorly drained Gilford soils, and the moderately well drained Oakville soils. The Gilford and Granby soils are on lower positions on the landscape than the Thetford soils. The Oakville soils are on higher positions.

The soils in this map unit are used mainly for building site development. In a few areas they are used for gardens, woodland, playgrounds, and parks or are idle land. There are a few swampy, undrained areas. Wetness, seepage, and poor filtering capacity are the main limitations to the use of Thetford soils for sanitary facilities and building site development. The Thetford soils are poorly suited to building site development.

Broad land use considerations

Each year a considerable acreage is being developed for residential, commercial, and industrial uses in this survey area. Deciding what land should be used for urban development is a very important issue. The general soil map can be used in broad planning, but it cannot be used in selecting a site for a specific use.

Areas where the soils are severely limited for residential and other urban uses are extensive. In large parts of the Marlette-Capac-Houghton map unit, a seasonal high water table and moderately slow permeability severely limit urban development. In parts of the Oshtemo-Spinks-Houghton unit, the Fox-Oshtemo-Houghton unit, the Marlette-Capac-Houghton unit and the Riddles-Marlette-Houghton unit, steepness of slope is a severe limitation. The Houghton soils in these map units are very severely limited for urban development because they are subject to ponding and have low strength.

There are large areas of soils in the county that can be developed for urban uses. These areas include the less sloping well drained soils of the Oshtemo-Spinks-Houghton unit and the Fox-Oshtemo-Houghton unit.

The Marlette, Capac, and Riddles soils in the Marlette-Capac-Houghton unit and the Riddles-Marlette-Houghton unit have the best suitability for use as farmland. Their suitability should be considered in broad planning. A considerable acreage already is being used for building sites, golf courses, and other nonfarm uses.

In some areas of the county the soils are well suited to farming but are poorly suited to nonfarm uses. For example, the Capac soils in the Marlette-Capac-Houghton unit have good suitability for farming and are among the best soils for cropland in the county. Wetness is a limitation to farm uses of Capac soils, but proper drainage and shaping of the surface can overcome this limitation.

Most of the soils in the county have good or fair suitability for woodland use.

The Urban land-Spinks-Oshtemo unit, the hilly parts of the Oshtemo-Spinks-Houghton unit, the Marlette-Capac-Houghton unit, and the Fox-Oshtemo-Houghton unit have good suitability for use as sites for parks and other recreation areas. Hardwood forests enhance the beauty of much of these map units. The areas of undrained Houghton soils, which provide habitat for many species of wildlife, are good nature study areas.

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 "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 underlying material, 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 underlying material. They also can differ in slope, stoniness, 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, Marlette sandy loam, 1 to 6 percent slopes, is one of several phases in the Marlette series.

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

A *soil complex* consists of two or more soils 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. Fox-Riddles sandy loams, 1 to 6 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Sloan-Marlette association 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 a mapped area 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. Brookston and Colwood loams 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 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.

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

10B—Marlette sandy loam, 1 to 6 percent slopes. This nearly level and undulating, moderately well drained soil is on low knolls and ridges. Most areas are dissected by shallow drainageways. Slopes are smooth and convex and are generally less than 100 feet long. Areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is dark grayish brown sandy loam about 8 inches thick. The subsoil is firm and is about 23 inches thick. In the upper part it is dark yellowish brown clay loam, and in the lower part it is yellowish brown clay loam. The substratum to a depth of about 60 inches is yellowish brown and pale brown, mottled, calcareous loam (fig. 5).

Included in mapping are small areas of Fox and Oshtemo soils that are on landscape positions similar to those of the Marlette soil. These soils are more droughty than the Marlette soil. Also included are the somewhat poorly drained Capac and Metamora soils that are lower on the landscape than the Marlette soil and the very

Figure 5.—Profile of Marlette sandy loam, 1 to 6 percent slopes. The darker layer is the clay loam subsoil. Depth is marked in feet.

poorly drained Brookston soils that are in drainageways and shallow depressions. The included soils make up 5 to 15 percent of the map unit.

Permeability is moderately slow in this Marlette soil, and the available water capacity is high. Runoff is medium. The high water table is at a depth of 2.5 to 6.0 feet from December to April.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used for crops. It is well suited to use as cropland, pasture, and woodland and to recreation uses.

This soil is suited to building site development, but wetness is a limitation for buildings with basements. If buildings with basements are constructed, the use of well compacted fill to raise the site and the use of subsurface drainage to lower the water table can help to overcome the wetness limitation. This soil is poorly suited to use as septic tank absorption fields because of wetness and moderately slow permeability. Special construction measures, such as enlarging or alternating the absorption fields, are needed to overcome these limitations.

If this soil is used as cropland, the major management concerns are controlling erosion, maintaining organic matter content, and keeping the soil in good tilth. The use of contour tillage helps to reduce erosion. Crop residue or green manure helps to maintain the organic matter content and improve tilth.

This soil is in capability subclass IIe and Michigan soil management group 2.5a.

10C—Marlette sandy loam, 6 to 12 percent slopes. This moderately sloping and gently rolling, well drained soil is on low knolls and ridges and on short, uneven side slopes. Most areas are dissected by shallow drainageways. Slopes are smooth and convex and are generally less than 100 feet long. Areas are irregular in shape and are 2 to 140 acres in size.

Typically, the surface layer is dark grayish brown sandy loam about 8 inches thick. The subsoil is firm and is about 23 inches thick. In the upper part it is dark yellowish brown clay loam, and in the lower part it is yellowish brown clay loam. The substratum to a depth of about 60 inches is yellowish brown and pale brown, mottled, calcareous loam. In some places the depth to calcareous loam is less than 30 inches.

Included in mapping are small areas of the well drained Fox and Oshtemo soils that are on landscape positions similar to those of the Marlette soil. These soils are more droughty than the Marlette soil. Also included are the somewhat poorly drained Blount, Capac, and Metamora soils that are on lower landscape positions. The included soils make up 5 to 15 percent of the map unit.

Permeability is moderately slow in this Marlette soil, and the available water capacity is high. Runoff is medium or rapid.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used for crops. It is well suited to use as woodland and pasture and to recreation uses. It is fairly suited to cropland use.

This soil is suited to building site development. Slope is a limitation to this use. Land shaping and installing retaining walls help to overcome this limitation. This soil is poorly suited to use as septic tank absorption fields because of moderately slow permeability and slope. Special construction measures, such as enlarging or alternating the absorption fields, are needed to overcome the permeability limitation. Installing the

absorption field across the slope helps to overcome the slope limitation.

If this soil is used as cropland, the major management concerns are controlling runoff and erosion, maintaining organic matter content, and keeping the soil in good tilth. Practices that help prevent erosion and control runoff are the use of a crop rotation that includes hay or cover crops, the use of grassed waterways, and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface. Crop residue or green manure helps to maintain the organic matter content and improve tilth.

This soil is in capability subclass IIIe and Michigan soil management group 2.5a.

10D—Marlette loam, 12 to 18 percent slopes. This strongly sloping and rolling, well drained soil is on knolls and ridgetops and on short side slopes that are adjacent to drainageways, depressions, and swales. Some areas are dissected by small gullied drainageways. Slopes are smooth and convex and are generally less than 100 feet long. Areas are irregular in shape and are 2 to 160 acres in size.

Typically, the surface layer is dark brown loam about 6 inches thick. The subsoil is firm and is about 21 inches thick. In the upper part it is dark yellowish brown clay loam and pale brown loam, and in the lower part it is yellowish brown clay loam. The substratum to a depth of about 60 inches is brown, mottled, calcareous loam. In some places the depth to calcareous loam is less than 30 inches.

Included in mapping are small areas of the well drained Oshtemo soils that are on landscape positions similar to those of the Marlette soil. These soils are more droughty than the Marlette soil. Also included are the somewhat poorly drained Blount, Capac, and Metamora soils that are on foot slopes. The included soils make up 5 to 15 percent of the map unit.

Permeability is moderately slow in this Marlette soil, and the available water capacity is high. Runoff is rapid to very rapid.

In most areas this soil is used as woodland or pasture or is idle land. It is well suited to use as woodland. It is fairly suited to use as pasture. It is poorly suited to use as cropland and to recreation uses.

This soil is poorly suited to building site development because of slope and generally is not suited to use as septic tank absorption fields because of slope and moderately slow permeability.

This soil is in capability subclass IVe and Michigan soil management group 2.5a.

10E—Marlette loam, 18 to 35 percent slopes. This hilly and steep, well drained soil is on knolls and ridgetops and on short side slopes next to streams, drainageways, depressions, and lakes. Slopes vary considerably in gradient within short distances. They are smooth and convex and are generally less than 100 feet long. Areas are irregular in shape and are 2 to 160 acres in size.

Typically, the surface layer is dark brown loam about 6 inches thick. The subsoil is firm and is about 20 inches thick. In the upper part it is dark yellowish brown clay loam, and in the lower part it is yellowish brown clay loam. The substratum to a depth of about 60 inches is brown, mottled, calcareous loam. In some places the depth to calcareous loam is less than 30 inches.

Included in mapping are small areas of Arkport and Spinks soils that are on landscape positions similar to those of the Marlette soil. These soils are more droughty than the Marlette soil. The included soils make up 1 to 5 percent of the map unit.

Permeability is moderately slow in the Marlette soil, and the available water capacity is high. Runoff is very rapid.

In most areas this soil is used as woodland and pasture or is idle land. It is well suited to use as woodland. It is poorly suited to use as cropland and pasture and to recreation uses.

This soil generally is not suited to building site development because of slope. It generally is not suited to use as septic tank absorption fields because of slope and moderately slow permeability.

If this soil is used as woodland, the major management concerns are slope and erosion. The erosion hazard and slope limitation necessitate locating roads, skid trails, and landings on gentle grades and providing for water removal with water bars, out-sloping road surfaces, culverts, and drop structures.

This soil is in capability subclass VIIe and Michigan soil management group 2.5a.

11B—Capac sandy loam, 0 to 4 percent slopes. This nearly level and gently undulating, somewhat poorly drained soil is in broad, flat areas and on low knolls and ridges. Slopes are smooth and convex and are generally less than 100 feet long. Areas are irregular in shape and are 2 to about 250 acres in size.

Typically, the surface layer is very dark grayish brown sandy loam about 8 inches thick. The subsoil is mottled, firm clay loam about 24 inches thick. It is brown in the upper part and grayish brown in the lower part. The substratum to a depth of about 60 inches is pale brown, mottled, calcareous loam.

Included in mapping are small areas of the very poorly drained Brookston and Colwood soils that are in small depressions and narrow drainageways. Also included are small areas of the Selfridge and Dixboro soils that are on landscape positions similar to those of the Capac soil and are more droughty than the Capac soil. The included soils make up 4 to 12 percent of the map unit.

Permeability is moderately slow in this Capac soil, and the available water capacity is high. Runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet from November through May.

In most areas this soil is used as pasture or woodland or is idle land. In a few areas it is used as cropland. This

soil is well suited to use as cropland, pasture, and woodland. It is fairly suited to most recreation uses.

This soil is poorly suited to building site development because of wetness and generally is not suited to use as septic tank absorption fields because of wetness and moderately slow permeability. If this soil is used as a site for buildings, surface or subsurface drainage is needed to lower the water table and well compacted fill is needed to raise the site. Sanitary facilities should be connected to public sewers and sewage treatment facilities.

If this soil is used as cropland, the main management concerns are removing excess water and maintaining good tilth. Surface and subsurface drains help to overcome wetness. Conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, helps to reduce compaction and maintain good tilth.

This soil is in capability subclass IIw and Michigan soil management group 2.5b.

12—Brookston and Colwood loams. This map unit consists of nearly level, very poorly drained soils in broad, flat areas and in drainageways. These soils are subject to frequent ponding. Areas are irregular in shape and are 2 to 200 acres or more in size. In many areas of this map unit, the Brookston soil is the only major soil. In other areas the Colwood soil is the only major soil. Both soils are present in some areas.

Typically, the surface layer of the Brookston soil is very dark gray loam about 11 inches thick. The subsurface layer is very dark gray, mottled, friable loam about 5 inches thick. The mottled subsoil is about 20 inches thick. In the upper part it is grayish brown, firm clay loam; in the middle part it is grayish brown, friable clay loam; and in the lower part it is grayish brown, firm silty clay loam. The substratum to a depth of about 60 inches is mottled gray, calcareous loam. In some places the surface layer is lighter in color and is less than 10 inches thick.

Typically, the surface layer of the Colwood soil is very dark brown loam about 11 inches thick. The mottled, friable subsoil is about 26 inches thick. In the upper part it is dark grayish brown loam, in the middle part it is light olive gray loam and silty clay loam, and in the lower part it is light brownish gray silt loam. The substratum to a depth of about 60 inches is gray, mottled, calcareous, stratified silt loam and very fine sand. In some places the surface layer is lighter in color and is less than 10 inches thick.

Included in mapping are small areas of Sebewa and Gilford soils that are more droughty than the Brookston soil and are on landscape positions similar to those of the Brookston soil. Also included are small areas of somewhat poorly drained Capac, Kibbie, Metamora, and Selfridge soils that are on low knolls and ridges. The included soils make up 5 to 15 percent of the map unit.

Permeability is moderate in the Brookston and Colwood soils, and available water capacity is high. Runoff is very slow or ponded. Both soils have a high water table that is at or above the surface from October to May.

In most areas these soils are used as woodland or pasture or are idle land. In a few areas they are used for crops. They are well suited to use as cropland and pasture if excess water is removed. They are poorly suited to use as woodland or pasture and to recreation uses because of wetness.

These soils are poorly suited to building site development and generally are not suited to use as septic tank absorption fields because of wetness. They should not be used as sites for buildings with basements. If they are used as sites for buildings without basements, the use of surface or subsurface drainage to lower the water table and the use of well compacted fill to raise the site help to overcome the wetness limitation. Sanitary facilities should be connected to public sewers and sewage treatment facilities.

If these soils are used as cropland, the main management concerns are removing excess water and maintaining good tilth. Surface and subsurface drains help to overcome wetness. Tilling only when the soils are not wet and using tillage practices that do not invert the soil and that leave all or part of the crop residue on the surface help to improve tilth.

If these soils are used as woodland, the major limitation is wetness. The main management concerns are equipment restrictions, seedling mortality, and windthrow. The use of heavy equipment for planting, tending, and harvesting trees is restricted during wet periods. Woodland operations should be timed to seasons of the year when the soils are relatively dry or frozen. Seedling loss can be high because of wetness. In some areas special site preparation, such as bedding, helps to reduce seedling mortality. The use of harvesting methods that do not leave trees standing alone or widely spaced helps to control windthrow.

These soils are in capability subclass IIw and Michigan soil management groups 2.5c and 2.5c-s.

13B—Oshtemo-Boyer loamy sands, 0 to 6 percent slopes. This complex consists of nearly level and undulating, well drained soils that are on broad knolls and ridges. Slopes are smooth and convex and are less than 100 feet long. Areas of this complex are irregular in shape and are 2 to 320 acres in size. The Oshtemo soil makes up 40 to 55 percent of the complex, and the Boyer soil makes up about 30 to 40 percent. The areas of these soils are so intermingled or are so small that it was not practical to separate them at the scale of mapping used.

Typically, the Oshtemo soil has a surface layer of dark brown loamy sand about 7 inches thick. The subsurface layer is yellowish brown loamy sand about 9 inches thick. The subsoil is about 37 inches thick. The upper part is reddish brown, friable sandy loam; and the lower part is yellowish brown, very friable loamy sand. The

substratum to a depth of about 60 inches is calcareous, stratified sand and gravelly sand (fig. 6). In some places the lower part of the substratum includes discontinuous bands of sandy loam that are 1 to 3 inches thick.

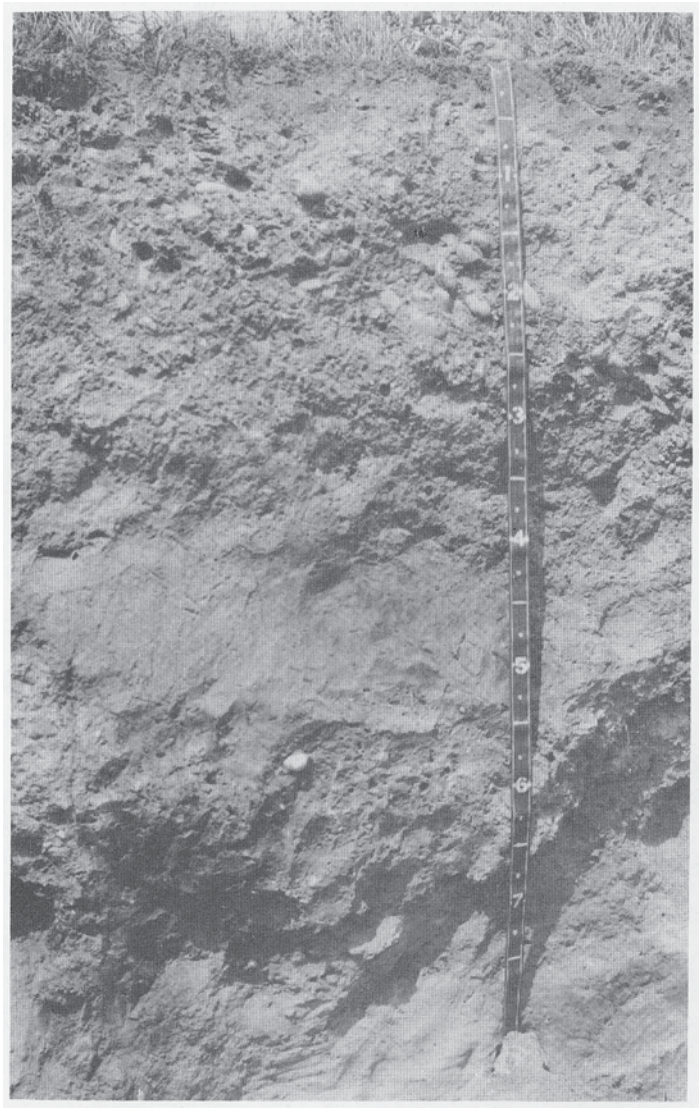


Figure 6.—Profile of Oshtemo loamy sand in an area of Oshtemo-Boyer loamy sands, 0 to 6 percent slopes. Depth is marked in feet.

Typically, the Boyer soil has a surface layer of dark grayish brown loamy sand about 6 inches thick. The subsurface layer is yellowish brown, very friable loamy sand about 12 inches thick. The subsoil is brown, friable gravelly sandy loam about 9 inches thick. The substratum to a depth of about 60 inches is light yellowish brown, calcareous stratified sand and gravelly sand.

Included in mapping are small areas of soils that are moderately well drained. These moderately well drained soils are on landscape positions similar to those of the Boyer soil or are in shallow depressions and narrow drainageways. Also included are small areas of the somewhat poorly drained Wasepi soils and the very poorly drained Gilford soils. These soils are in depressional areas and narrow drainageways. The included soils make up 3 to 15 percent of the complex.

Permeability is moderately rapid in the subsoil and very rapid in the substratum of the Oshtemo and Boyer soils. The available water capacity is moderate for the Oshtemo soil and low for the Boyer soil. Runoff is slow.

In most areas these soils are used as pasture or woodland or are idle land. These soils are well suited to use as pasture and woodland. They are fairly well suited to cropland use and to recreation uses.

These soils are well suited to building site development and to use as septic tank absorption fields. Poor filtering capacity is a limitation for septic tank absorption fields. The effluent drains satisfactorily, but ground water pollution is a hazard.

If these soils are used as cropland, the major management concerns are controlling soil blowing, overcoming droughtiness, and maintaining organic matter content. Cover crops, such as rye, protect fields from soil blowing. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, can help to maintain the content of organic matter and can help to overcome droughtiness.

If these soils are used as woodland, the major management concern is seedling mortality. Special site preparation, such as furrowing, helps to overcome the seedling mortality problem.

These soils are in capability subclass IIIs and Michigan soil management groups 3a and 4a.

13C—Oshtemo-Boyer loamy sands, 6 to 12 percent slopes. This complex consists of moderately sloping and gently rolling, well drained soils that are on knolls and ridgetops. Slopes are smooth and convex and are generally less than 100 feet long. Areas of this complex are irregular in shape and are 2 to 150 acres in size. Oshtemo loamy sand makes up 40 to 50 percent of the complex, and Boyer loamy sand makes up 25 to 35 percent. The areas of these soils are so intermingled or are so small that it was not practical to separate them at the scale of mapping used.

The Oshtemo soil typically has a surface layer of brown loamy sand about 6 inches thick. The subsurface layer is yellowish brown loamy sand about 11 inches thick. The subsoil is about 37 inches thick. In the upper part it is reddish brown, friable gravelly sandy loam; and in the lower part it is yellowish brown, very friable loamy

sand. The substratum to a depth of about 60 inches is pale brown, calcareous, stratified sand and gravelly sand.

The Boyer soil typically has a surface layer of dark grayish brown loamy sand about 6 inches thick. The subsurface layer is yellowish brown loamy sand about 11 inches thick. The subsoil is brown, friable gravelly sandy loam about 10 inches thick. The substratum to a depth of about 60 inches is light yellowish brown, calcareous, stratified sand and gravelly sand.

Included in mapping are small areas of the well drained Riddles soils that are on landscape positions similar to those of the Oshtemo and Boyer soils. These included soils are not as droughty as the Oshtemo and Boyer soils. Also included are small areas of the somewhat poorly drained Wasepi soils and the very poorly drained Gilford soils. These soils are in depressional areas and narrow drainageways. The included soils make up 5 to 20 percent of the complex.

Permeability is moderately rapid in the subsoil and very rapid in the substratum of the Oshtemo and Boyer soils. The available water capacity is moderate for Oshtemo soils and low for Boyer soils. Runoff is slow.

In most areas these soils are used as pasture or woodland or are idle land. In a few areas they are used as cropland. These soils are well suited to pasture and woodland. They are fairly suited to cropland use and to recreation uses.

These soils are suited to building site development, but slope is a limitation. Land shaping and installing retaining walls help to overcome the slope limitation. These soils are suited to septic tank absorption fields, but slope and poor filtering capacity are limitations. The effluent drains satisfactorily, but there is a hazard of ground water pollution. Land shaping and installing the absorption field across the slope help to overcome the slope limitation.

If these soils are used as cropland, the major management concerns are controlling soil blowing and water erosion, overcoming droughtiness, and maintaining organic matter content. Cover crops, such as rye, protect fields from water erosion and soil blowing. Contour tillage helps to slow runoff. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, can help to maintain organic matter content and overcome droughtiness.

If these soils are used as woodland, the major management concern is seedling mortality. Special site preparation, such as furrowing, helps to overcome the seedling mortality problem.

These soils are in capability subclass IIIe and Michigan soil management groups 3a and 4a.

13E—Oshtemo-Boyer loamy sands, 12 to 40 percent slopes. This complex consists of strongly sloping to very steep, well drained soils that are on knolls, ridgetops, and sides of hills. Slopes are smooth and convex and are generally less than 75 feet long. Areas of this complex are irregular in shape and are 2 to 300 acres in size. Oshtemo loamy sand makes up 40 to 60 percent of the complex, and Boyer loamy sand makes up 15 to 25 percent. The areas of these soils are so intermingled or are so small that it was not practical to separate them at the scale of mapping used.

The Oshtemo soil typically has a surface layer of brown loamy sand about 5 inches thick. The subsurface layer is yellowish brown loamy sand about 11 inches thick. The subsoil is about 37 inches thick. In the upper part it is reddish brown, friable sandy loam; and in the lower part it is yellowish brown, very friable loamy sand. The substratum to a depth of about 60 inches is pale brown, calcareous, stratified sand and gravelly sand.

The Boyer soil typically has a surface layer of dark grayish brown loamy sand about 8 inches thick. The subsoil is about 20 inches thick. It is yellowish brown, loose sand in the upper part and brown, friable sandy loam in the lower part. The substratum to a depth of about 60 inches is light yellowish brown, calcareous, stratified sand and gravelly sand. In places the soil is severely eroded. In some places slopes range to 65 percent.

Included in mapping are small areas of well drained Riddles and Arkport soils that are on landscape positions similar to those of the Oshtemo and Boyer soils. These soils make up 5 to 10 percent of the complex. The Riddles soils are not as droughty as the Oshtemo and Boyer soils. The Arkport soils do not have gravelly sand in the substratum. Also included in mapping are small areas of somewhat poorly drained Wasepi soils. These soils are in depressional areas and narrow drainageways and make up 2 to 5 percent of the complex.

Permeability is moderately rapid in the subsoil and very rapid in the substratum of the Oshtemo and Boyer soils. The available water capacity is moderate for Oshtemo soils and low for Boyer soils. Runoff is medium.

In most areas these soils are used as woodland or pasture. These soils are suited to woodland use. They are poorly suited to use as pasture and to recreation uses.

These soils are generally not suitable for building site development because of slope. They are generally not suitable for septic tank absorption fields because of slope and poor filtering capacity.

If these soils are used as woodland, the major management concerns are seedling mortality and erosion. Some seedling loss can be expected during dry summer months. Special site preparation, such as furrowing, helps to overcome this problem. The erosion hazard and slope necessitate locating roads, skid trails, and landings on gentle grades and providing for water removal with water bars, out-sloping road surfaces, culverts, and drop structures.

The soils in this complex are in capability subclass VIIe and Michigan soil management groups 3a and 4a.

14B—Oakville fine sand, 0 to 6 percent slopes. This nearly level to undulating, moderately well drained soil is in broad flat areas and on low knolls and ridges. Slopes are smooth and convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is dark brown fine sand about 7 inches thick. The subsoil is yellowish brown, loose fine sand about 30 inches thick. The substratum to a depth of about 60 inches is brownish yellow and pale brown fine sand. In some places there is loamy or clayey material below a depth of 50 inches.

Included in mapping are small areas of Oshtemo and Metea soils that are on landscape positions similar to those of the Oakville soil. These soils are not as droughty as the Oakville soil. Also included are the somewhat poorly drained Thetford and Tedrow soils that are on low knolls and the poorly drained and very poorly drained Granby soils that are in depressions and drainageways. These soils make up 3 to 10 percent of the map unit.

Permeability is rapid in this Oakville soil. The available water capacity is low. Runoff is very slow. The seasonal high water table is at a depth of 3 to 6 feet from November to April.

In most areas this soil is used as pasture or woodland or is idle land. This soil is well suited to use as pasture and fairly suited to use as woodland. It is poorly suited to cropland use.

This soil is suited to building site development, but wetness is a limitation for dwellings with basements. If dwellings with basements are constructed, the site should be raised with well compacted fill material and subsurface drainage should be installed to lower the water table. This soil is suited to use as septic tank absorption fields, but poor filtering capacity is a limitation. The effluent drains satisfactorily, but there is a hazard of ground water pollution.

If this soil is used as cropland, the major management concerns are controlling soil blowing, maintaining organic matter content, and conserving moisture. Cover crops, such as rye, protect fields from soil blowing. The use of a crop rotation that includes grasses and legumes and crop residue management can help to maintain the content of organic matter and can help to overcome droughtiness.

If this soil is used as woodland, the major management concern is seedling mortality. Seedling loss can be high because of the droughtiness of the soil. Special site preparation, such as furrowing, may be necessary in some areas to help overcome this problem.

This soil is in capability subclass IVs and Michigan soil management group 5a.

14C—Oakville fine sand, 6 to 18 percent slopes. This gently rolling and rolling, well drained soil is on knolls and ridgetops. Areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is dark brown fine sand about 7 inches thick. The subsoil is yellowish brown and brownish yellow, loose sand about 30 inches thick. The substratum to a depth of about 60 inches is pale brown sand. In some places there is loamy or clayey material below a depth of 50 inches.

Included with this soil in mapping are small areas of Oshtemo, Metea, and Arkport soils that are on landscape positions similar to those of the Oakville soil. These soils are not as droughty as the Oakville soil. Also included are the somewhat poorly drained Thetford soils and Tedrow soils that are on foot slopes or in narrow drainageways. These soils make up 4 to 15 percent of the map unit.

Permeability is rapid. The available water capacity is low. Runoff is slow.

In most areas this soil is used as pasture and woodland. This soil is fairly suited to use as pasture and woodland and to recreation uses. It is poorly suited to cropland use.

This soil is suited to building site development, but slope is a limitation. Land shaping and installing retaining walls or designing the building to complement the slope help to overcome this limitation. This soil is poorly suited to septic tank absorption fields because of slope and poor filtering capacity. Land shaping and installing the absorption field across the slope help to overcome the slope limitation. The effluent drains satisfactorily, but there is a hazard of ground water pollution.

If this soil is used as woodland, the major management concern is seedling mortality. Some seedling loss can be expected during dry summer months. Special site preparation, such as furrowing, helps to overcome this problem.

This soil is in capability subclass VIs and Michigan soil management group 5a.

15B—Spinks loamy sand, 0 to 6 percent slopes. This nearly level and undulating, well drained soil is in broad nearly level areas and on low knolls and ridges. Slopes are smooth and convex and are generally less than 100 feet long. Areas are irregular in shape and are 2 to 100 acres in size.

Typically, the surface layer is dark brown loamy sand about 9 inches thick. The subsurface layer is pale brown sand about 17 inches thick. The next layer, to a depth of about 60 inches, consists of brown, loose sand and thin strata of reddish brown, very friable loamy sand (fig. 7). In some areas gravelly sand is below a depth of about 40 inches, and in places loamy or clayey material is below a depth of 50 inches. Also, some areas are moderately well drained.

Included in mapping are small areas of Arkport and Oshtemo soils that are on landscape positions similar to those of the Spinks soil. These soils are not as droughty as the Spinks soil. Also included are small areas of somewhat poorly drained Tedrow and Thetford soils that are on lower landscape positions than the Spinks soil and areas of the poorly drained Granby soils and very

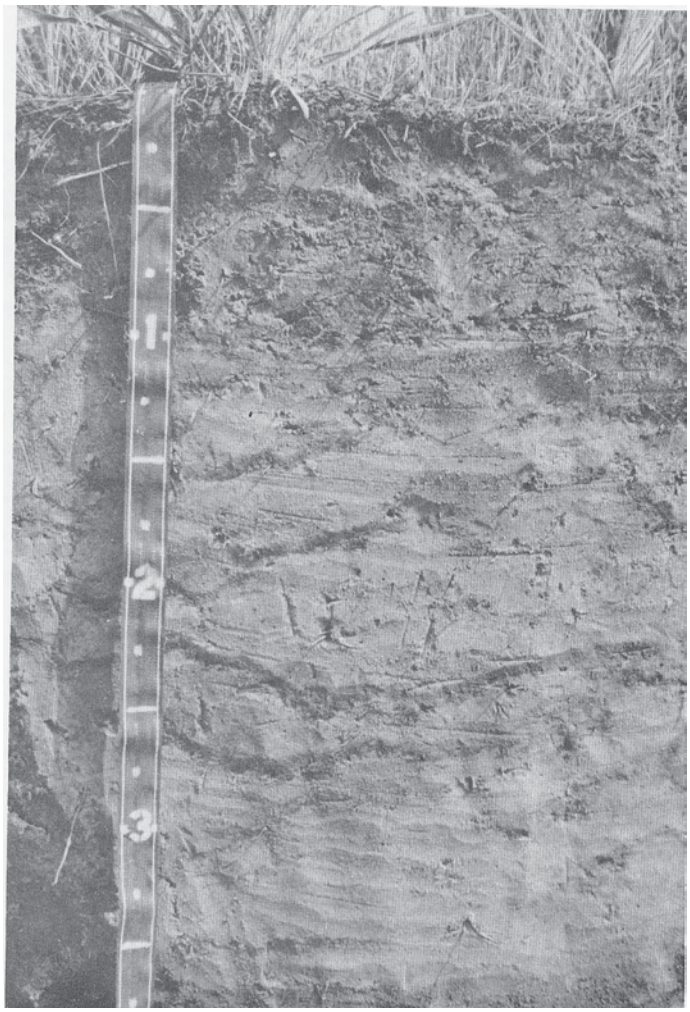


Figure 7.—Profile of Spinks loamy sand, 0 to 6 percent slopes. The dark wavy bands are loamy sand.

poorly drained Gilford and Houghton soils that are in depressions and drainageways. The included soils make up 5 to 15 percent of the map unit.

Permeability is moderately rapid in the Spinks soil, and the available water capacity is low. Runoff is slow.

In most areas this soil is used as pasture or woodland or is idle land. In a few areas it is used for crops and for apple orchards and nursery stock. It is fairly suited to use as cropland, pasture, and woodland. This soil is well suited to building site development and to use as septic tank absorption fields.

If this soil is used as cropland, the major management concerns are controlling soil blowing, overcoming droughtiness, and maintaining organic matter content. Cover crops, such as rye, protect fields from soil blowing. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, can help to maintain the organic matter content and to overcome droughtiness.

If this soil is used as woodland, the major management concern is seedling mortality. Some seedling loss can be expected during dry summer months. Special site preparation, such as furrowing, helps to overcome this problem.

This soil is in capability subclass IIIs and Michigan soil management group 4a.

15C—Spinks loamy sand, 6 to 12 percent slopes. This moderately sloping or gently rolling, well drained soil is on knolls and ridgetops. Slopes are smooth and convex and are generally less than 100 feet long. Areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is dark brown loamy sand about 8 inches thick. The subsurface layer is pale brown sand about 17 inches thick. The next layer to a depth of about 60 inches consists of yellowish brown, loose sand and thin strata of dark reddish brown, very friable loamy sand. In some areas gravelly sand is below a depth of about 35 inches. In some areas loamy or clayey material is below a depth of 50 inches.

Included in mapping are small areas of Arkport and Oshtemo soils that are on landscape positions similar to those of the Spinks soil. These soils are not as droughty as the Spinks soil. Also included are small areas of the somewhat poorly drained Tedrow and Thetford soils that are on low foot slopes and in drainageways and the very poorly drained Gilford soils and the poorly drained Granby soils that are in narrow drainageways. The included soils make up 2 to 8 percent of the map unit.

Permeability is moderately rapid in the Spinks soil, and the available water capacity is low. Runoff is medium to slow.

In most areas this soil is used as pasture or woodland or is idle land. In a few areas it is used as cropland. It is fairly suited to use as pasture, woodland, and cropland and to recreation uses.

This soil is suited to building site development and to use as septic tank absorption fields. Slope is a limitation to these uses. For buildings, land shaping and the use of retaining walls help to overcome the slope limitation. For septic tank absorption fields, land shaping and installing the absorption field across the slope help to overcome this limitation.

If this soil is used as cropland, the major management concerns are controlling water erosion and soil blowing, overcoming droughtiness, and maintaining organic matter content. Cover crops, such as rye, protect fields from water erosion and soil blowing. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, can help to maintain the organic matter content and to overcome droughtiness.

If this soil is used as woodland, the major management concern is seedling mortality. Some seedling loss can be expected during dry summer months. Special site preparation, such as furrowing, helps to overcome this problem.

This soil is in capability subclass IIIe and Michigan soil management group 4a.

15E—Spinks loamy sand, 12 to 35 percent slopes. This strongly sloping or rolling to steep, well drained soil is on knolls and ridgetops. Slopes are smooth and convex and are generally less than 100 feet long. Areas are irregular in shape and are 2 to 250 acres in size.

Typically, the surface layer is dark brown loamy sand about 7 inches thick. The subsurface layer is pale brown sand about 17 inches thick. The next layer to a depth of about 60 inches consists of brown, loose sand and thin strata of reddish brown, very friable loamy sand. In some areas gravelly sand is below a depth of 30 inches. Also, in some areas slopes are as much as 55 percent.

Included in mapping are small areas of Arkport soils that are on landscape positions similar to those of the Spinks soil. These soils are not as droughty as the Spinks soil. Also included are small areas of the somewhat poorly drained Tedrow and Thetford soils that are on foot slopes and in drainageways and the very poorly drained Gilford soils and the poorly drained Granby soils that are in short drainageways. The included soils make up 2 to 10 percent of the map unit.

Permeability is moderately rapid in the Spinks soil, and the available water capacity is low. Runoff is medium.

In most areas this soil is used as woodland or pasture. It is fairly suited to use as woodland. It is poorly suited to use as pasture and to recreation uses.

This soil is generally not suitable for building sites or for use as septic tank absorption fields because of slope.

If this soil is used as woodland, the major management concerns are seedling mortality, equipment limitations, and erosion. Some seedling loss can be expected during dry summer months. Special site preparation, such as furrowing, helps to overcome this problem. Normal planting and logging equipment can be used with care, but the erosion hazard and slope limitation necessitate locating roads, skid trails, and landings on gentle grades and providing for water removal with water bars, out-sloping road surfaces, culverts, and drop structures.

This soil is in capability subclass VIe and Michigan soil management group 4a.

17A—Wasepi sandy loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is in broad flat areas and on low knolls. Slopes are slightly convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 80 acres in size.

Typically, the surface layer is very dark gray sandy loam about 8 inches thick. The subsurface layer is brown, friable sandy loam about 7 inches thick. The subsoil is brown, mottled, friable sandy loam about 15 inches thick. The substratum to a depth of about 60 inches is grayish brown, calcareous gravelly sand. In some places the substratum is sand. In places the soil is moderately well drained.

Included in mapping are small areas of Matherton soils. These soils are on landscape positions similar to those of the Wasepi soil. They are not as droughty as the Wasepi soil. Also included are small areas of poorly drained Granby soils and very poorly drained Gilford soils that are in depressions. The included soils make up 2 to 8 percent of the map unit.

Permeability is moderately rapid in the subsoil of this Wasepi soil and very rapid in the substratum. The available water capacity is low. Runoff is slow. The seasonal high water table is at a depth of 1/2 foot to 2 feet from November to May.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used for crops. This soil is fairly suited to use as cropland. It is well suited to use as pasture and woodland. It is poorly suited to most recreation uses.

This soil is poorly suited to building site development because of wetness and is poorly suited to use as septic tank absorption fields because of wetness and poor filtering capacity. If this soil is used as a site for buildings, the use of surface or subsurface drains to lower the water table and the use of well compacted fill to raise the site help to overcome the wetness limitation. Special construction measures, such as elevating the systems, are needed for sewage disposal to overcome the wetness and poor filtering capacity.

If this soil is used as cropland, the main management concerns are overcoming wetness, conserving soil moisture during dry periods, maintaining organic matter content, and preventing soil blowing. The use of surface and subsurface drainage reduces wetness. Cover crops, such as rye, protect fields from soil blowing. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, help to maintain organic matter content and to overcome droughtiness.

This soil is in capability subclass IIIw and Michigan soil management group 4b.

18B—Fox sandy loam, 1 to 6 percent slopes. This nearly level to undulating, well drained soil is on foot slopes, knolls, and ridges. Some areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 150 acres in size.

Typically, the surface layer is very dark grayish brown sandy loam about 9 inches thick. The subsurface layer is brown gravelly sandy loam about 7 inches thick. The

subsoil is dark brown, firm gravelly sandy clay loam about 14 inches thick. The substratum to a depth of about 60 inches is brown, calcareous gravelly sand.

Included in mapping are small areas of well drained Spinks and Marlette soils that are on landscape positions similar to those of the Fox soil. The Spinks soils are more droughty than the Fox soil. The Marlette soils are less droughty and have a slower permeability rate. Also included are somewhat poorly drained Matherton soils that are on low knolls and in narrow drainageways at lower elevations. Also included are the very poorly drained Brookston and Gilford soils and poorly drained Sebewa soils that are in small depressions or narrow drainageways. The included soils make up 3 to 15 percent of the map unit.

Permeability is moderate in the subsoil of this Fox soil and very rapid in the substratum. The available water capacity is moderate. Runoff is slow. The shrink-swell potential is moderate.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used for crops. This soil is well suited to use as cropland, pasture, and woodland and to recreation uses.

This soil is well suited to building site development and is suitable for septic tank absorption fields. Poor filtering capacity is a limitation for septic tank absorption fields. The effluent drains satisfactorily, but there is a hazard of ground water pollution.

If this soil is used as cropland, the main management concerns are controlling runoff and erosion, maintaining organic matter content, and keeping the soil in good tilth. The use of contour tillage and contour stripcropping help to reduce runoff and erosion. Crop residue and green manure help to maintain the organic matter content and improve the tilth of the soil.

This soil is in capability subclass IIe and Michigan soil management group 3/5a.

18C—Fox sandy loam, 6 to 12 percent slopes. This moderately sloping or gently rolling, well drained soil is on side slopes, knolls, and ridges. Most areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is dark grayish brown sandy loam about 9 inches thick. The subsoil is firm and is about 24 inches thick. In the upper part it is dark brown gravelly sandy clay loam, and in the lower part it is dark yellowish brown gravelly clay loam. The substratum to a depth of about 60 inches is brown, calcareous, stratified sand and gravelly sand. In spots the soil is severely eroded.

Included in mapping are small areas of well drained Spinks, Boyer, and Marlette soils that are on landscape positions similar to those of the Fox soil. These soils, except the Marlette soils, are more droughty. The Marlette soils are less droughty and have a slower permeability rate. Also included are the somewhat poorly drained Matherton soils that are on low knolls, ridges, and narrow drainageways at lower elevations. Also included are the poorly drained Sebewa soils and very poorly drained Gilford soils that are in small depressions or narrow drainageways. The included soils make up 4 to 15 percent of the map unit.

Permeability is moderate in the subsoil of this Fox soil and very rapid in the substratum. The available water capacity is moderate. Runoff is medium. The shrink-swell potential is moderate.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used for crops. This soil is well suited to use as woodland and pasture and to recreation uses. It is fairly suited to cropland use.

This soil is suited to building site development, but slope is a limitation. Land shaping and installing retaining walls help to overcome the slope limitation. This soil is suited to use as septic tank absorption fields, but slope and poor filtering capacity are limitations. Land shaping and installing the absorption field across the slope help to overcome the slope limitation. The effluent drains satisfactorily, but there is a danger of ground water pollution.

If this soil is used as cropland, the major management concerns are controlling runoff and erosion, maintaining organic matter content, and keeping the soil in good tilth. Among the practices that help to prevent erosion and runoff are the use of a crop rotation that includes hay, the use of cover crops and grassed waterways, and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface. Crop residue and green manure help to maintain the organic matter content and improve the tilth of the soil.

This soil is in capability subclass IIIe and Michigan soil management group 3/5a.

18D—Fox sandy loam, 12 to 25 percent slopes. This strongly sloping or rolling to hilly, well drained soil is on side slopes, knolls, and ridges. Most areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex and are less than 100 feet long. Areas are dominantly irregular in shape but include meandering ridges, and they are 2 to 175 acres in size.

Typically, the surface layer is dark grayish brown sandy loam about 8 inches thick. The subsoil is firm and is about 22 inches thick. In the upper part it is dark brown gravelly sandy clay loam, and in the lower part it is dark yellowish brown gravelly clay loam. The substratum to a depth of about 60 inches is brown, calcareous, stratified sand and gravelly sand. In some spots the soil is severely eroded.

Included in mapping are small areas of well drained Spinks, Boyer, and Marlette soils that are on landscape positions similar to those of the Fox soil. These soils, except Marlette, are more droughty. Marlette soils are less droughty and have a slower permeability rate. Also included are the somewhat poorly drained Matherton

soils that are on low knolls and narrow drainageways at lower elevations. Also included are the poorly drained Sebewa soils and very poorly drained Gilford soils that are in small depressions or narrow drainageways. The included soils make up 3 to 12 percent of the map unit.

Permeability is moderate in the subsoil of this Fox soil and very rapid in the substratum. The available water capacity is moderate. Runoff is medium to rapid. The shrink-swell potential is moderate.

In most areas this soil is used as woodland or pasture or is idle land. This soil is well suited to pasture. It is fairly suited to woodland and recreation uses.

This soil is generally not suited to building site development because of slope. It is generally not suitable for septic tank absorption fields because of slope and poor filtering capacity.

If this soil is used as woodland, the major management concerns are equipment limitations and erosion. Normal planting and logging equipment can be used with care, but the erosion hazard and slope limitation necessitate locating roads, skid trails, and landings on gentle grades and providing for water removal with water bars, out-sloping road surfaces, culverts, and drop structures.

This soil is in capability subclass IVe and Michigan soil management group 3/5a.

19—Sebewa loam. This nearly level, poorly drained soil is in depressions and drainageways. It is subject to frequent ponding. Areas are irregular in shape and are 2 to 100 acres or more in size.

Typically, the surface layer is very dark gray loam about 11 inches thick. The subsoil is gray, mottled, firm clay loam about 21 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled calcareous gravelly sand. In some places the subsoil has more clay.

Included in mapping are small areas of the very poorly drained Houghton and Adrian soils that are in small depressions. Also included are somewhat poorly drained Wasepi and Matherton soils that are on low knolls. The included soils make up 2 to 10 percent of the map unit.

Permeability is moderate in the subsoil of this Sebewa soil and very rapid in the substratum. The available water capacity is moderate. Runoff is very slow to ponded. The high water table is at or above the surface from September to May.

In most areas this soil is used as woodland or pasture or is idle land. It is well suited to use as cropland and pasture and is poorly suited to most recreation uses and to woodland use.

This soil is generally not suited to building site development because of wetness. It should not be used as a site for buildings with basements. If this soil is used as a site for buildings without basements, the use of well compacted fill to raise the site and the use of surface or subsurface drains to lower the water table can help to overcome the wetness limitation. This soil is generally not suited to use as conventional septic tank absorption fields because of its wetness and poor filtering capacity. Sanitary facilities should be connected to public sewers and sewage treatment facilities.

If this soil is used as cropland, the main management concerns are overcoming wetness and maintaining good tilth. Providing adequate surface and subsurface drainage helps to overcome wetness. Tilling only when the soil is not wet and using conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, improve soil tilth.

If this soil is used as woodland, the major management concerns are equipment limitations, seedling mortality, and windthrow. The use of heavy equipment for planting, tending, and harvesting trees is restricted during wet periods. Woodland operations can be timed to seasons of the year when the soil is relatively dry or frozen. Seedling loss is high because of wetness. Special site preparation, such as bedding, can be used in some areas to reduce seedling loss. Selecting harvest methods that do not leave trees standing alone or widely spaced helps to control windthrow.

This soil is in capability subclass IIw and Michigan soil management group 3/5c.

20B—Glynwood loam, 2 to 6 percent slopes. This gently sloping, moderately well drained soil is on foot slopes, knolls, and ridgetops. Most areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 100 acres in size.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsurface layer is pale brown loam about 4 inches thick. The subsoil, about 19 inches thick, is dark yellowish brown. In the upper part it is firm clay, and in the lower part it is mottled, very firm clay. The substratum to a depth of about 60 inches is pale brown, calcareous clay loam. In some places the surface layer is sandy loam or loamy sand. In some places there is intermixing of surface material with the upper part of the subsoil.

Included in mapping are small areas of well drained Metea and Marlette soils that are on landscape positions similar to those of the Glynwood soil. These soils make up 5 to 12 percent of the map unit.

Permeability is slow in this Glynwood soil. The available water capacity is high. Runoff is medium. The shrink-swell potential is moderate. The high water table is at a depth of 2.0 to 3.5 feet from January to April.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used for crops. This soil is well suited to use as cropland and pasture. It is fairly suited to woodland use and to recreation uses.

This soil is poorly suited to building site development because of wetness and shrink-swell potential and to use as septic tank absorption fields because of slow permeability and wetness. If this soil is used as a site for

buildings, drains should be installed around foundations and then the foundations should be backfilled with suitable material. Special construction measures, such as enlarging or alternating the absorption fields, are needed for septic tank systems.

If this soil is used as cropland, the main management concerns are controlling runoff and erosion, maintaining organic matter content, and maintaining good tilth. Contour tillage helps to reduce runoff and erosion. Crop residue and green manure help to maintain the organic matter content and improve the tilth of the soil.

If this soil is used as woodland, the major management concern is seedling mortality. Special harvest methods that leave some mature trees to protect the seedlings from the sun and wind may be needed.

This soil is in capability subclass IIe and Michigan soil management group 1.5b.

20C—Glynwood loam, 6 to 12 percent slopes. This moderately sloping or gently rolling, moderately well drained soil is on knolls and ridgetops. Most areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex. Areas are irregular in shape and 2 to 100 acres in size.

Typically, the surface layer is grayish brown loam about 7 inches thick. The subsurface layer is pale brown loam about 2 inches thick. The subsoil, about 24 inches thick, is dark yellowish brown. In the upper part it is firm clay, and in the lower part it is mottled, very firm clay. The substratum to a depth of about 60 inches is pale brown, calcareous clay loam. In some places there is intermixing of the subsurface material with the upper part of the subsoil. In some places the surface layer is sandy loam.

Included in mapping are small areas of well drained Metea and Marlette soils on landscape positions similar to those of the Glynwood soil. Also included are small areas of the somewhat poorly drained Blount soils at the base of slopes and in narrow drainageways and depressions. Also included are small areas of the poorly drained and very poorly drained Lenawee, Brookston, Houghton, and Adrian soils in depressions, seep areas at the base of hills, and narrow drainageways. The included soils make up 3 to 12 percent of the map unit.

Permeability is slow in this Glynwood soil. The available water capacity is high. Runoff is rapid. The shrink-swell potential is moderate. The high water table is at a depth of 2.0 to 3.5 feet from January to April.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used for crops. This soil is fairly suited to use as cropland and woodland and to recreation uses. It is well suited to use as pasture.

This soil is poorly suited to building site development because of wetness, shrink-swell potential, and slope. Drainage should be provided around foundations and then the foundations should be backfilled with suitable material. Land shaping is needed for building site development. This soil is poorly suited to septic tank absorption fields because of slow permeability and wetness. Special construction measures, such as enlarging the absorption fields, are needed for septic tank systems.

If this soil is used as cropland, the major management concerns are controlling runoff and erosion, maintaining organic matter content, and keeping the soil in good tilth. The use of a crop rotation that includes hay, the use of cover crops and grassed waterways, and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, help to reduce erosion and runoff. Crop residue and green manure help to maintain the organic matter content and improve the tilth of the soil.

If this soil is used as woodland, the major management concern is seedling mortality. Special harvest methods that leave some mature trees to protect the seedlings from the sun and wind may be needed.

This soil is in capability subclass IIIe and Michigan soil management group 1.5a.

23B—Sisson fine sandy loam, 1 to 6 percent slopes. This nearly level and undulating, well drained soil is on foot slopes, knolls, and ridges. Most areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is dark brown fine sandy loam about 8 inches thick. The subsurface layer is brown fine sandy loam about 4 inches thick. The subsoil is firm, yellowish brown loam about 23 inches thick. The substratum to a depth of about 60 inches is yellowish brown, calcareous stratified silt loam and very fine sand.

Included in mapping are small areas of Metea and Oshtemo soils that are on landscape positions similar to those of the Sisson soil. These soils are more droughty than the Sisson soil. Also included are the somewhat poorly drained Kibbie and Dixboro soils that are on low knolls and ridges at lower elevations. Also included are the very poorly drained Brookston and Houghton soils that are in small depressions or narrow drainageways. The included soils make up 3 to 11 percent of the map unit.

Permeability is moderate in this Sisson soil. The available water capacity is high. Runoff is slow. The shrink-swell potential is moderate.

In most areas this soil is used as woodland or pasture or is idle land. This soil is well suited to use as cropland, pasture, and woodland and to recreation uses. It is well suited to building site development and to use as septic tank absorption fields.

If this soil is used as cropland, the main management concerns are controlling runoff and erosion and maintaining organic matter content and tilth. Contour tillage helps to reduce runoff and erosion. Crop residue and green manure help to maintain the organic matter content and improve the tilth of the soil.

This soil is in capability subclass IIe and Michigan soil management group 2.5a-s.

23C—Sisson fine sandy loam, 6 to 12 percent slopes. This moderately sloping or gently rolling and rolling, well drained soil is on knolls and ridgetops. Most areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex and are less than 200 feet long. Areas are irregular in shape and are 2 to 100 acres in size.

Typically, the surface layer is dark brown fine sandy loam about 7 inches thick. The subsurface layer is brown fine sandy loam about 3 inches thick. The subsoil is firm, yellowish brown loam about 20 inches thick. The substratum to a depth of about 60 inches is yellowish brown, calcareous stratified silt loam and very fine sand.

Included in mapping are small areas of Metea and Oshtemo soils that are on landscape positions similar to those of the Sisson soil. These soils are more droughty than the Sisson soil. Also included are the somewhat poorly drained Kibbie and Dixboro soils that are on foot slopes, low knolls, and ridges at elevations below the Sisson soil. Also included are the very poorly drained Houghton and Adrian soils that are in depressions and drainageways. The included soils make up 3 to 12 percent of the map unit.

Permeability is moderate in this Sisson soil. The available water capacity is high. Runoff is medium to rapid. The shrink-swell potential is moderate.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used as cropland. This soil is fairly suited to cropland and recreation uses. It is well suited to use as pasture and woodland.

This soil is suited to building site development and to use as septic tank absorption fields, but slope is a limitation. For buildings, land shaping and installing retaining walls help to overcome the slope limitation. For septic tank absorption fields, land shaping and installing the absorption field across the slope help to overcome this limitation.

If this soil is used as cropland, the main management concerns are controlling runoff and erosion, maintaining organic matter content, and keeping this soil in good tilth. Contour tillage helps to reduce erosion and runoff. Crop residue and green manure help to maintain the organic matter content and improve the tilth of the soil.

This soil is in capability subclass IIIe and Michigan soil management group 2.5a-s.

25B—Owosso sandy loam, 1 to 6 percent slopes. This nearly level and undulating, well drained soil is on foot slopes, knolls, and ridges. Most areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 100 acres in size.

Typically, the surface layer is dark brown sandy loam about 7 inches thick. The subsurface layer is pale brown fine sandy loam about 4 inches thick. The subsoil is about 34 inches thick. In the upper part it is yellowish brown, friable fine sandy loam; in the middle part it is dark yellowish brown, friable sandy loam; and in the lower part it is dark yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, calcareous loam.

Included in mapping are small areas of Metea, Oshtemo, and Boyer soils that are on landscape positions similar to those of the Owosso soil. These soils are more droughty than the Owosso soil. Also included are the somewhat poorly drained Capac and Metamora soils that are on low knolls and ridges at lower elevations. Also included are the very poorly drained Houghton soils that are in small depressions and narrow drainageways. The included soils make up 3 to 10 percent of the map unit.

Permeability is moderately rapid in the upper part of the subsoil of this Owosso soil and moderately slow in the lower part of the subsoil and in the substratum. The available water capacity is high. Runoff is slow. The shrink-swell potential is moderate.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used as cropland. This soil is well suited to use as cropland, pasture, and woodland and to recreation uses.

This soil is well suited to building site development and poorly suited to use as septic tank absorption fields because of moderately slow permeability. Special construction measures, such as enlarging or alternating the absorption fields, are needed to overcome the permeability limitation.

If this soil is used as cropland, the main management concerns are controlling runoff and erosion, maintaining organic matter content, and keeping the soil in good tilth. Contour tillage helps to reduce erosion and runoff. Crop residue and green manure help to maintain organic matter content and improve tilth.

This soil is in capability subclass IIe and Michigan soil management group 3/2a.

25C—Owosso sandy loam, 6 to 12 percent slopes. This moderately sloping or gently rolling, well drained soil is on knolls and ridgetops. Most areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex and are less than 200 feet long. Areas are irregular in shape and are 2 to 90 acres in size.

Typically, the surface layer is brown sandy loam about 6 inches thick. The subsurface layer is yellowish brown sandy loam about 3 inches thick. The subsoil is about 30 inches thick. In the upper part it is yellowish brown and dark yellowish brown, mottled, friable sandy loam and fine sandy loam; and in the lower part it is dark yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, calcareous loam.

Included in mapping are small areas of well drained Oshtemo, Boyer, and Marlette soils that are on

landscape positions similar to those of the Owosso soil. These soils, except Marlette, are more droughty than the Owosso soil. The Marlette soils have slower permeability in the subsoil. Also included are the somewhat poorly drained Capac and Metamora soils that are on low knolls and ridges at lower elevations. Also included are the very poorly drained Brookston soils that are in small depressions or narrow drainageways. The included soils make up 4 to 10 percent of the map unit.

Permeability is moderately rapid in the upper part of the subsoil of this Owosso soil and moderately slow in the lower part of the subsoil and in the substratum. The available water capacity is high. Runoff is medium. The shrink-swell potential is moderate.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used as cropland. This soil has fair suitability for cropland use and recreation uses. It is well suited to use as woodland and pasture.

This soil is suited to building site development, but slope is a limitation. Land shaping and installing retaining walls help to overcome this limitation. This soil is poorly suited to use as septic tank absorption fields because of its moderately slow permeability and slope. Special structures, such as enlarged septic tank absorption fields or alternating drain fields, are needed to overcome the permeability limitation. Installing the absorption field across the slope helps to overcome the slope limitation.

If this soil is used as cropland, the main management concerns are controlling runoff and erosion, maintaining organic matter content, and keeping the soil in good tilth. Contour tillage and contour stripcropping help to reduce erosion and runoff. Crop residue and green manure help to maintain the organic matter content and improve the tilth of the soil.

This soil is in capability subclass IIIe and Michigan soil management group 3/2a.

26—Sloan silt loam. This nearly level, very poorly drained soil is on flood plains. It is subject to frequent flooding. Areas are irregular in shape and are 2 to 100 acres in size.

Typically, the surface layer is dark brown silt loam about 11 inches thick. The subsurface layer is dark gray silt loam about 3 inches thick. The subsoil is grayish brown, mottled, friable silt loam about 22 inches thick. The substratum to a depth of about 60 inches is gray, mottled, calcareous stratified silty clay loam and fine sandy loam and thin layers of very dark brown fine sandy loam. In some places the subsoil and the substratum are more clayey. Some places are mucky.

Included in mapping are small areas of the somewhat poorly drained Thetford and Wasepi soils. These soils are on low knolls. They make up 2 to 9 percent of the map unit.

Permeability is moderate or moderately slow in this Sloan soil. The available water capacity is high. Runoff is very slow or ponded. The high water table is near or above the surface from November to June.

In most areas this soil is used as woodland. In a few areas it is used as pasture. This soil is poorly suited to use as woodland, pasture, and cropland and to recreation uses. It is not suitable for building site development or for use as septic tank absorption fields because of flooding.

If this soil is used as woodland, the major management concerns are equipment limitations, seedling mortality, and windthrow. Woodland operations should be timed to seasons of the year when the soil is relatively dry or is frozen. Special site preparation, such as bedding, can be used in some areas to help reduce seedling loss. The use of harvest methods that do not leave trees standing alone or widely spaced helps to control windthrow.

This soil is in capability subclass Vw and Michigan soil management group L-2c.

27—Houghton and Adrian mucks. These nearly level, very poorly drained soils are in bogs or upland depressions. They are subject to ponding. Areas are irregular in shape and are 2 to 200 acres in size. Many areas of this map unit are predominantly Houghton soil; other areas are predominantly Adrian soil. Both soils are present in some areas.

Typically, the surface layer of the Houghton soil is black muck about 8 inches thick. The material below that, to a depth of about 60 inches, is black muck also.

Typically, the surface layer of the Adrian soil is black muck about 10 inches thick. The subsurface layer is black, friable muck about 20 inches thick. The substratum, to a depth of about 60 inches, is gray, calcareous gravelly sand. In some places marl or loamy material is at a depth of 16 to 50 inches. In some places there is a soil similar to the Houghton soil except it has thicker layers of mucky peat or sedimentary peat.

Included in mapping are small areas of Brookston and Granby soils that are on narrow areas along the outer edges of the map unit. The Brookston soils have slower permeability and Granby soils are more droughty than the Houghton soil. The included soils make up 3 to 8 percent of the map unit.

Permeability is moderately slow to moderately rapid in the muck and rapid in the underlying material. The available water capacity is high. Runoff is very slow. These soils have a high water table at or above the surface from November to May.

In most areas these soils are used as woodland or are idle land. In a few areas they are used for unimproved pasture, crops, or sod production. They are poorly suited to use as woodland and pasture and to recreation uses. These soils are not suited to building site development or to use as septic tank absorption fields because of ponding.

If suitable drainage outlets are available and these soils are drained and protected from soil blowing, they are suited to corn or to specialty crops, such as potatoes, carrots, onions, and mint.

If these soils are used as woodland, the major management concerns are seedling mortality, equipment limitations, and windthrow. The use of heavy equipment for planting, tending, and harvesting trees is restricted during wet periods. Woodland operations can be timed to seasons of the year when the soils are relatively dry or frozen.

These soils are in capability subclass Vw and Michigan soil management groups Mc and M/4c.

31B—Metea loamy sand, 0 to 6 percent slopes. This nearly level and undulating, well drained soil is on flat plains, knolls, and ridges. Slopes are smooth and convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is dark brown loamy sand about 10 inches thick. The subsurface layer consists of brown sand and yellowish brown loamy sand and is about 20 inches thick. The subsoil is brown loam about 8 inches thick. The substratum to a depth of 60 inches is brown, calcareous loam.

Included in mapping are small areas of Arkport, Owosso, Marlette, and Spinks soils that are on landscape positions similar to those of the Metea soil. The Owosso and Marlette soils are less droughty and the Spinks soils are more droughty than the Metea soil. Arkport soils are more permeable. Also included in mapping are the somewhat poorly drained Selfridge soils that are on low knolls below the Metea soil and the poorly drained Sebewa soils that are in depressions and drainageways. The included soils make up 2 to 10 percent of the map unit.

Permeability is very rapid in the upper part of this Metea soil and moderate in the subsoil and in the substratum. The available water capacity is moderate. Surface runoff is slow.

In most areas this soil is used as pasture or woodland or is idle land. In a few areas it is used for crops. This soil is well suited to use as pasture. It is fairly suited to use as cropland and woodland and to recreation uses.

This soil is well suited to building site development. It is suited to use as septic tank absorption fields, but moderate permeability is a limitation to this use. Special construction measures, such as enlarging or alternating the absorption fields, may be needed to overcome the permeability limitation.

If this soil is used as cropland, the major management concerns are controlling soil blowing, overcoming droughtiness, and maintaining the organic matter content. Cover crops, such as rye, protect fields from soil blowing. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, can help to maintain the organic matter content and overcome droughtiness.

If this soil is used as woodland, the major management concern is seedling mortality. Seedling loss can be high because of the droughtiness of the soil. Special site preparation, such as furrowing, helps to overcome this problem.

This soil is in capability subclass IIIe and Michigan soil management group 4/2a.

31C—Metea loamy sand, 6 to 12 percent slopes. This moderately sloping or gently rolling, well drained soil is on knolls and ridges. Slopes are smooth and convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 150 acres in size.

Typically, the surface layer is dark brown loamy sand about 7 inches thick. The subsurface layer is brown and yellowish brown sand and loamy sand and is about 20 inches thick. The subsoil is brown loam about 8 inches thick. The substratum to a depth of 60 inches is brown, calcareous loam.

Included in mapping are small areas of Arkport, Owosso, Marlette, and Spinks soils that are on landscape positions similar to those of the Metea soil. The Owosso and Marlette soils are less droughty and the Spinks soils are more droughty than the Metea soil. Arkport soils are more permeable in the subsoil. Also included in mapping are the somewhat poorly drained Selfridge soils that are on low knolls and ridges below the Metea soil and the poorly drained Sebewa soils that are in depressions and drainageways. The included soils make up 5 to 15 percent of the map unit.

Permeability is very rapid in the upper part of this Metea soil and moderate in the subsoil and in the substratum. The available water capacity is moderate. Surface runoff is slow to medium.

In most areas this soil is used as pasture or woodland or is idle land. In a few areas it is used as cropland. This soil is well suited to use as pasture. It is fairly suited to use as cropland and woodland and to recreation uses.

This soil is suited to building site development, but slope is a limitation. Land shaping and installing retaining walls help to overcome the slope limitation. This soil is suitable for septic tank absorption fields, but moderate permeability and slope are limitations. Special construction measures, such as enlarging or alternating the absorption fields, may be needed to overcome the permeability limitation. Land shaping and installing the absorption field across the slope help to overcome the slope limitation.

If this soil is used as cropland, the major management concerns are controlling soil blowing and runoff, overcoming droughtiness, and maintaining organic matter content. Cover crops, such as rye, protect fields from soil blowing. Contour tillage helps to slow runoff. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, can help to maintain the content of organic matter and overcome droughtiness.

If this soil is used as woodland, the major management concern is seedling mortality. Seedling loss can be high because of the droughtiness of the soil.

Special site preparation, such as furrowing, helps to overcome this problem.

This soil is in capability subclass IIIe and Michigan soil management group 4/2a.

32B—Blount loam, 0 to 4 percent slopes. This nearly level and gently undulating, somewhat poorly drained soil is in broad, nearly level areas and on low knolls. Slopes are slightly convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is dark gray loam about 7 inches thick. The subsoil is mottled and is about 23 inches thick. In the upper part it is brown, firm silty clay loam; and in the lower part it is grayish brown, very firm clay. The substratum to a depth of about 60 inches is brown, mottled, calcareous silty clay loam.

Included in mapping are small areas of moderately well drained Glynwood soils and poorly drained Sebewa and Lenawee soils. The Glynwood soils are on slightly higher knolls. The Sebewa and Lenawee soils are in shallow depressions and narrow drainageways. The included soils make up 2 to 10 percent of the map unit.

Permeability is slow or moderately slow in this Blount soil. The available water capacity is high. Runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet from January through May. The shrink-swell potential is moderate.

In most areas this soil is used for urban development. In a few areas it is used as pasture, cropland, or woodland or is idle land. This soil is well suited to use as cropland and pasture. It is fairly suited to woodland use and to recreation uses.

This soil is poorly suited to building site development because of wetness. It is generally not suited to use as septic tank absorption fields because of wetness and slow permeability. If the soil is used as a site for buildings, the use of surface or subsurface drainage to lower the water table and the use of well compacted fill to raise the site help to overcome the wetness limitation. Sanitary facilities should be connected to public sewers and sewage treatment facilities.

If this soil is used as cropland, the main management concerns are controlling wetness and maintaining good soil tilth. Surface and subsurface drains help to overcome the wetness limitation. Conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, helps to reduce soil compaction and maintain good tilth.

This soil is in capability subclass IIw and Michigan soil management group 1.5b.

33—Lenawee silty clay loam. This nearly level, poorly drained soil is in depressional areas and drainageways. It is subject to frequent ponding. Areas are irregular in shape and are 2 to 150 acres in size.

Typically, the surface layer is very dark gray silty clay loam about 8 inches thick. The subsoil is mottled and is about 45 inches thick. In the upper part it is dark gray, firm silty clay loam; in the middle part it is gray, very firm silty clay; and in the lower part it is gray, very firm silty clay loam. The substratum to a depth of about 60 inches is light yellowish brown, mottled, calcareous silty clay loam. In some places the surface layer is lighter colored.

Included in mapping are small areas of Sebewa soils that are on landscape positions similar to those of the Lenawee soil. The Sebewa soils are more droughty than the Lenawee soil. Also included are small areas of the very poorly drained Houghton and Adrian soils that are in small depressions and small areas of the somewhat poorly drained Blount soils that are on low knolls. The included soils make up 2 to 10 percent of the map unit.

Permeability is moderately slow in this Lenawee soil. The available water capacity is high. Runoff is very slow to ponded. The high water table is at or above the surface from November to May.

In most areas this soil is used as woodland or pasture or is idle land. This soil is well suited to use as cropland and pasture if it is drained. It is poorly suited to woodland use and to recreation uses.

This soil is poorly suited to building site development because of wetness. It should not be used as a site for buildings with basements. If this soil is used as a site for buildings without basements, the use of surface or subsurface drainage to lower the water table and the use of well compacted fill to raise the site help to overcome the wetness limitation. This soil generally is not suited to use as septic tank absorption fields because of wetness and slow permeability. Sanitary facilities should be connected to public sewers and sewage treatment facilities.

If this soil is used as cropland, the major management concerns are removing excess water and maintaining good tilth. Surface and subsurface drains help to overcome the wetness limitation. Tilling only when the soil is not wet and using conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, help to improve tilth.

If this soil is used as woodland, the major management concerns are equipment limitations, seedling mortality, and windthrow. The use of heavy equipment for planting, tending, and harvesting trees is restricted during wet periods. Woodland operations can be timed to seasons of the year when the soil is relatively dry or frozen. Seedling loss can be high because of wetness. Special site preparation, such as bedding, can be used in some areas to help reduce seedling loss. The use of harvest methods that do not leave trees standing alone or widely spaced helps to prevent windthrow.

This soil is in capability subclass IIw and Michigan soil management group 1.5c.

34B—Kibbie fine sandy loam, 0 to 4 percent slopes. This nearly level and gently undulating, somewhat poorly drained soil is in broad, nearly level

areas and on low knolls. Slopes are smooth and convex and are generally less than 100 feet long. Areas are irregular in shape and are 2 to 100 acres in size.

Typically, the surface layer is very dark grayish brown fine sandy loam about 9 inches thick. The subsoil is brown and mottled and is about 23 inches thick. In the upper part it is clay loam, and in the lower part it is silt loam. The substratum to a depth of about 60 inches is light yellowish brown, mottled, calcareous, stratified very fine sand and silt loam. In some places the surface layer and subsoil are more than 40 inches thick.

Included in mapping are small areas of the very poorly drained Houghton, Thomas, and Brookston soils that are in small depressions and narrow drainageways. Also included are small areas of the Selfridge and Dixboro soils that are on landscape positions similar to those of the Kibbie soil. They are more droughty than the Kibbie soil. Also included are some areas of soils that are similar to the Kibbie soil except that they are moderately well drained and slightly more sloping. These soils are on side slopes bordering drainageways, knolls, and ridgetops. The included soils make up as much as 10 percent of the map unit.

Permeability is moderate in this Kibbie soil, and the available water capacity is high. Runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet from November through May.

In most areas this soil is used as pasture or woodland or is idle land. This soil is well suited to use as cropland, pasture, and woodland. It is fairly suited to most recreation uses.

This soil is poorly suited to building site development and to use as septic tank absorption fields because of wetness. If the soil is used as a site for buildings, the use of surface or subsurface drainage to lower the water table and the use of well compacted fill to raise the site helps to overcome the wetness limitation. For septic tank absorption fields, special construction, such as filling or mounding the absorption field site with suitable soil material, may be needed to raise the field above the water table.

If this soil is used as cropland, the main management concerns are removing excess water and maintaining good soil tilth. Surface and subsurface drains help to overcome the wetness limitation. Conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, helps to reduce compaction and maintain good tilth. Also, keeping tillage operations to a minimum helps to maintain good tilth.

This soil is in capability subclass IIw and Michigan soil management group 2.5b.

35A—Thetford loamy fine sand, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on broad plains characterized by slight rises. Slopes are slightly convex. Areas are irregular in shape and are 2 to 100 acres in size.

Typically, the surface layer is very dark grayish brown loamy fine sand about 9 inches thick. The subsurface layer is light yellowish brown loamy fine sand about 11 inches thick. The subsoil consists of pale brown, mottled fine sand and thin, discontinuous strata of dark brown, very friable loamy sand about 25 inches thick. The substratum to a depth of about 60 inches is pale brown and light brownish gray, mottled, calcareous fine sand and sand. In some places the surface layer contains pebbles or is lighter colored. In some places the subsoil contains layers of gravelly sand or contains thicker, discontinuous layers of finer textured material.

Included in mapping are small areas of the Metamora, Dixboro, and Kibbie soils that are on landscape positions similar to those of the Thetford soil. These soils are not as droughty as the Thetford soil. Also included are small areas of poorly drained Granby and Sebewa soils and very poorly drained Gilford and Thomas soils that are in depressions and drainageways. The included soils make up 2 to 9 percent of the map unit.

Permeability is moderately rapid in this Thetford soil. The available water capacity is low. Runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet from February through May.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used as cropland. This soil is well suited to pasture. It is fairly suited to use as cropland and woodland and to recreation uses.

This soil is poorly suited to building site development and to use as septic tank absorption fields because of wetness. If this soil is used as a site for buildings, the use of surface or subsurface drainage to lower the water table and the use of well compacted fill to raise the site help to overcome the wetness limitation. For septic tank absorption fields, special construction, such as filling or mounding the absorption field site with suitable soil material, may be needed to raise the field above the water table.

If this soil is used as cropland, the main management concerns are overcoming wetness and droughtiness, preventing soil blowing, and maintaining the organic matter content. Subsurface drains reduce the wetness limitation. Cover crops, such as rye, protect fields from soil blowing. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, help to maintain the organic matter content and conserve moisture.

If this soil is used as woodland, the major management concern is seedling mortality. Some seedling loss can be expected because of droughtiness during dry summer months. Special site preparation, such as furrowing, helps to overcome the seedling mortality.

This soil is in capability subclass IIIw and Michigan soil management group 4b.

36A—Metamora sandy loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on broad, flat plains and low knolls. Slopes are slightly

convex and are less than 75 feet long. Areas are irregular in shape and are 2 to 100 acres in size.

Typically, the surface layer is very dark grayish brown sandy loam about 9 inches thick. The subsurface layer consists of grayish brown and pale brown sandy loam and is about 19 inches thick. The subsoil is grayish brown, mottled, firm clay loam and is about 8 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled, calcareous loam. In the southern part of the county, this soil has a clayey substratum.

Included in mapping are small areas of Dixboro and Selfridge soils that are on landscape positions similar to those of the Metamora soil. The Dixboro and Selfridge soils are more droughty. Also included are small areas of the very poorly drained Brookston, Colwood, Thomas, Houghton, and Adrian soils that are in depressions and drainageways. The included soils make up 2 to 10 percent of this map unit.

Permeability is moderately rapid in the surface soil and moderately slow in the subsoil and substratum. The available water capacity is high. Runoff is slow. The seasonal high water table is at a depth of 1/2 foot to 2 feet from November through May. The shrink-swell potential is moderate.

In most areas this soil is used as pasture or woodland or is idle land. In a few areas it is used for crops. This soil is well suited to use as cropland, pasture, and woodland. It is fairly suited to most recreation uses.

This soil is poorly suited to building site development because of wetness and is poorly suited to use as septic tank absorption fields because of wetness and moderately slow permeability. If this soil is used as a site for buildings, the use of surface or subsurface drainage to lower the water table and the use of well compacted fill to raise the site help to overcome the wetness limitation. For septic tank absorption fields, special construction, such as filling or mounding the absorption field site with suitable soil material, may be needed to raise the field above the water table.

If this soil is used as cropland, the main management concerns are removing excess water and maintaining soil tilth. Surface and subsurface drains help to overcome wetness. Conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, helps to reduce compaction and maintain good soil tilth. Also, keeping tillage operations to a minimum helps to maintain good tilth.

This soil is in capability subclass IIw and Michigan soil management group 3/2b.

38—Napoleon muck. This nearly level, very poorly drained soil is on lowlands. It is subject to ponding. Areas are irregular in shape and are 3 to 40 acres in size.

Typically, the surface layer of the Napoleon soil is black muck about 10 inches thick. The material below that, to a depth of 60 inches, is dark reddish brown mucky peat in the upper 38 inches and very dark gray muck in the lower 12 inches. In some places the material below a depth of 40 inches is sandy or loamy.

Permeability is moderate or moderately rapid. The available water capacity is high. Runoff is very slow. The high water table is near or above the surface from September to June.

In most areas this soil is covered by brush. It is poorly suited to woodland use, to use as habitat for openland wildlife, and to recreation uses. Generally it is not suited to use as pasture and cropland. It is not suited to use as a site for buildings and to use as septic tank absorption fields. The hazard of ponding is the main limitation of this soil for most uses.

If outlets are available, this soil can be drained and used for specialty crops such as blueberries.

This soil is in capability subclass VIw and Michigan soil management group Mc-a.

39—Granby loamy sand. This nearly level, poorly drained soil is in broad, flat areas and drainageways and is subject to frequent ponding. Areas are irregular in shape and are 2 to 60 acres in size.

Typically, the surface layer is black loamy sand about 11 inches thick. The subsoil is mottled and is about 27 inches thick. In the upper part it is dark gray, very friable loamy sand; and in the lower part it is gray, loose sand. The substratum to a depth of about 60 inches is light gray, mottled sand. In some places loamy or clayey material is at a depth below 40 inches. In some places the surface layer is muck less than 16 inches thick.

Included in mapping are small areas of poorly drained Sebewa soils and very poorly drained Gilford soils that are on landscape positions similar to those of the Granby soil. The Sebewa and Gilford soils are less droughty than the Granby soil. Also included are small areas of the somewhat poorly drained Tedrow, Thetford, and Wasepi soils that are on low knolls. The included soils make up 1 to 10 percent of the map unit.

Permeability is rapid in this Granby soil, and the available water capacity is low. Runoff is very slow or ponded. The high water table is at or above the surface from November through June.

In most areas this soil is used as woodland or pasture or is idle land. This soil is fairly suited to use as pasture or cropland and poorly suited to woodland use and to recreation uses.

This soil is poorly suited to building site development because of wetness. It should not be used as a site for buildings with basements. If this soil is used as a site for buildings without basements, the use of surface or subsurface drainage to lower the water table and the use of well compacted fill to raise the site help to overcome the wetness limitation. This soil is generally not suited to use as septic tank absorption fields because of its wetness and poor filtering capacity. Sanitary facilities should be connected to public sewers and sewage treatment facilities.

If this soil is used as cropland, the management concerns are removing excess water and maintaining

good soil tilth. If drained, this soil is droughty and subject to soil blowing. The use of cover crops, green manure, and crop residue and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, help to conserve moisture, maintain good soil tilth, and control soil blowing.

If this soil is used as woodland, the major management concerns are equipment limitations, seedling mortality, and windthrow. The use of heavy equipment for planting, tending, and harvesting trees is restricted during wet periods. Woodland operations can be timed to seasons of the year when the soil is relatively dry or frozen. Seedling loss will be high because of wetness. Special site preparation, such as bedding, can be used in some areas to help reduce seedling loss. The use of harvest methods that do not leave trees standing alone or widely spaced helps to prevent windthrow.

This soil is in capability subclass IVw and Michigan soil management group 5c.

40B—Udorthents, loamy, undulating. This map unit consists of moderately well drained or well drained soils that have been so altered that classification at the series level is not feasible. These soils range in texture from sandy loam to clay loam. They make up areas of 3 to 75 acres. In some areas, soil material has been excavated. In other areas, the soils have been covered by fill material.

Included in mapping are strongly sloping to very steep soils along the outer edges of the mapped areas. These soils are more erodible. In a few areas the soils are sandy or clayey or have organic material below 5 feet. The included soils make up 2 to 15 percent of this map unit.

Permeability, reaction, and available water capacity are variable. Surface runoff is slow to medium. The high water table is at a depth of 2 to more than 5 feet. The soil material generally is very low in content of organic matter.

In most areas the soils are idle land. In a few areas they are used for pasture or for recreation uses. These soils generally are poorly suited to cropland use. Onsite evaluation is needed to determine their suitability for woodland, pasture, and recreation uses and for building site development.

These soils are not assigned to interpretive groupings.

40C—Udorthents, loamy, rolling. This map unit consists of moderately well drained or well drained soils that have been so altered that classification at the series level is not feasible. These soils range in texture from sandy loam to clay loam. They make up areas of 3 to 75 acres. In most areas, soil material has been excavated. In a few areas, the soils have been covered by fill material.

Included in mapping are gently sloping or undulating soils. Included also are a few areas of sandy or clayey soils. The included soils make up 4 to 10 percent of this map unit.

Permeability, reaction, and available water capacity are variable. Surface runoff is medium to rapid. The soil material generally is very low in organic matter content.

In most areas these soils are idle land. In a few areas they are used for pasture or for recreation uses. These soils are poorly suited to cropland use. Onsite evaluation is needed to determine their suitability for woodland, pasture, and recreation uses and for building site development.

These soils are not assigned to interpretive groupings.

41B—Aquents, sandy and loamy, undulating. This map unit consists of somewhat poorly drained and poorly drained soils that have been so altered that classification at the series level is not feasible. These soils range in texture from sand to clay loam. They make up areas of 3 to 50 acres. In most areas, these soils have been covered by fill material. In a few areas, soil material has been excavated.

Included in mapping are moderately sloping to very steep soils along the outer edges of the mapped areas. They are more erodible. Included also are a few areas of marl or clay and some areas where organic material is below 2 to 4 feet or the fill material is a mixture of organic and mineral materials. The included soils make up 5 to 20 percent of this map unit.

The high water table is at a depth of 2 feet to near the surface from October to May. Permeability, reaction, and available water capacity are variable. Surface runoff is slow to ponded. The soil material is generally very low in organic matter content.

In most areas these soils are idle land. In a few areas they are used for urban development, pasture, or recreation uses. These soils generally are poorly suited to cropland use. Onsite evaluation is needed to determine their suitability for woodland, pasture, and recreation uses and for building site development.

These soils are not assigned to interpretive groupings.

42—Pits. This map unit consists of areas that have been excavated for sand or for sand and gravel. Areas range from 3 to 120 acres.

Included in mapping are some strongly sloping to steep soils that are subject to erosion. Also included are a few areas of Aquents and Udipsamments that have not been excavated and some pond areas.

The high water table ranges from near the surface to more than 5 feet in depth. Surface runoff is medium to ponded.

Most areas are used as wildlife habitat or are still being mined.

This miscellaneous area is not assigned to interpretive groupings.

43—Sloan-Marlette association. This association consists of nearly level, very poorly drained Sloan soils

on flood plains and moderately sloping to steep Marlette soils on adjacent side slopes. The Sloan soils are subject to frequent flooding. Areas are long, narrow, and winding and are 10 to 400 acres or more. The association is about 55 percent Sloan soils and about 30 percent Marlette soils.

Typically, the surface layer of the Sloan soils is dark brown silt loam about 11 inches thick. The subsurface layer is dark gray silt loam about 3 inches thick. The subsoil is grayish brown, mottled, friable silt loam about 22 inches thick. The substratum to a depth of about 60 inches is gray, mottled, calcareous, stratified silty clay loam and fine sandy loam; and it contains thin layers of very dark brown fine sandy loam. In some places the soil is mucky.

Typically, the surface layer of the Marlette soils is dark grayish brown loam about 4 inches thick. The subsoil is firm and is about 26 inches thick. In the upper part it is mixed yellowish brown clay loam and pale brown loam, and in the lower part it is yellowish brown clay loam. The substratum to a depth of about 60 inches is pale brown, calcareous loam.

Included in mapping are well drained Oshtemo, Fox, Arkport, and Spinks soils on landscape positions similar to those of the Marlette soils. These soils are more droughty than the Marlette soils. Also included in the River Rouge Watershed are soils that have a much higher clay content. These soils have a slower permeability rate.

Permeability is moderate or moderately slow in the Sloan soils and moderately slow in the Marlette soils. The available water capacity is high. Runoff is slow to ponded on the Sloan soils and medium to very rapid on the Marlette soils. The water table in the Sloan soils is at or near the surface from November through June.

In most areas these soils are used as woodland. In a few areas they are used as pasture. These soils are poorly suited to use as pasture, woodland, and cropland and to recreation uses.

These soils are not suitable for building site development and for use as septic tank absorption fields because of the flooding hazard on the Sloan soils and the slope limitation of the Marlette soils.

The main concerns in woodland management on the Sloan soils are equipment limitations, seedling mortality, and windthrow hazard. The main concern in areas of the Marlette soils is the erosion hazard. Woodland operations can be timed to seasons of the year when the Sloan soils are relatively dry or frozen. Special site preparation, such as bedding, can be used in some areas to help prevent loss of seedlings. The use of harvest methods that do not leave trees standing alone or widely spaced helps to prevent windthrow.

These soils are in capability subclass Vw and Michigan soil management groups L-2c and 2.5a.

44B—Riddles sandy loam, 1 to 6 percent slopes. This nearly level and undulating, well drained soil is on foot slopes, knolls, and ridges. Most areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is dark grayish brown sandy loam about 8 inches thick. The subsurface layer is brown sandy loam about 4 inches thick. The subsoil is sandy clay loam about 34 inches thick. In the upper part it is yellowish brown and friable; in the middle part it is dark yellowish brown and firm; and in the lower part it is yellowish brown, mottled, and friable. The substratum to a depth of about 60 inches is brown, calcareous sandy loam.

Included in mapping are the somewhat poorly drained Capac and Metamora soils that are on low knolls and ridges at lower elevations. Also included are the poorly drained and very poorly drained Brookston and Houghton soils that are in small depressions or narrow drainageways. The included soils make up 2 to 10 percent of the map unit.

Permeability is moderate in this Riddles soil. The available water capacity is high. Runoff is slow. The shrink-swell potential is moderate.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used for crops. The soil is well suited to use as cropland, pasture, and woodland and to recreation uses. This soil is well suited to building site development and to use as septic tank absorption fields.

If this soil is used as cropland, the main management concerns are controlling erosion, maintaining organic matter content, and keeping the soil in good tilth. The use of contour tillage helps to reduce erosion. Crop residue and green manure help to maintain the organic matter content and improve the tilth of the soil.

This soil is in capability subclass IIe and Michigan soil management group 2.5a.

44C—Riddles sandy loam, 6 to 12 percent slopes. This moderately sloping or gently rolling, well drained soil is on knolls and ridges. Most areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is dark brown sandy loam about 7 inches thick. The subsurface layer is brown sandy loam about 4 inches thick. The subsoil is sandy clay loam about 33 inches thick. In the upper part it is yellowish brown and friable; in the middle part it is dark yellowish brown and firm; and in the lower part it is yellowish brown, mottled, and friable. The substratum to a depth of about 60 inches is brown, calcareous sandy loam.

Included in mapping are the somewhat poorly drained Capac and Metamora soils that are on foot slopes, low knolls, and ridges at lower elevations. Also included are the poorly drained and very poorly drained Brookston

soils that are in depressions and drainageways. The included soils make up 2 to 9 percent of the map unit.

Permeability is moderate in this Riddles soil. The available water capacity is high. Runoff is medium to rapid. The shrink-swell potential is moderate.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used for crops. This soil is well suited to use as woodland and pasture and to recreation uses. It is fairly suited to cropland use.

This soil is suited to building site development and to use as septic tank absorption fields, but slope is a limitation. For buildings, the slope limitation can be overcome by land shaping and by installing retaining walls. For septic tank absorption fields, it can be overcome by installing the absorption field on the contour.

If this soil is used as cropland, the major management concerns are controlling runoff and erosion, maintaining organic matter content, and keeping the soil in good tilth. Practices that help to prevent erosion and runoff are the use of a crop rotation that includes hay, the use of cover crops and grassed waterways, and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface. Crop residue and green manure help to maintain the organic matter content and improve the tilth of the soil.

This soil is in capability subclass IIIe and Michigan soil management group 2.5a.

44D—Riddles sandy loam, 12 to 18 percent slopes. This strongly sloping or rolling, well drained soil is on knolls and ridges. Most areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is dark brown sandy loam about 6 inches thick. The subsurface layer is brown sandy loam about 4 inches thick. The subsoil is sandy clay loam about 32 inches thick. In the upper part it is yellowish brown and friable; in the middle part it is dark yellowish brown and firm; and in the lower part it is yellowish brown and friable. The substratum to a depth of about 60 inches is brown, calcareous sandy loam. In some places the soil has been severely eroded.

Included in mapping are the somewhat poorly drained Capac and Metamora soils that are on foot slopes, low knolls, and ridges at lower elevations. Also included are the poorly drained and very poorly drained Brookston soils that are in depressions and drainageways. The included soils make up 2 to 9 percent of the map unit.

Permeability is moderate in this Riddles soil. The available water capacity is high. Runoff is rapid. The shrink-swell potential is moderate.

In most areas this soil is used as woodland or pasture or is idle land. This soil is well suited to use as woodland and fairly suited to use as pasture. It is poorly suited to cropland use and to recreation uses.

This soil is poorly suited to building site development and to use as septic tank absorption fields because of slope. For dwellings, the slope limitation can be overcome by land shaping and by installing retaining walls. For septic tank absorption fields, this limitation can, in some places, be overcome by installing the absorption field on the contour.

This soil is in capability subclass IVe and Michigan soil management group 2.5a.

45B—Arkport loamy fine sand, 2 to 6 percent slopes. This nearly level and undulating, well drained soil is on foot slopes, knolls, and ridges. Slopes are smooth or convex and are less than 100 feet long. Areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is very dark grayish brown loamy fine sand about 9 inches thick. The subsurface layer is yellowish brown, very friable loamy fine sand about 12 inches thick. The next layer consists of light yellowish brown, very friable loamy fine sand and thin strata of brown, friable very fine sandy loam, and it is about 23 inches thick. The next layer to a depth of about 60 inches consists of very pale brown and brownish yellow, very friable loamy very fine sand and thin strata of yellowish brown, friable very fine sandy loam. In a few places the subsoil has a higher clay content or the substratum is gravelly sand. In some areas the soil is moderately well drained.

Included in mapping are small areas of the somewhat poorly drained Dixboro soils and the well drained Spinks soils. The Spinks soils are more droughty than the Arkport soil and generally are at higher elevations. The Dixboro soils are on low knolls and ridges and in drainageways. Also included are small areas of very poorly drained Gilford, Houghton, and Thomas soils. These soils are in depressions. The included soils make up 5 to 15 percent of the map unit.

Permeability is moderately rapid in this Arkport soil, and the available water capacity is moderate. Runoff is slow.

In most areas this soil is used as pasture or woodland or is idle land. This soil is well suited to use as pasture and woodland. It is fairly suited to cropland use and to recreation uses. This soil is well suited to building site development and to use as septic tank absorption fields.

If this soil is used as cropland, the major management concerns are controlling soil blowing, overcoming droughtiness, and maintaining organic matter content. Cover crops, such as rye, protect fields from soil blowing. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, can help to maintain the content of organic matter and overcome droughtiness.

If this soil is used as woodland, the major management concern is seedling mortality. Special site preparation, such as furrowing, helps to overcome this problem.

This soil is in capability subclass IIe and Michigan soil management group 3a-s.

45C—Arkport loamy fine sand, 6 to 12 percent slopes. This moderately sloping or gently rolling, well drained soil is on knolls and ridgetops. Most areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex and are generally less than 100 feet long. Areas are irregular in shape and are 2 to 150 acres in size.

Typically, the surface layer is dark grayish brown loamy fine sand about 8 inches thick. The subsurface layer is yellowish brown loamy fine sand about 11 inches thick. The next layer consists of light yellowish brown, very friable loamy fine sand and thin strata of dark brown very fine sandy loam, and it is about 20 inches thick. The next layer to a depth of about 60 inches consists of very pale brown and brownish yellow, very friable loamy very fine sand and thin strata of yellowish brown very fine sandy loam. In places the subsoil has a higher clay content, and in places there is gravelly sand below 50 inches.

Included in mapping are small areas of the somewhat poorly drained Dixboro soils and the well drained Spinks soils. The Spinks soils are more droughty than the Arkport soil and generally are on landscape positions similar to those of the Arkport soil. The Dixboro soils are in narrow drainageways and on foot slopes. Also included are small areas of the very poorly drained Gilford and Thomas soils that are in small depressions. The included soils make up 3 to 10 percent of the map unit.

Permeability is moderately rapid in this Arkport soil. The available water capacity is moderate. Runoff is medium.

In most areas this soil is used as pasture or woodland or is idle land. In a few areas it is used as cropland. This soil is well suited to use as pasture and woodland. It is fairly suited to cropland use and to recreation uses.

This soil is suited to building site development and to use as septic tank absorption fields, but slope is a limitation. For buildings, land shaping and installing retaining walls help to overcome the slope limitation. For septic tank absorption fields, installing the absorption field on the contour can overcome this limitation.

If this soil is used as cropland, the major management concerns are controlling soil blowing, overcoming droughtiness, and maintaining organic matter content. Cover crops, such as rye, protect fields from soil blowing. Contour tillage helps to slow runoff. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, can help to maintain the content of organic matter and overcome droughtiness.

If this soil is used as woodland, the major management concern is seedling mortality. Special site preparation, such as furrowing, helps to overcome this problem in some areas.

This soil is in capability subclass IIIe and Michigan soil management group 3a-s.

45D—Arkport loamy fine sand, 12 to 25 percent slopes. This moderately sloping to very hilly, well drained soil is on knolls, side slopes, and ridgetops. Some areas of this soil are dissected by shallow drainageways. Slopes are smooth and convex and are commonly less than 100 feet long. Areas are irregular in shape and are 2 to 150 acres in size.

Typically, the surface layer is brown loamy fine sand about 7 inches thick. The subsurface layer is yellowish brown loamy fine sand about 15 inches thick. The next layer consists of yellowish brown, very friable loamy fine sand and thin strata of brown, friable very fine sandy loam; and it is about 21 inches thick. The next layer to a depth of about 60 inches is very pale brown and yellowish brown, friable very fine sandy loam. In places the subsoil has a higher clay content. In some places gravelly sand is below 50 inches.

Included in mapping are small areas of the well drained Spinks soils. The Spinks soils are more droughty than the Arkport soil and generally are on landscape positions similar to those of the Arkport soil. These included soils make up 3 to 8 percent of the map unit.

Permeability is moderately rapid in this Arkport soil, and the available water capacity is moderate. Runoff is medium to rapid.

In most areas this soil is used as woodland or pasture or is idle land. This soil is fairly suited to woodland use. It is poorly suited to use as pasture and to recreation uses. This soil generally is not suitable for building site development and for use as septic tank absorption fields because of slope.

If this soil is used as woodland, the major management concerns are equipment limitations and seedling mortality. Some seedling loss can be expected during dry summer months. Special site preparation, such as furrowing, helps to overcome the seedling mortality problem. Normal planting and logging equipment can be used, but careful planning of roads, landings, and skid trails is necessary.

This soil is in capability subclass IVe and Michigan soil management group 3a-s.

46A—Dixboro loamy fine sand, 0 to 3 percent slopes. This somewhat poorly drained soil is on broad, nearly level areas or low knolls. Slopes are slightly convex and are generally less than 50 feet long. Areas are irregular in shape and are 2 to 100 acres in size.

Typically, the surface layer is very dark grayish brown loamy fine sand about 8 inches thick. The subsurface layer is pale brown loamy very fine sand about 8 inches thick. The subsoil is strong brown, mottled, friable very fine sandy loam about 19 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled, calcareous, stratified very fine sand, loamy very fine sand, and very fine sandy loam. In some places the surface layer is lighter colored. In some places the subsoil contains thin layers of gravelly sand or contains thin strata with more clay.

Included in mapping are small areas of poorly drained Granby soils and very poorly drained Gilford, Thomas, and Colwood soils that are in depressions and drainageways. Also included are small areas of the well drained Arkport soils that are on knolls and ridges at higher elevations. The included soils make up 3 to 10 percent of the map unit.

Permeability is moderate in this Dixboro soil, and the available water capacity is moderate. Runoff is slow. The seasonal high water table is at a depth of 1 foot to 2 feet from November through April.

In most areas this soil is used as pasture or woodland or is idle land. In a few areas it is used as cropland. This soil is well suited to use as cropland, pasture, and woodland. It is fairly suited to most recreation uses.

This soil is poorly suited to building site development and to use as septic tank absorption fields because of wetness. If this soil is used as a site for buildings, the use of surface or subsurface drainage to lower the water table and the use of well compacted fill to raise the site help to overcome the wetness limitation. For septic tank absorption fields, special construction, such as filling or mounding the absorption field site with suitable soil material, may be needed to raise the field above the water table.

If this soil is used as cropland, the main management concerns are removing excess water, controlling soil blowing, and maintaining organic matter content. If adequate outlets are available, subsurface drainage can help to overcome the wetness limitation. Cover crops, such as rye, protect fields from soil blowing. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, help to maintain organic matter content and control soil blowing.

If this soil is used as woodland, the major management concern is seedling mortality. Special site preparation, such as furrowing, helps to overcome the seedling mortality problem.

This soil is in capability subclass IIw and Michigan soil management group 3b-s.

47B—Fox-Riddles sandy loams, 1 to 6 percent slopes. These nearly level and undulating, well drained soils are in broad, flat areas and on low knolls and ridges. Slopes are smooth and convex and are less than 100 feet long. Areas are irregular in shape and are 5 to 240 acres in size. The Fox soil makes up about 60 percent of the complex, and the Riddles soil makes up about 35 percent. The areas of these soils are so intermingled or so small that it was not practical to separate them at the scale of mapping used.

Typically, the Fox soil has a surface layer of very dark grayish brown sandy loam about 9 inches thick. The subsurface layer is brown gravelly sandy loam about 7 inches thick. The subsoil is dark brown, firm gravelly sandy clay loam and is about 14 inches thick. The substratum to a depth of about 60 inches is brown, calcareous gravelly sand.

Typically, the Riddles soil has a surface layer of dark grayish brown sandy loam about 8 inches thick. The subsurface layer is brown sandy loam about 4 inches thick. The subsoil is sandy clay loam about 34 inches thick. In the upper part it is yellowish brown and friable; in the middle part it is dark yellowish brown and firm; and in the lower part it is yellowish brown and friable. The substratum to a depth of about 60 inches is brown, calcareous sandy loam.

Included in mapping are small areas of well drained Boyer soils that are on landscape positions similar to those of the Fox and Riddles soils. These Boyer soils are more droughty than the Fox and Riddles soils. Also included are the somewhat poorly drained Capac, Matherton, and Metamora soils in drainageways, and on low knolls and ridges at lower elevations and the poorly drained Sebewa soil in small depressions or narrow drainageways. The included soils make up 8 to 20 percent of the complex.

Permeability is moderate in the subsoil and rapid in the substratum in the Fox soil. It is moderate in the Riddles soil. The available water capacity is moderate in the Fox soil and high in the Riddles soil. Runoff is slow. The shrink-swell potential is moderate.

In most areas these soils are used as pasture or woodland or are idle land. In a few areas they are used as cropland. These soils are well suited to use as cropland, pasture, and woodland.

These soils are well suited to building site development. They are also well suited to use as septic tank absorption fields; however, the Fox soils have poor filtering capacity. The effluent drains satisfactorily in the Fox soils, but there is a hazard of ground water pollution.

If these soils are used as cropland, the main management concerns are controlling runoff and erosion, maintaining organic matter content, and keeping the soil in good tilth. Contour tillage helps to reduce erosion and runoff. Crop residue and green manure help to maintain the organic matter content and improve the tilth of the soil.

These soils are in capability subclass IIe and Michigan soil management groups 3/5a and 2.5a.

47C—Fox-Riddles sandy loams, 6 to 12 percent slopes. These moderately sloping or gently rolling, well drained soils are on knolls and ridgetops. Slopes are smooth and convex and are less than 150 feet long. Areas are irregular in shape and are 5 to 120 acres in size. The Fox soil makes up 35 to 60 percent of the mapped areas, and the Riddles soil makes up 25 to 35 percent. The areas of these soils are so intermingled or so small that it was not practical to separate them at the scale of mapping used.

Typically, the Fox soil has a surface layer of very dark grayish brown sandy loam about 9 inches thick. The subsurface layer is brown gravelly sandy loam about 7

inches thick. The subsoil is dark brown, firm gravelly sandy clay loam and is about 13 inches thick. The substratum to a depth of about 60 inches is brown, calcareous gravelly sand.

Typically, the Riddles soil has a surface layer of dark grayish brown sandy loam about 9 inches thick. The subsurface layer is brown sandy loam about 7 inches thick. The subsoil is sandy clay loam about 35 inches thick. In the upper part it is yellowish brown and friable; in the middle part it is dark yellowish brown and firm; and in the lower part it is yellowish brown and friable. The substratum to a depth of about 60 inches is brown, calcareous sandy loam.

Included in mapping are small areas of well drained Boyer soils that are on landscape positions similar to those of the Fox or Riddles soils. These Boyer soils are more droughty than the Fox or Riddles soils. Also included are the somewhat poorly drained Capac, Matherton, and Metamora soils in drainageways and on low knolls and ridges at lower elevations and the poorly drained Sebewa soils and very poorly drained Thomas soils in small depressions or narrow drainageways. The included soils make up 8 to 20 percent of the complex.

Permeability is moderate in the subsoil and rapid in the substratum in the Fox soil. It is moderate in the Riddles soil. The available water capacity is moderate in the Fox soil and high in the Riddles soil. Runoff is slow. The shrink-swell potential is moderate.

In most areas these soils are used as woodland or pasture or are idle land. In a few areas they are used as cropland. These soils are fairly suited to cropland use and to recreation uses. They are well suited to use as pasture and woodland.

These soils are suited to building site development, but slope is a limitation. Land shaping and installing retaining walls help to overcome the slope limitation for buildings. These soils are suited to use as septic tank absorption fields, but slope is a limitation. Land shaping and installing the absorption field across the slope help to overcome this limitation. Poor filtering capacity is an additional limitation to the use of the Fox soil as septic tank absorption fields. The effluent drains satisfactorily, but there is a hazard of ground water pollution.

If these soils are used as cropland, the major management concerns are controlling runoff and erosion, maintaining organic matter content, and keeping the soil in good tilth. Contour tillage helps to reduce erosion and runoff. Crop residue and green manure help to maintain the organic matter content and improve the tilth of the soil.

These soils are in capability subclass IIIe and Michigan soil management groups 3/5a and 2.5a.

48—Gilford sandy loam. This nearly level, very poorly drained soil is in broad, flat areas and in drainageways. It is subject to frequent ponding. Areas are irregular in shape and range in size from 2 to 100 acres or more.

Typically, the surface layer is very dark brown sandy loam about 11 inches thick. The subsoil is friable sandy loam and is about 27 inches thick. In the upper part it is dark gray, and in the lower part it is gray and mottled. The substratum to a depth of about 60 inches is gray, calcareous gravelly sand. In some areas, the surface layer is thinner, or the subsoil consists of alternate layers of sand, loamy sand, and sandy loam.

Included in mapping are small areas of the very poorly drained Houghton and Adrian soils that are in small depressions. The Houghton and Adrian soils are less stable than the Gilford soil. Also included are small areas of the somewhat poorly drained Wasepi soils that are on low knolls. The included soils make up 2 to 8 percent of this map unit.

Permeability is moderately rapid in the subsoil of this Gilford soil and very rapid in the substratum. The available water capacity is low. Runoff is very slow or ponded. The high water table is at or above the surface from December to May.

In most areas this soil is used as woodland or pasture or is idle land. This soil is well suited to use as cropland and pasture. It is poorly suited to woodland use and to recreation uses.

This soil is poorly suited to building site development because of wetness and generally is not suited to use as septic tank absorption fields because of wetness and poor filtering capacity. It should not be used as a site for buildings with basements. If the soil is used as a site for buildings without basements, the use of surface or subsurface drainage to lower the water table and the use of well compacted fill to raise the site help to overcome the wetness limitation. Sanitary facilities should be connected to public sewers and sewage treatment facilities.

If this soil is used as cropland, the main management concerns are removing excess water and maintaining good tilth. Surface and subsurface drains help to overcome the wetness limitation. Tilling when the soil is not wet and using conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, help to improve tilth.

If this soil is used as woodland, the major management concerns are equipment limitations, seedling mortality, and windthrow. The use of heavy equipment for planting, tending, and harvesting trees is restricted during wet periods. Woodland operations can be timed to seasons of the year when the soil is relatively dry or frozen. Seedling loss will be high because of wetness. Special site preparation, such as bedding, can be used in some areas to help reduce the loss of seedlings. The use of harvest methods that do not leave trees standing alone or widely spaced helps to prevent windthrow.

This soil is in capability subclass IIIw and Michigan soil management group 4c.

49—Cohoctah fine sandy loam. This nearly level, poorly drained or very poorly drained soil is on flood plains and is subject to frequent flooding. Areas are

irregular in shape and range from 2 to 100 acres or more in size.

Typically, the surface layer is very dark gray fine sandy loam about 11 inches thick. The substratum to a depth of 60 inches is dark gray fine sandy loam in the upper 10 inches; gray, mottled, sandy loam and very dark brown sandy loam in the next 27 inches; and gray, calcareous gravelly sand in the lower 12 inches. In some places the upper part of the substratum has less clay.

Included in mapping are small areas of soils that are similar to the Cohoctah soil, except that they are somewhat poorly drained and are on low knolls on the flood plains. These included soils make up 2 to 7 percent of the map unit.

Permeability is moderately rapid in this Cohoctah soil, and the available water capacity is low. Runoff is very slow or ponded. This soil has a high water table near or above the surface from September through May.

In most areas this soil is used as woodland or is idle land. In a few areas it is used for pasture. This soil is poorly suited to use as woodland, pasture, and cropland and to recreation uses. This soil is not suited to building site development and to use as septic tank absorption fields because of flooding.

If this soil is used as woodland, the major management concerns are equipment limitations, seedling mortality, and windthrow. Woodland operations can be timed to seasons of the year when the soil is relatively dry or frozen. Seedling loss is high because of wetness. Special site preparation, such as bedding, can be used in some areas to help reduce seedling loss. The use of harvest methods that do not leave trees standing alone or widely spaced helps to prevent windthrow.

This soil is in capability subclass Vw and Michigan soil management group L-2c.

50B—Udipsamments, undulating. This map unit consists of moderately well drained and well drained soils that have been so altered that classification at the series level is not feasible. These soils range in texture from fine sand to gravelly sand. They make up areas of 3 to 75 acres or more. In some areas soil material has been excavated. In other areas the soils have been covered by fill material.

Included in mapping are strongly sloping to very steep soils along the outer edges of the mapped areas. These soils are subject to erosion. Also included are some areas that are loamy or clayey or have organic material below about 5 feet. The included soils make up 5 to 15 percent of this map unit.

In most areas the soils are used for wildlife habitat or are idle land. In a few areas they are used for pasture or for recreation uses. Generally, these soils are poorly suited to use as cropland. Onsite evaluation is needed to determine their suitability for woodland, pasture, recreation, and engineering uses.

These soils are not assigned to interpretive groupings.

50D—Udipsamments, rolling to steep. This map unit consists of piles and ridges of gravelly mine spoil and overburden. This soil material has been so altered that identification at the series level is not feasible. It is well drained and ranges in texture from fine sand to gravelly sand. Areas are 5 to 200 or more acres. In a few places the slope gradient is more than 40 percent.

Included in mapping are less sloping soils at the edge of the mapped areas. They are not so erodible. Also included are areas of loamy or clayey soils. The included soils make up 4 to 15 percent of this unit.

These Udipsamments are used as wildlife habitat or are idle land. In a few areas they are used for recreation. They are poorly suited to cropland use. Onsite evaluation is needed to determine their suitability for woodland, pasture, recreation, and engineering uses.

These soils are not assigned to interpretive groupings.

51B—Leoni gravelly sandy loam, 1 to 6 percent slopes. This nearly level and undulating, well drained soil is on flat plains, low knolls, and ridges. Slopes are smooth and convex and are less than 150 feet long. Areas are irregular in shape and 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown gravelly sandy loam about 8 inches thick. The subsurface layer is pale brown gravelly sandy loam about 7 inches thick. The subsoil is friable and is about 25 inches thick. In the upper part it is yellowish brown gravelly sandy clay loam, in the middle part it is dark brown gravelly sandy clay loam, and in the lower part it is light yellowish brown gravelly sandy loam. The substratum to a depth of about 60 inches is pale brown, calcareous gravelly sand.

Included in mapping are small areas of somewhat poorly drained cobbly soils on lower ridges and drainageways and small areas of poorly drained cobbly soils in small depressions. These included soils make up 2 to 10 percent of the map unit.

Permeability is moderate in the subsoil of this Leoni soil and moderately rapid or rapid in the substratum. The available water capacity is low. Runoff is slow. The shrink-swell potential is moderate.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used as cropland. This soil is well suited to woodland use. It is fairly suited to use as cropland and pasture and to recreation uses.

This soil is well suited to building site development and to use as septic tank absorption fields. Cobbles are a limitation for buildings. It may be necessary to remove cobbles from building sites.

If this soil is used as cropland, the main management concerns are overcoming droughtiness, maintaining organic matter content, and keeping the soil in good tilth. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, help to conserve moisture and reduce runoff. Crop residue and green manure help to maintain the organic matter content and improve the tilth of the soil.

This soil is in capability subclass IIIs and Michigan soil management group Ga.

51C—Leoni gravelly sandy loam, 6 to 12 percent slopes. This moderately sloping or gently rolling, well drained soil is on knolls and ridges. Slopes are smooth and convex and are less than 100 feet long. Areas are irregular in shape and are 5 to 70 acres in size.

Typically, the surface layer is brown gravelly sandy loam about 7 inches thick. The subsoil is friable and is about 37 inches thick. In the upper part it is yellowish brown gravelly sandy clay loam, and in the lower part it is dark yellowish brown gravelly sandy clay loam. The substratum to a depth of about 60 inches is light yellowish brown gravelly sand. In some places the soil is severely eroded.

Included in mapping are small areas of the very poorly drained Gilford, Thomas, and Houghton soils and the poorly drained Sebewa soils that are in depressions. These soils make up 2 to 8 percent of the map unit.

Permeability is moderate in the subsoil of this Leoni soil and moderately rapid or rapid in the substratum. The available water capacity is low. Runoff is medium to rapid. The shrink-swell potential is moderate.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used as cropland. This soil is well suited to woodland use. It is fairly suited to cropland use and poorly suited to recreation uses.

This soil is suited to building site development, but slope and cobbles are limitations to this use. Land forming and installing retaining walls can help to overcome the slope limitation. The cobbles may have to be removed. This soil is suited to septic tank absorption fields, but slope is a limitation. Land shaping and installing the absorption field across the slope help to overcome the slope limitation for septic tank absorption fields.

If this soil is used as cropland, the major management concerns are overcoming droughtiness, controlling runoff and erosion, maintaining the organic matter content, and keeping the soil in good tilth. The use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, helps to conserve moisture. Practices that help prevent erosion and runoff are the use of a crop rotation that includes hay, the use of cover crops and grassed waterways, and the use of conservation tillage. Crop residue and green manure help to maintain the organic matter content and improve the tilth of the soil.

This soil is in capability subclass IIIe and Michigan soil management group Ga.

52A—Selfridge loamy sand, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on broad, flat areas or low knolls. Slopes are slightly convex and are less than 50 feet long. Areas are irregular in shape and are 2 to 80 acres in size.

Typically, the surface layer is very dark grayish brown loamy sand about 9 inches thick. The subsurface layer is brown loamy sand or light yellowish brown sand about 23 inches thick. The subsoil is brown, mottled, friable loam about 9 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled, calcareous loam. In the southern part of the county, this soil is clayey below a depth of 40 inches.

Included in mapping are small areas of Capac and Metamora soils on landscape positions similar to those of the Selfridge soil. These soils are not as droughty as the Selfridge soil. Also included are small areas of the very poorly drained Brookston, Houghton, and Thomas soils that are in depressions and drainageways and small areas of the well drained Metea soils that are on higher knolls and ridges. The included soils make up 5 to 10 percent of the map unit.

Permeability is rapid in the sandy surface soil and moderately slow in the loamy subsoil and substratum. The available water capacity is moderate. Runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet from November through May.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used as cropland. This soil is well suited to use as pasture. It is fairly suited to use as cropland and woodland and to recreation uses.

This soil is poorly suited to building site development because of wetness and is poorly suited to use as septic tank absorption fields because of wetness and moderately slow permeability. If the soil is used as a site for buildings, the use of surface or subsurface drains to lower the water table and the use of well compacted fill to raise the site can help to overcome the wetness limitation. For septic tank absorption fields, special construction, such as filling or mounding the absorption field site with suitable soil material, may be needed to raise the field above the water table and into more permeable soil material.

If this soil is used as cropland, the major management concerns are wetness, water erosion and soil blowing, droughtiness, and organic matter content. Subsurface drainage helps to reduce the wetness limitation. Cover crops, such as rye, protect fields from water erosion and soil blowing. The use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, helps to conserve moisture. The use of crop rotations that include grasses and legumes and the use of crop residue management can help to maintain organic matter content.

If this soil is used as woodland, the major management concern is seedling mortality. Some seedling loss can be expected due to droughtiness during dry summer months. Exposing soil just prior to the production of the seed crop can help desirable tree seedlings become established quickly and get a head start on competing vegetation.

This soil is in capability subclass IIIw and Michigan soil management group 4/2b.

53A—Tedrow loamy sand, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on

broad, flat areas or low knolls. Slopes are slightly convex and are less than 50 feet long. Areas are irregular in shape and are 2 to 100 acres in size.

Typically, the surface layer is very dark grayish brown loamy sand about 9 inches thick. The subsoil is multicolored, loose sand about 36 inches thick. The substratum to a depth of about 60 inches is light brownish gray calcareous sand. In some places the subsoil and substratum are very fine sand or are stratified loamy fine sand to light sandy loam. In some places there is gravelly sand below a depth of about 36 inches. In some places there is loamy or clayey material below 50 inches.

Included in mapping are small areas of poorly drained Granby soils and very poorly drained Gilford, Houghton, and Thomas soils that are in depressions and drainageways. Also included are small areas of moderately well drained Oakville soils that are on slightly higher knolls and ridges. The included soils make up 4 to 10 percent of the map unit.

Permeability is rapid in this Tedrow soil, and the available water capacity is low. Runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet from January through April.

In most areas this soil is used as woodland or pasture or is idle land. In a few areas it is used as cropland. This soil is well suited to use as pasture. It is fairly suited to use as cropland and woodland and to recreation uses.

This soil is poorly suited to building site development because of wetness, and it is poorly suited to use as septic tank absorption fields because of wetness and poor filtering capacity. If this soil is used as a site for buildings, the use of surface or subsurface drains to lower the water table and the use of well compacted fill to raise the site help to overcome the wetness limitation. If it is used as septic tank absorption fields, special construction, such as filling or mounding the absorption field with suitable soil material, may be needed to raise the site above the water table and to increase the filtering capacity.

If this soil is used as cropland, the major management concerns are wetness, water erosion and soil blowing, droughtiness, and organic matter content. Subsurface drainage helps to reduce the wetness limitation. Cover crops, such as rye, protect fields from erosion and soil blowing. The use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, helps to conserve moisture. The use of crop rotations that include grasses and legumes and the use of crop residue management can help to maintain organic matter content.

If this soil is used as woodland, the major management concern is seedling mortality. Some seedling loss can be expected due to droughtiness during dry summer months. Exposing soil just prior to the production of the seed crop can help desirable tree seedlings become established quickly and get a head start on competing vegetation.

This soil is in capability subclass IIIs and Michigan soil management group 5b.

54A—Matherton sandy loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on low knolls. Slopes are slightly convex and are less than 150 feet long. Areas are irregular in shape and are 2 to 180 acres in size.

Typically, the surface layer is very dark grayish brown sandy loam about 8 inches thick. The subsurface layer is grayish brown loam about 5 inches thick. The subsoil is mottled, friable sandy clay loam about 21 inches thick. In the upper part it is grayish brown, and in the lower part it is brown. The substratum to a depth of about 60 inches is light brownish gray, calcareous gravelly sand. In some places the depth to gravelly sand is more than 40 inches.

Included in mapping are small areas of Wasepi and Capac soils that are on landscape positions similar to those of the Matherton soil. The Wasepi soils are more droughty and the Capac soils less droughty than the Matherton soil. Also included are small areas of the poorly drained Sebewa soils and the very poorly drained Gilford soils that are in depressions and drainageways. The included soils make up 5 to 10 percent of this map unit.

Permeability is moderate in the subsoil of this Matherton soil and rapid or very rapid in the substratum. The available water capacity is moderate. Runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet from November through May.

In most areas this soil is used as pasture or woodland or is idle land. This soil is well suited to use as cropland, pasture, and woodland. It is fairly suited to most recreation uses.

This soil is poorly suited to building site development because of wetness, and it is poorly suited to use as septic tank absorption fields because of wetness and poor filtering capacity. If this soil is used as a site for buildings, the use of surface or subsurface drains to lower the water table and the use of well compacted fill to raise the site help to overcome the wetness limitation. If it is used as septic tank absorption fields, special construction, such as filling or mounding the absorption field with suitable soil material, may be needed to raise the site above the water table and to increase the filtering capacity.

If this soil is used as cropland, the main management concerns are removing excess water and maintaining good soil tilth. Surface and subsurface drains help to overcome the wetness limitation. Conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, helps to maintain good tilth.

This soil is in capability subclass IIw and Michigan soil management group 3/5b.

56A—Urban land-Blount-Lenawee complex, 0 to 3 percent slopes. This complex consists of Urban land;

nearly level, somewhat poorly drained Blount soils on low knolls; and nearly level, poorly drained Lenawee soils on smooth lowland flats and in shallow depressions and drainageways. Low areas are subject to frequent ponding. Areas of this complex are 5 to 500 or more acres and contain 40 to 70 percent Urban land, 20 to 25 percent Blount soils, and 15 to 20 percent Lenawee soils. The areas of these soils and Urban land are so intermingled or so small that mapping them separately is not practical at the scale used.

The Urban land is covered by streets, sidewalks, driveways, parking lots, houses, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the surface layer of the Blount soils is very dark grayish brown loam about 8 inches thick. The subsoil is mottled and is about 28 inches thick. In the upper part it is brown, firm silty clay loam; and in the lower part it is grayish brown, very firm clay. The substratum to a depth of about 60 inches is grayish brown, mottled, calcareous silty clay loam. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other areas have been cut, built up, or smoothed. In some places the subsoil has more clay.

Typically, the surface layer of the Lenawee soils is very dark brown silty clay loam about 9 inches thick. The subsoil is mottled and is about 36 inches thick. In the upper part it is dark gray, firm silty clay loam; in the middle part it is gray, very firm silty clay; and in the lower part it is gray, very firm silty clay loam. The substratum to a depth of about 60 inches is light yellowish brown, mottled, calcareous silty clay loam. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed.

Included in mapping are small areas of the moderately well drained Glynwood soils on slightly higher, convex areas. Also included are small areas of Aquents that are on landscape positions similar to those of the Lenawee soils. The included soils make up 2 to 10 percent of the complex.

In winter and spring the high water table is at a depth of 1 to 2 feet in the Blount soils and is near or at the surface in the Lenawee soils. Permeability is slow or moderately slow in the Blount soils and moderately slow in the Lenawee soils. The available water capacity is high. Surface runoff is slow to ponded.

Most areas of this complex are used for residential, commercial, and light industrial development. Some areas are used for schools. The Blount and Lenawee soils, which make up the open parts of the complex, are used mainly for lawns, gardens, windbreaks, ornamental or wildlife planting, and open space and to a lesser extent for parks and woodland. The Blount soils are fairly suited to use as sites for lawns, vegetable and flower gardens, and trees and shrubs. The Lenawee soils, unless drained, are poorly suited to these uses. These soils are poorly suited to recreation uses.

If grasses, flowers, vegetables, trees, and shrubs are grown, the main management concerns are removing excess water and maintaining the organic matter content and tilth of the soil. Surface and subsurface drainage can be used successfully on this soil; however, onsite evaluation is needed to determine the best method of drainage for a particular area. The content of organic matter in the soil can be maintained by adding compost material or by plowing under grasses or legumes, such as clover, each year. Soil tilth can be maintained by not working the soil while it is wet and by adding suitable materials to increase the aeration of the soil and make it easier for the roots to penetrate the clay. Working the soil when it is wet causes the soil to become cloddy and compact. Perennial plants that are selected for planting should have a fairly high tolerance for wetness. In areas where the subsoil has been exposed during construction or landforming, suitable topsoil should be added.

The Blount and Lenawee soils are poorly suited to building site development because of wetness. They should not be used as sites for buildings with basements. If these soils are used as sites for buildings without basements, the use of surface and subsurface drains to lower the water table and the use of well compacted fill to raise the site help to overcome the wetness limitation. These soils generally are not suited to use as septic tank absorption fields because of wetness and slow or moderately slow permeability. Sanitary facilities should be connected to public sewers and sewage treatment facilities.

This complex is not assigned to interpretive groupings.

59—Urban land. This miscellaneous area consists of nearly level and sloping land that is covered by commercial buildings, condominiums and apartment buildings, parking lots, streets, sidewalks, driveways, railroad yards, industrial complexes, and other structures. These structures cover about 85 percent or more of the mapped area.

Included with the Urban land in mapping are some small areas of sandy to clayey soils.

Urban land is not assigned to interpretive groupings.

60B—Urban land-Marlette complex, 0 to 8 percent slopes. This complex consists of Urban land and nearly level to gently rolling, moderately well drained Marlette soils on knolls, ridges, and side slopes. Areas of this complex are 10 to 500 or more acres and contain 40 to 75 percent Urban land and 20 to 30 percent Marlette soils. The areas of Urban land and Marlette soils are so intermingled or so small that mapping them separately is not practical at the scale used.

The Urban land is covered by streets, sidewalks, driveways, parking lots, houses, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the Marlette soils have a surface layer of dark grayish brown sandy loam about 7 inches thick. The

subsoil is firm clay loam about 30 inches thick. In the upper part it is dark yellowish brown, and in the lower part it is yellowish brown and mottled. The substratum to a depth of about 60 inches is brown, mottled, calcareous loam. In some places, the soil has been radically altered. Some of the higher areas have been levelled, and some of the lower areas have been filled. Other small areas have been built up or smoothed.

Included in mapping are small areas of the somewhat poorly drained Capac, Metamora, Kibbie, and Selfridge soils that are on low-lying positions and in drainageways. These included soils make up 2 to 10 percent of this complex.

Permeability of the Marlette soils is moderately slow, and the available water capacity is high. Surface runoff is medium. The seasonal high water table is at a depth of 2 1/2 to 6 feet in winter and spring.

Most areas of this complex are used for residential, commercial, and light industrial development. Some areas are used for schools. The Marlette soils, which make up the open parts of the complex, are used for lawns, gardens, and environmental plantings and to a lesser extent for parks and woodland. They are well suited to use as sites for lawns, vegetable and flower gardens, trees, and shrubs and fairly to poorly suited to use as sites for playgrounds. They are fairly suited to use as sites for buildings.

If grasses, flowers, vegetables, trees, and shrubs are grown, the main concern is controlling erosion. Mulching, grass seeding or sodding with fertilization, and the use of diversions, erosion control structures, and grassed waterways help to prevent erosion. In areas where the subsoil is exposed, topsoil should be added.

The Marlette soils are suited to building site development, but wetness is a limitation. Raising the site with well compacted fill material and installing subsurface drains can help to overcome this limitation. The Marlette soils are poorly suited to use as septic tank absorption fields because of moderately slow permeability. Sanitary facilities should be connected to public sewers and sewage treatment facilities.

This complex is not assigned to interpretive groupings.

60C—Urban land-Marlette complex, 8 to 15 percent slopes. This complex consists of Urban land and gently rolling or rolling, well drained Marlette soils on knolls, ridges, and side slopes. Areas of this complex are 10 to 200 or more acres and contain 40 to 75 percent Urban land and 20 to 30 percent Marlette soils. The areas of Urban land and Marlette soils are so intermingled or so small that mapping them separately is not practical at the scale used.

The Urban land is covered by streets, sidewalks, driveways, parking lots, houses, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the Marlette soils have a surface layer of dark grayish brown sandy loam about 7 inches thick. The subsoil is firm clay loam about 30 inches thick. In the upper part it is dark yellowish brown, and in the lower part it is yellowish brown and mottled. The substratum to a depth of about 60 inches is brown, mottled, calcareous loam. In some places, the soil has been radically altered. Some of the higher areas have been levelled, and some of the lower areas have been filled. Other small areas have been built up or smoothed.

Included in mapping are small areas of the somewhat poorly drained Capac, Metamora, Kibbie, and Selfridge soils that are in drainageways. These included soils make up 5 to 10 percent of this complex.

Permeability of the Marlette soils is moderately slow, and the available water capacity is high. Surface runoff is medium.

Most areas of this complex are used for residential, commercial, and light industrial development. Some areas are used for schools. The Marlette soils, which make up the open parts of the complex, are used for lawns, gardens, and environmental plantings and to a lesser extent for parks and woodland. They are well suited to use as sites for lawns, vegetable and flower gardens, trees, and shrubs and fairly to poorly suited to use as sites for playgrounds and buildings.

If grasses, flowers, vegetables, trees, and shrubs are grown, the main management concern is controlling erosion. Mulching, grass seeding or sodding with fertilization, and the use of diversions, erosion control structures, and grassed waterways help to prevent erosion. In areas where the subsoil is exposed, topsoil should be added.

The Marlette soils are suited to building site development, but slope is a limitation. Land shaping helps to overcome this limitation. The Marlette soils are poorly suited to use as septic tank absorption fields because of slope and moderately slow permeability. Sanitary facilities should be connected to public sewers and sewage treatment facilities.

This complex is not assigned to interpretive groupings.

60D—Urban land-Marlette complex, 15 to 25 percent slopes. This complex consists of Urban land and rolling and hilly, well drained Marlette soils on knolls, ridges, and side slopes. Areas of this complex are 10 to 70 or more acres and contain 35 to 60 percent Urban land and 35 to 45 percent Marlette soils. The areas of Urban land and Marlette soils are so intermingled that mapping them separately is not practical at the scale used.

The Urban land is covered by streets, sidewalks, driveways, parking lots, houses, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the Marlette soils have a surface layer of dark grayish brown sandy loam about 7 inches thick. The subsoil is firm clay loam about 30 inches thick. In the upper part it is dark yellowish brown, and in the lower part it is yellowish brown and mottled. The substratum to

a depth of about 60 inches is brown, mottled, calcareous loam. In some places, the soil has been radically altered. Some of the higher areas have been levelled, and some of the lower areas have been filled. Other small areas have been built up or smoothed.

Included in mapping are small areas of the somewhat poorly drained Capac soils that are in drainageways. The included soils make up 5 to 10 percent of this complex.

Permeability of the Marlette soils is moderately slow, and the available water capacity is high. Surface runoff is medium.

Most areas of this complex are used for residential, commercial, and light industrial development. Some areas are used for schools. The Marlette soils, which make up the open parts of the complex, are used for lawns, gardens, and environmental plantings and to a lesser extent for parks and woodland. They are well suited to use as sites for lawns, vegetable and flower gardens, trees, and shrubs and poorly suited to use as sites for playgrounds. They are fairly suited to use as sites for buildings.

The Marlette soils are fairly suited to grasses, flowers, vegetables, trees, and shrubs if erosion is controlled. Mulching, spraying asphalt, netting, grass seeding or sodding with fertilization, and the use of diversions, erosion control structures, and grassed waterways help to prevent erosion. In areas where the subsoil is exposed, topsoil should be added.

The Marlette soils are poorly suited to building site development because of slope, and they are poorly suited to use as septic tank absorption fields because of moderately slow permeability and slope. Land shaping and installing retaining walls help to overcome the slope limitation for buildings. Sanitary facilities should be connected to public sewers and sewage treatment facilities.

This complex is not assigned to interpretive groupings.

61A—Urban land-Capac complex, 0 to 3 percent slopes. This complex consists of areas of Urban land and nearly level, somewhat poorly drained Capac soils on flat plains, low knolls, and side slopes. Areas of this complex are irregular in shape and are 5 to 300 or more acres in size. The Urban land makes up about 40 to 75 percent of mapped areas, and the Capac soils make up 15 to 25 percent. Areas of these soils are so intermingled or so small that mapping them separately is not practical at the scale used.

Urban land is covered by streets, sidewalks, driveways, parking lots, houses, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the surface layer of the Capac soils is very dark grayish brown sandy loam about 8 inches thick. The subsoil is mottled, firm clay loam about 24 inches thick. In the upper part it is brown, and in the lower part it is grayish brown. The substratum to a depth of about 60 inches is pale brown, mottled, calcareous loam. In some places the soil has been radically altered. Some of the low areas have been filled or levelled; and other areas have been cut, built up, or smoothed.

Included in mapping are the very poorly drained Brookston, Gilford, Houghton, and Adrian soils that are in low-lying areas and are subject to ponding. These included soils make up 5 to 10 percent of the complex.

In the Capac soils the seasonal high water table is at a depth of 1 to 2 feet in winter and spring. Permeability is moderately slow, and the available water capacity is high. Surface runoff is slow.

Most areas of this complex are used for residential, commercial, and light industrial development. Some areas are used for schools. The Capac soils, which make up the open parts of the complex, are used mainly for lawns, gardens, windbreaks, and ornamental or wildlife plantings and to a lesser extent for parks and woodland.

If grasses, flowers, vegetables, trees, and shrubs are grown, the main management concern is removing excess water. Several methods of artificial drainage can be used on these soils. The best method for a particular area should be selected by onsite evaluation. Perennial plants that are selected for planting should have a fair tolerance for wetness.

The Capac soils are poorly suited to building site development because of wetness and generally are not suited to use as septic tank absorption fields because of wetness and moderately slow permeability. If these soils are used as sites for buildings, the use of surface or subsurface drainage to lower the water table and the use of well compacted fill to raise the site can help to overcome the wetness limitation. Sanitary facilities should be connected to public sewers and sewage treatment facilities.

This complex is not assigned to interpretive groupings.

62B—Urban land-Spinks complex, 0 to 8 percent slopes. This complex consists of Urban land and nearly level to gently rolling, well drained Spinks soils on broad flat areas, knolls, and ridges. Areas of this complex are irregular in shape and range from 5 to 500 acres or more. Urban land makes up about 40 to 75 percent of mapped areas, and Spinks soils make up 25 to 35 percent. The areas of Urban land and the Spinks soils are so intermingled that mapping them separately is not practical at the scale used.

Urban land is covered by streets, sidewalks, driveways, parking lots, houses, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the surface layer of the Spinks soils is brown loamy sand about 8 inches thick. The subsurface layer is pale brown sand about 9 inches thick. The next layer to a depth of about 60 inches consists of brown, loose sand and thin bands of reddish brown, very friable loamy sand. In some places the soil has been radically altered. Some of the higher areas have been levelled, and some

of the lower areas have been filled. Other small areas have been built up or smoothed. In some places the total thickness of bands is less than 6 inches or there is gravelly sand below about 50 inches.

Included in mapping are small areas of well drained Riddles soils on landscape positions similar to those of the Spinks soils. These soils have more clay in the subsoil and are less droughty than the Spinks soils. Also included are small areas of somewhat poorly drained Wasepi, Thetford, and Selfridge soils that are on low-lying landscape positions or in drainageways. The included soils make up 5 to 10 percent of the complex.

Permeability is moderately rapid in the Spinks soils. The available water capacity is low. Runoff is slow.

Most areas of this complex are used for residential, commercial, and light industrial development. Some areas are used for schools. The Spinks soils, which make up the open parts of the complex, are used for lawns, gardens, and environmental plantings and to a lesser extent for parks and woodland. These soils generally are poorly suited to grasses, flowers, vegetables, and many trees and shrubs.

The Spinks soils are well suited to building site development and to use as septic tank absorption fields.

This complex is not assigned to interpretive groupings.

62C—Urban land-Spinks complex, 8 to 15 percent slopes. This complex consists of Urban land and gently rolling and rolling, well drained Spinks soils on knolls, ridges, and side slopes. Areas are irregular in shape and range from 5 to 200 acres or more. Urban land makes up about 40 to 75 percent of the mapped areas, and Spinks soils make up 30 to 40 percent. The areas of Urban land and the Spinks soils are so intermingled that mapping them separately is not practical at the scale used.

Urban land is covered by streets, sidewalks, driveways, parking lots, houses, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the surface layer of the Spinks soils is brown loamy sand about 8 inches thick. The subsurface layer is pale brown sand about 9 inches thick. The next layer to a depth of about 60 inches consists of brown, loose sand and thin bands of reddish brown, very friable loamy sand. In some places the soil has been radically altered. Some of the higher areas have been levelled, and some of the lower areas have been filled. Other small areas have been built up or smoothed. In some places the total thickness of bands is less than 6 inches or there is gravelly sand below 50 inches.

Included in mapping are small areas of well drained Riddles soils on landscape positions similar to those of the Spinks soils. These soils are less droughty than the Spinks soils. Also included are small areas of somewhat poorly drained Wasepi, Thetford, and Selfridge soils that are on low-lying landscape positions or in drainageways. The included soils make up 5 to 10 percent of the complex.

Permeability is moderately rapid in the Spinks soils. The available water capacity is low. Runoff is medium.

Most areas of this complex are used for residential, commercial, and light industrial development. Some areas are used for schools. The Spinks soils, which make up the open parts of the complex, are used for lawns, gardens, and environmental plantings and to a lesser extent for parks and woodland.

The Spinks soils are suited to building site development and to use as septic tank absorption fields, but slope is a limitation. For buildings, the slope limitation can be overcome by land shaping and installing retaining walls. For septic tank absorption fields, this limitation can be overcome by land shaping and installing the absorption field across the slope.

This complex is not assigned to interpretive groupings.

63A—Urban land-Thetford complex, 0 to 3 percent slopes. This complex consists of Urban land and nearly level, somewhat poorly drained Thetford soils on smooth, low-lying plains. Areas of this complex are 5 to 140 acres and are 35 to 75 percent Urban land and 20 to 30 percent Thetford soils. The areas of Urban land and Thetford soils are so intermingled or so small that it is not practical to separate them at the scale of mapping used.

Urban land is covered by streets, sidewalks, driveways, parking lots, houses, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the surface layer of the Thetford soils is very dark grayish brown loamy fine sand about 8 inches thick. The subsurface layer is light yellowish brown loamy fine sand about 16 inches thick. The subsoil consists of pale brown, mottled, loose fine sand and thin, discontinuous bands of dark brown, very friable loamy sand, about 25 inches thick. The substratum to a depth of about 60 inches is pale brown, mottled, calcareous fine sand and sand. In some places mainly in the City of Southfield and Royal Oak areas, the subsoil texture is loamy very fine sand and the thickness of bands in the subsoil is less than 6 inches. In some areas the substratum is loamy or clayey below a depth of about 50 inches. In places the soil has been radically altered. Some of the low areas have been filled or levelled; other areas have been cut, built up, or smoothed.

Included in mapping are small areas of very poorly drained Houghton and Adrian soils and poorly drained Granby soils that are in low-lying areas. The Houghton and Adrian soils are less stable than the Thetford soils. The included soils make up 2 to 8 percent of the complex.

Thetford soils have a high water table at a depth of 1 to 2 feet in winter and spring. Permeability is moderately rapid. The available water capacity is low, and runoff is slow.

Most areas are used for residential, commercial, and light industrial development. Some areas are used for

schools. The Thetford soils, which make up the open parts of the complex, are used mainly for lawns, gardens, windbreaks, and ornamental or wildlife plantings, parks, and woodland. They are fairly suited to lawns, vegetable and flower gardens, trees, and shrubs.

If grasses, flowers, vegetables, trees, and shrubs are grown, the main management concerns are removing excess water, overcoming droughtiness, and maintaining organic matter content. Several methods of artificial drainage can be used on this soil. The best method for a particular area will need to be selected by onsite evaluation. Perennial plants that are selected for planting should have a fairly high tolerance for wetness. Topsoil is needed in areas where the subsoil has been exposed during construction or landforming.

The Thetford soils are poorly suited to building site development and to use as septic tank absorption fields because of wetness. If these soils are used as building sites, the use of surface and subsurface drains to lower the water table and the use of well compacted fill to raise the site can help to overcome the wetness limitation. Sanitary facilities should be connected to public sewers and sewage treatment facilities.

This complex is not assigned to interpretive groupings.

67B—Ormas loamy sand, 0 to 6 percent slopes. This nearly level and undulating, well drained soil is on broad, nearly level plains and on low knolls and ridges. Slopes are smooth and convex and are commonly less than 100 feet long. Areas are irregular in shape and are 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown loamy sand about 9 inches thick. The subsurface layer is pale brown loamy sand and light yellowish brown sand about 23 inches thick. The subsoil is dark brown, firm gravelly sandy clay loam about 11 inches thick. The substratum to a depth of about 60 inches is pale brown, calcareous gravelly sand. In some places the subsoil and substratum consist of alternate layers of sandy clay loam and sandy loam.

Included in mapping are small areas of somewhat poorly drained Matherton, Wasepi, and Selfridge soils that are on flat plains, in depressions, and on foot slopes. Also included are poorly drained Sebewa soils and very poorly drained Brookston and Houghton soils that are in depressions. The included soils make up 2 to 10 percent of the map unit.

Permeability is moderately rapid in the subsoil of this Ormas soil and very rapid in the substratum. The available water capacity is low, and surface runoff is slow.

In most areas this soil is used as pasture or woodland or is idle land. This soil is well suited to use as pasture and woodland. It is fairly well suited to cropland and recreation uses. This soil is well suited to building site development and to use as septic tank absorption fields.

If this soil is used as cropland, the major management concerns are controlling soil blowing, overcoming droughtiness, and maintaining organic matter content. Cover crops, such as rye, protect fields from soil blowing. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, can help to maintain the content of organic matter and overcome droughtiness.

If this soil is used as woodland, the major management concern is seedling mortality. Special site preparation, such as furrowing, can help to overcome this problem in some areas.

This soil is in capability subclass IIIs and Michigan soil management group 4a.

67C—Ormas loamy sand, 6 to 12 percent slopes. This moderately sloping and gently rolling, well drained soil is on knolls, ridgetops, and side slopes. Slopes are smooth and convex and are generally less than 100 feet long. Areas of this soil are irregular in shape and are 2 to 100 acres in size.

Typically, the surface layer is dark grayish brown loamy sand about 8 inches thick. The subsurface layer is pale brown loamy sand and light yellowish brown sand about 23 inches thick. The subsoil is dark brown, firm gravelly sandy clay loam about 10 inches thick. The substratum to a depth of 60 inches is pale brown, calcareous gravelly sand. In some places the subsoil and substratum consist of alternate layers of sandy loam and sandy clay loam.

Included in mapping are small areas of somewhat poorly drained Matherton, Wasepi, and Selfridge soils that are on foot slopes and in depressions. Also included are poorly drained Sebewa soils and very poorly drained Thomas soils that are in depressions. The included soils make up 5 to 10 percent of the map unit.

Permeability is moderately rapid in the subsoil of this Ormas soil and very rapid in the substratum. The available water capacity is low. Surface runoff is medium.

In most areas this soil is used as pasture or woodland or is idle land. In a few areas it is used as cropland. This soil is well suited to use as pasture and woodland. It is fairly well suited to cropland and recreation uses.

This soil is suited to building site development and to use as septic tank absorption fields, but slope is a limitation. For buildings, land shaping and installing retaining walls help to overcome the slope limitation. For septic tank absorption fields, land shaping and installing the absorption field across the slope help to overcome this limitation.

If this soil is used as cropland, the major management concerns are controlling water erosion and soil blowing, overcoming droughtiness, and maintaining organic matter content. Cover crops, such as rye, protect fields from water erosion and soil blowing. Contour tillage helps to slow runoff. The use of grasses and legumes in the crop rotation and the use of conservation tillage, which does not invert the soil and leaves all or part of the crop residue on the surface, can help to maintain the content of organic matter and overcome droughtiness.

If this soil is used as woodland, the major management concern is seedling mortality. Special site preparation, such as furrowing, helps to overcome this problem.

This soil is in capability subclass IIIe and Michigan soil management group 4a.

68—Cohoctah-Fox association. This map unit consists of nearly level, very poorly drained Cohoctah soils on flood plains and moderately sloping to steep, well drained Fox soils on adjacent side slopes. The Cohoctah soils are subject to frequent flooding. Areas are long, narrow, and winding and are 10 to 100 acres. The map unit is about 55 percent Cohoctah soils and about 30 percent Fox soils.

Typically, the surface layer of the Cohoctah soils is very dark gray fine sandy loam about 11 inches thick. The substratum is dark gray fine sandy loam in the upper 10 inches; gray, mottled sandy loam and very dark brown sandy loam in the next 27 inches; and gray, calcareous gravelly sand in the lower part.

Typically, the surface layer of the Fox soils is very dark grayish brown sandy loam about 9 inches thick. The subsurface layer is brown sandy loam about 6 inches thick. The subsoil is dark brown, firm gravelly sandy clay loam. The substratum to a depth of about 60 inches is brown, calcareous gravelly sand.

Included in mapping are small areas of Riddles, Marlette, Sisson, and Arkport soils on landscape positions similar to those of the Fox soils. These soils are less droughty than the Fox soils. The included soils make up 5 to 10 percent of the map unit.

Permeability is moderately rapid in the Cohoctah soils. In the Fox soils, it is moderate in the subsoil and very rapid in the substratum. The available water capacity is low for Cohoctah soils and moderate for Fox soils. Runoff is slow to ponded on the Cohoctah soils and medium to very rapid on the Fox soils. The high water table in the Cohoctah soils is at or near the surface from September through May.

In most areas these soils are in permanent vegetation including woodland. In a few areas they are used for pasture. These soils have poor suitability for use as pasture, woodland, and cropland and for recreation uses.

These soils are not suitable for building site development and for use as septic tank absorption fields because of the flood hazard in areas of the Cohoctah soils and because of the slope limitation of the Fox soils.

If these soils are used as woodland, the major management concerns in areas of the Cohoctah soils are equipment limitations, seedling mortality, and windthrow. In areas of the Fox soils, the major concerns are water erosion and slope. Woodland operations can be timed to seasons of the year when the Cohoctah soils are relatively dry or frozen. Special site preparation, such as bedding, can be used to help reduce seedling mortality in some areas of the Cohoctah soils. The use of harvest methods that do not leave trees standing alone or widely spaced helps to overcome the windthrow problem. Roads and skid trails should be placed on gentle grades.

These soils are in capability subclass Vw and Michigan soil management groups L-2c and 3/5a.

69—Thomas muck. This nearly level, very poorly drained soil is on small to broad flat areas, swamps, and drainageways. It is subject to occasional ponding. Areas are irregular in shape and are 5 to 140 or more acres in size.

Typically, the surface layer is black muck about 11 inches thick. The subsoil is dark gray, mottled, firm clay loam about 9 inches thick. The substratum is gray, mottled, calcareous clay loam in the upper 26 inches. Below that, to a depth of about 60 inches, it is gray, mottled, calcareous loam. In some places the subsoil and substratum have layers that are either coarser textured or finer textured. In some places the subsoil contains thin layers of organic material.

Included in mapping are small areas of very poorly drained Houghton soils that are on landscape positions similar to those of the Thomas soil. The Houghton soils are less stable than the Thomas soil. They make up 5 to 10 percent of the map unit.

Permeability is moderate in the upper part of this Thomas soil and moderately slow or slow in the lower part. The available water capacity is high. Runoff is very slow or ponded. This soil has a high water table at or above the surface from November to June. The shrink-swell potential is moderate.

In most areas this soil is used as woodland or pasture or is idle land. This soil is poorly suited to use as cropland, pastureland, and woodland and to recreation uses. Because of wetness, it is not suited to building site development and to use as septic tank absorption fields.

If this soil is used as woodland, the major management concerns are equipment limitations, seedling mortality, and windthrow. The use of heavy equipment for planting, tending, and harvesting trees is restricted during wet periods. Woodland operations can be timed to seasons when the soil is relatively dry or frozen. Seedling loss is high because of wetness. Special site preparation, such as bedding, can be used in some areas to help reduce loss of seedlings. The use of harvest methods that do not leave trees standing alone or widely spaced helps to prevent windthrow.

This soil is in capability subclass Vw and Michigan soil management group 1.5c-c.

Prime farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited and the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our Nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It may be cropland, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for producing food or fiber or is available for these uses. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops if acceptable farming methods are used. Prime farmland produces the highest yields with the smallest inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. It also has favorable temperature and growing season and acceptable acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland 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.

Some parts of the county have been losing some prime farmland to industrial and urban uses. The loss of prime farmland to other uses results in cropping of marginal lands, which generally are more erodible, droughty, and difficult to cultivate and are less productive.

Soil map units that meet the requirements for prime farmland in Oakland County are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. Some map units are considered prime farmland only in areas that are adequately drained. The soil qualities that affect use and management are described in the section "Detailed soil map units."

The map units that meet the soil requirements for prime farmland are:

10B—Marlette sandy loam, 1 to 6 percent slopes
11B—Capac sandy loam, 0 to 4 percent slopes (where drained)
12—Brookston and Colwood loams (where drained)
18B—Fox sandy loam, 1 to 6 percent slopes
19—Sebewa loam (where drained)
20B—Glynwood loam, 2 to 6 percent slopes
23B—Sisson fine sandy loam, 1 to 6 percent slopes
25B—Owosso sandy loam, 1 to 6 percent slopes
32B—Blount loam, 0 to 4 percent slopes (where drained)
33—Lenawee silty clay loam (where drained)
34B—Kibbie fine sandy loam, 0 to 4 percent slopes
36A—Metamora sandy loam, 0 to 3 percent slopes (where drained)
44B—Riddles sandy loam, 1 to 6 percent slopes
45B—Arkport loamy fine sand, 2 to 6 percent slopes
46A—Dixboro loamy fine sand, 0 to 3 percent slopes
47B—Fox-Riddles sandy loams, 1 to 6 percent slopes
54A—Matherton sandy loam, 0 to 3 percent slopes (where drained)

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 avoid 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 behavior 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 recreation 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 (*6*).

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

Dwight L. Quisenberry, agronomist, Soil Conservation Service, helped write this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants 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 Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants 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 "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

According to the Census of Agriculture (*10*) about 11 percent of Oakland County's total land area, or 61,562 acres, was farmland in 1974. This farmland included 13,370 acres of permanent pasture; 16,341 acres of row crops, mainly corn; 6,319 acres of close-growing crops, mainly wheat and oats; 15,256 acres of hay crops, mainly alfalfa and alfalfa mixtures; and 296 acres of specialty crops, mainly sweet corn and melons. Abandoned farmland, woodland, wetland, and urban areas make up the rest of the county's land area.

Erosion is the major hazard on the cropland in Oakland County. Where the slope is more than 2 percent, water erosion is a hazard. Marlette soils, for example, have slope of as much as 35 percent.

Loss of the surface layer by erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, such as the Glynwood soils. Erosion also reduces productivity on soils that tend to be droughty, such as Arkport and Boyer soils. Second, erosion on farmland results in pollution of streams by sediment. Controlling erosion improves the quality of water for municipal use, for recreation, and for fish and wildlife.

In many sloping areas, preparing a good seedbed and tilling are difficult in spots because the original friable surface layer has been eroded and clayey material is exposed. Such spots are common in the sloping areas of Marlette and Glynwood soils.

Erosion control practices provide a protective cover for the surface layer, reduce runoff, and increase infiltration. A cropping system that keeps a vegetative cover on the soil for extended periods can hold erosion losses to amounts that will not reduce the productivity of the soils. On livestock farms, which require pasture and hay, the legume and grass forage crops in the cropping system reduce erosion on sloping land and provide nitrogen and improve tilth for the following crop.

Drainage is the major management need on about three-fourths of the acreage used for crops and pasture

in the survey area. The poorly drained or very poorly drained soils are naturally so wet that, unless drained, they generally cannot be used for the production of crops common to the survey area. Brookston, Colwood, Gilford, Sebewa, Sloan, Lenawee, Granby, and Cohoctah soils are poorly drained or very poorly drained. The organic Houghton, Adrian, Napoleon, and Thomas soils are very poorly drained.

If somewhat poorly drained soils used as cropland are not drained, the crops are damaged in most years. Capac, Wasepi, Blount, Kibbie, Thetford, Metamora, Dixboro, Selfridge, Tedrow, and Matherton soils are the somewhat poorly drained soils in this survey area.

Draining the land used for crops improves the aeration of the root zone. Spring planting, spraying, and harvesting are delayed and weed control is more difficult where drainage is poor. A combination of surface drainage and tile drainage is needed for most areas of the somewhat poorly drained, poorly drained, and very poorly drained soils used for intensive row cropping. Random tile drainage usually is adequate for the moderately well drained soils. Drains may have to be more closely spaced in soils that have slow permeability. Finding adequate outlets for tile drains is difficult in many areas of the Cohoctah, Adrian, Houghton, Sloan, Napoleon, Granby, Sebewa, and Thomas soils.

Organic soils oxidize and subside when the pore space is filled with air. Special drainage systems are therefore needed to control the depth and the period of drainage. Keeping the water table at the level required by crops during the growing season and raising it to the surface during other parts of the year minimize the oxidation and subsidence of organic soils. Information on drainage design for each kind of soil is available at local offices of the Soil Conservation Service.

Natural fertility is medium to high in the loamy soils and low in most of the sandy soils on the uplands. Many of the sandy soils are strongly acid to slightly acid. Applications of ground limestone are required to raise the pH to a level sufficient for good growth of alfalfa and other crops that grow only on nearly neutral soils. Available phosphorus and potash levels are naturally low to medium in most of these soils. For all soils, additions of lime and fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected yields (*4*). The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to apply.

Tilth of the soil is an important factor affecting the germination of seeds and the infiltration of water into the soil. Soils that are granular and porous have good tilth.

Some of the soils that are used for crops have a loamy surface layer that is light in color and low in organic matter content. Generally the structure of such soils is weak, and intense rainfall causes the surface to crust. If a crust forms, infiltration is reduced and runoff is increased. Regular additions of crop residue, manure, and other organic material can help to improve soil tilth and to reduce crust formation.

In areas of the darker colored, more clayey Brookston, Colwood, and Lenawee soils, which are wet until late in spring, tilth is difficult to maintain. If these soils are wet when plowed, they tend to be very cloddy when dry, the subsoil compacts, and a good seedbed is difficult to prepare. Cover crops and green manure crops, proper use of crop residue, conservation tillage, and applications of livestock manure help to maintain and improve organic matter content and tilth. Good management practices are needed if an intensive cropping system or continuous cultivation exists.

Specialty crops grown commercially in the county include vegetables, such as tomatoes and sweet corn; sod; and apples.

Permanent pasture in the county is mostly on soils that are subject to erosion. These soils generally are eroded, and many are low in natural fertility and have poor tilth. Control of erosion is particularly important during seeding operations. Mulch seeding or use of a nurse crop can help to control further erosion. The need for lime and fertilizer should be determined by soil tests, and adequate amounts should be applied.

The productivity of a pasture and its ability to protect the surface of the soil is influenced by the number of livestock it supports, the length of time the livestock graze, and rainfall distribution. Good pasture management includes the use of stocking rates that maintain key forage species, pasture rotation, deferred grazing, restricting grazing during wet periods, and supplying water at strategic locations for livestock.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The 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 insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

Land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (*8*). 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 grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use. There are no class I soils in this survey area.

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. There are no class VIII soils in this survey area.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w,* or *s,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is 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); and *s* shows that the soil is limited mainly because it is shallow, droughty, or stony.

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* or *s* 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.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units." Also given at the end of each description is a Michigan soil management group. The soils are assigned to a group according to need for lime and fertilizer and for artificial drainage and other practices. For soils making up a complex, the management groups are listed in the same order as the series named in the complex. For a detailed explanation of the Michigan soil management groups see Michigan State University Extension Bulletin E-1262 (*5*).

Woodland management and productivity

A mixed hardwood forest of oak, hickory, pine, sugar maple, and beech once covered most of the upland areas; and red maple, elm, eastern white-cedar, cottonwood, and tamarack covered the swampy and lowland areas. Much of this original woodland has been cleared by cultivation and urban expansion. The remaining woodland is mainly in areas of soils that are too steep, too wet, or too sandy for farming. The soils in those areas can produce trees of high quality if the woodland is properly managed.

Woodland now makes up about 150,000 acres, or 27 percent of the county. About three-quarters of this acreage is in state, metropolitan, and county parks. The rest is privately owned.

The largest areas of woodland are in general soil map units 2, 3, and 4. On the uplands the most common trees are black and white oak, black cherry, beech, aspen, sugar maple, and red oak. On the lowlands the main trees are tamarack, red maple, eastern white-cedar, silver maple, swamp white oak, ash, and cottonwood. Plantations consisting of red, white, jack, and Scotch pine and plantings of Norway spruce, white spruce, and eastern white-cedar are scattered throughout the county. Christmas tree plantations and apple orchards are in a few areas. Many of the plantations and woodland areas could be improved by thinning out the trees that are poorly formed or slow growing or have other undesirable characteristics. Pruning, fire protection, and control of disease and insects are also needed to improve stands.

The Soil Conservation Service, the Michigan Department of Natural Resources, Cooperative Extension Service, or a private consultant in forestry can help determine specific woodland management needs.

Table 7 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 (woodland suitability) 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 important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This 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.

Trees to plant are those that are suited to the soils and to commercial wood production.

Environmental plantings

Planting trees, shrubs, and vines, such as those listed in table 8, in an urban environment presents problems that are different from those in a rural environment. There may be regulations prohibiting the planting of certain kinds of plants. There may be certain hazards to plants, such as toxic fumes, high levels of salt, and soil disturbance, which are not common in a rural environment. Consult local ordinances and urban foresters at the Michigan Department of Natural Resources, Extension Service, local nurserymen, or other trained foresters for more specific information.

Street borders. Trees planted along the borders of streets perform many useful functions. They provide environmental, social, architectural, engineering, and climatic benefits. Trees selected for street borders should not have shallow root systems that buckle and break up pavement and clog sewers and storm drains. They should not have brittle limbs that break easily under high winds or a coating of ice or snow. They should have fair tolerance to the salt used to melt ice and snow. These trees should also have the ability to tolerate noxious fumes, dust, and smoke.

Shade trees provide many benefits besides removing carbon dioxide from the air and replacing it with oxygen and filtering dust and pollutants. They cool homes and offices and improve the appearance of the community. There are a wide variety of hardy shade trees in the survey area. The selection of which shade tree to plant depends upon the effect you wish to achieve, the size of your building, and the area available for tree growth. In general, trees should not be planted closer to the house than the average height at maturity, nor in areas where falling limbs could cause damage.

Ornamentals. Trees and shrubs may be planted in lawns, parks, public squares, odd areas, and other places for decorative purposes (fig. 8). The attractiveness of trees and shrubs can be attributed largely to the color and shape of leaves, needles, fruit, flowers, and bark. A wide variety of ornamental trees and shrubs are suited to the survey area.

Figure 8.—Many ornamentals, shade trees, screens, and fruit trees have been planted in this area, which is dominantly Oshtemo-Boyer loamy sands, 0 to 6 percent slopes.

Screens for noise abatement and concealment of unsightly areas are needed in most urban areas. The types of trees and shrubs listed in table 8 grow relatively tall in a short period of time. For best results in reducing noise, trees and shrubs should be planted close to the noise source rather than close to the area needing protection. For year-round screening, evergreens are recommended. A combination of trees and dense shrubs may be most effective. Some of the dense shrubs suitable for wildlife food and cover and for ornamentals are also suitable for screens. Knowledge of trees and shrubs and experience are needed to select the best combination of trees and shrubs. Consult an experienced technician or nurseryman to select the species which are suitable for your site.

Plants for shaded areas, roadsides, and steep banks. In urban areas, there are many sites suitable neither for grass nor for woody plants. The topography, shade, or intended uses of the sites make it more practical to use certain ground cover plants. A ground cover should grow within the temperature, moisture, and other conditions to which it may be subjected; it should grow rapidly enough to cover and protect the area; it should be easily propagated, commercially available, low growing, and relatively resistant to foot traffic; and it should require only a minimum amount of maintenance.

Wildlife food and cover. Many forms of wildlife inhabit the urban areas. Nongame birds, cottontail, tree squirrels, ring-necked pheasant, white-tailed deer, waterfowl, mink, muskrat, raccoon, opossum, and other

small mammals are present, as are frogs, toads, and nonpoisonous snakes. The list of wildlife food and cover plants in table 8 is limited to shrubs, although grasses, annuals such as wheat and corn, trees, shrubs, and vines in the proper combination form the most ideal habitat. Not all of the suitable shrubs are listed in the table, and no particular wildlife species was considered in the preparation of this list. If habitat for a particular species of wildlife is to be created or maintained, the Soil Conservation Service, the Michigan Department of Natural Resources, Extension Service, or other organizations can be contacted for assistance.

Recreation

Oakland County has many areas of scenic, geologic, and historic interest. These areas are used for camping, hiking, horseback riding, hunting, picnicking, and snow skiing. The county has over 1,000 lakes and many streams suitable for fishing, boating, and canoeing. Public lands available for recreation include Seven Lakes State Park and Holly, Ortonville, Bald Mountain, Pontiac Lake, Proud Lake, and Highland State Recreation Areas. Other recreation areas are in public and private parks throughout the county (fig. 9).

The use of these recreation areas, which are near the Detroit metropolitan area, has increased greatly in the past several years. Many soils are well suited to development of recreation facilities. The soils that are best suited are in general soil map units 2, 3, and 4. These map units are characterized by nearly level to hilly terrain, wooded slopes, exposed glacial formations, lakes, and many streams.

The soils of the survey area are rated in table 9 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

Figure 9.—This municipal golf course takes in areas of Thetford and Cohoctah soils (foreground) and areas of Brookston and Capac soils.

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 sewerlines. 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 recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, 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 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

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.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife habitat

Oakland County has a varied population of fish and wildlife. Whitetail deer, squirrel, raccoon, and thrushes inhabit the wooded areas. Quail, cottontail, pheasant, and many types of songbirds live in the farmed and open areas where food and cover are available. The streams and many lakes in the county support trout, bass, pike, perch, and sunfish. Many of the lakes and wetlands also provide cover and feeding areas for ducks, swans, Canadian geese, and herons (fig. 10).

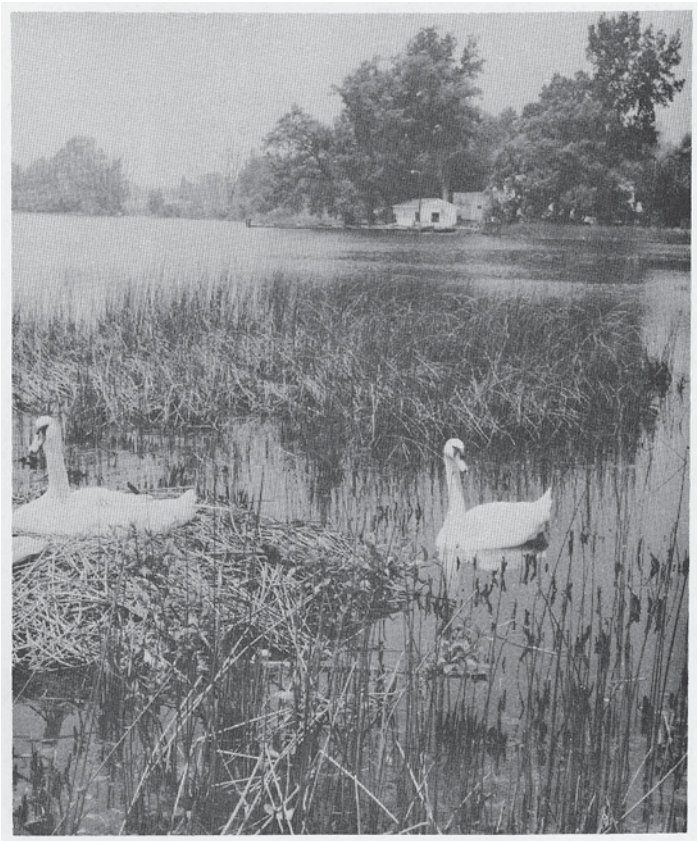


Figure 10.—This area of Houghton and Adrian mucks is a feeding and breeding area for wetland wildlife.

Many areas in the county can be improved for use as wildlife habitat by increasing the food supply and cover that wildlife need. The areas that are best suited to improvement for wildlife habitat are in map units 1, 2, 3, and 4 described in the section "General soil map units."

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 10, 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 flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, bromegrass, clover, alfalfa, and crownvetch.

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 flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, quackgrass, dandelions, and nightshade.

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, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, maple, apple, hawthorn, dogwood, hickory, blackberry, and raspberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are honeysuckle, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. 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, tamarack, 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, cattails, arrowhead, 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, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, potholes, 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. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, tree 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, 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. The ratings are given in the following tables: 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 need to 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 (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) 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 11 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 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 the 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, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 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 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, 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 12 shows the degree and the 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 12 also shows the suitability of the soils for use as daily cover for landfills. 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, and flooding affect absorption of the effluent.

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 is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. 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 12 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, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of 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 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 needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, and soil reaction affect trench type 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 type 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 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 13 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 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, 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 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 the depth to the water table is 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. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, 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 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 14 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 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 boulders and organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table and permeability of the aquifer. 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 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 potential frost action. Excavating and grading and the stability of ditchbanks are affected by large stones, slope, and the hazard of cutbanks caving. 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. 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, and slope affect the construction of grassed waterways. A hazard of wind erosion, 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 characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering index properties

Table 15 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 "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. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, 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, SP-SM.

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.

Rock fragments larger than 3 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 oven-dry 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.

Physical and chemical properties

Table 16 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 clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. 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, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

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 change is based on the soil fraction less than 2 millimeters in diameter. 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 wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse 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 sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, 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 wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of 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 17 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 intake 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.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 17 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, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

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 absence of distinctive horizons that form in soils that are not subject to flooding.

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 depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, 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 17.

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. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. 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 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 creates a severe corrosion environment. 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 and acidity.

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*9*). 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. In table 18, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten 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 have 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. Mostly 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 fine-loamy, 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. The soil is compared with similar soils and with nearby soils of other 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 (*7*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*9*). 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 bogs or depressions on moraines, till plains, and outwash plains. These soils formed in organic sediments and in the underlying calcareous gravelly sand. Permeability is moderately slow to moderately rapid in the organic material and rapid in the underlying layers. The slope is 0 to 1 percent.

The Adrian soils are similar to Houghton soils and are commonly adjacent to Granby and Houghton soils on the landscape. The Granby soils do not have mucky layers above the sand. The Houghton soils do not have sand

below the mucky layers. The Granby and Houghton soils are on landscape positions similar to those of the Adrian soils.

Typical pedon of Adrian muck, in an area of Houghton and Adrian mucks, 2,000 feet west and 396 feet north of the SE corner of sec. 3, T. 5 N., R. 10 E.

Oa1—0 to 10 inches; black (10YR 2/1) broken face and rubbed sapric material; less than 5 percent fibers; weak medium granular structure; friable; slightly acid; abrupt wavy boundary.

Oa2—10 to 18 inches; black (10YR 2/1) broken face and rubbed sapric material; about 10 percent fibers, less than 5 percent after rubbing; moderate medium platy structure; friable; slightly acid; clear wavy boundary.

Oa3—18 to 24 inches; black (5YR 2/1) broken face and black (10YR 2/1) rubbed sapric material; about 10 percent fibers, less than 5 percent after rubbing; moderate thick platy structure; friable; medium acid; clear wavy boundary.

Oa4—24 to 30 inches; black (10YR 2/1) broken face and rubbed sapric material; about 15 percent fibers, less than 5 percent after rubbing; weak thick platy structure; friable; slightly acid; clear wavy boundary.

IICg—30 to 60 inches; gray (10YR 5/1) gravelly sand; single grain; loose; about 25 percent pebbles; slight effervescence; moderately alkaline.

The sandy IIC horizon is at a depth of 16 to 50 inches. In a few pedons, there is a thin layer of hemic material. Reaction below the Oa1 horizon is medium acid to mildly alkaline. In some pedons, a few woody fragments are throughout the organic material.

The Oa horizon has hue of 5YR, 7.5YR, and 10YR, value of 2 to 4, and chroma of 0 to 3; or it is neutral and has value of 2 to 4.

The IIC horizon is mildly alkaline or moderately alkaline. This horizon has value of 4 to 6 and chroma of 1 or 2. It is sand or gravelly sand.

Arkport series

The Arkport series consists of well drained, moderately rapidly permeable soils on moraines and outwash plains. These soils formed in calcareous stratified sandy and loamy material. The slope range is 2 to 25 percent.

The Arkport soils are similar to Spinks soils and are generally adjacent to Spinks and Metea soils on the landscape. The Spinks soils have a coarser textured B horizon than the Arkport soils. The Metea soils have finer textures in the B and C horizons. The Spinks and Metea soils are on landscape positions similar to those of the Arkport soils.

Typical pedon of Arkport loamy fine sand, 2 to 6 percent slopes, 1,310 feet east and 1,330 feet south of the NW corner of sec. 9, T. 5 N., R. 7 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy fine sand; pale brown (10YR 6/3) dry; moderate medium granular structure; very friable; few roots; medium acid; abrupt smooth boundary.

A2—9 to 21 inches; yellowish brown (10YR 5/6) loamy fine sand; weak fine subangular blocky structure; very friable; few roots; 1 percent pebbles; medium acid; clear wavy boundary.

A&B1—21 to 44 inches; light yellowish brown (10YR 6/4) loamy fine sand (A2); weak fine subangular blocky structure; very friable; lamellae and bands of brown (7.5YR 5/4) very fine sandy loam (B2t); weak fine and medium subangular blocky structure; friable; few thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; 1 percent pebbles; slightly acid; gradual wavy boundary.

A&B2—44 to 60 inches; very pale brown (10YR 7/4) and brownish yellow (10YR 6/6) loamy very fine sand (A2); weak subangular blocky structure; very friable; wavy discontinuous 1/4- to 5-inch-thick lamellae and bands of dark yellowish brown (10YR 4/4) very fine sandy loam (B2t); massive; friable; mildly alkaline.

The solum is 40 to 66 inches thick. It is medium acid to mildly alkaline.

The Ap horizon has value of 3 or 4 and chroma of 1 to 3. It is dominantly loamy fine sand, but the range includes loamy sand and fine sandy loam.

The A2 horizon has value of 5 or 6 and chroma of 3 to 6. It is loamy fine sand, fine sandy loam, or loamy very fine sand.

In the A&B horizons, the A part is loamy very fine sand or loamy fine sand and the B part is very fine sandy loam or fine sandy loam. The A part has value of 5 to 7 and chroma of 3 to 6, and the B part has hue of 10YR or 7.5YR and value and chroma of 4 to 6. In some pedons, there are thin, discontinuous strata of silt loam.

Blount series

The Blount series consists of somewhat poorly drained, slowly or moderately slowly permeable soils on lake plains and moraines. These soils formed in calcareous loamy glacial till. The slope range is 0 to 4 percent.

The Blount soils are commonly adjacent to the Glynwood and Lenawee soils on the landscape. The Glynwood soils are moderately well drained and are on slightly higher positions on the landscape than the Blount soils. The Lenawee soils are poorly drained and are on lower positions on the landscape.

Typical pedon of Blount loam, 0 to 4 percent slopes, 2,940 feet south and 560 feet west of the NE corner of sec. 4, T. 2 N., R. 9 E.

Ap—0 to 7 inches; dark gray (10YR 4/1) loam; light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; 2 percent pebbles; neutral; abrupt smooth boundary.

B21t—7 to 11 inches; brown (10YR 5/3) silty clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; many fine roots; some pale brown (10YR 6/3) coatings on peds; 2 percent pebbles; slightly acid; clear wavy boundary.

B22tg—11 to 20 inches; grayish brown (10YR 5/2) clay; common fine faint gray (10YR 5/1) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; many fine roots; dark grayish brown (10YR 4/2) clay films on walls of root channels and vertical faces of peds; 2 percent pebbles; neutral; gradual wavy boundary.

B23tg—20 to 30 inches; grayish brown (10YR 5/2) clay; common medium distinct yellowish brown (10YR 5/6) and common medium faint gray (10YR 5/1) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; few fine roots; dark grayish brown (10YR 4/2) clay films on walls of root channels and faces of peds; 2 percent pebbles; mildly alkaline; abrupt wavy boundary.

C—30 to 60 inches; brown (10YR 5/3) silty clay loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; massive; firm; 2 percent pebbles; strong effervescence; moderately alkaline.

The solum is 20 to 40 inches thick and is medium acid to mildly alkaline.

The Ap or A1 horizon has chroma of 1 or 2. The A horizon is dominantly loam, but the range includes silt loam.

The B21t horizon has value of 5 or 6 and chroma of 1 to 6. It is clay loam or silty clay loam. The B22tg and B23tg horizons have value of 4 or 5. They are clay loam, clay, or silty clay.

The C horizon has value of 4 to 6 and chroma of 2 to 4. It is silty clay loam or clay loam.

Boyer series

The Boyer series consists of well drained soils on outwash plains, beach ridges, and moraines. These soils formed in sandy and loamy material and in the underlying calcareous gravelly sand. Permeability is moderately rapid in the subsoil and very rapid in the substratum. The slope range is 0 to 40 percent.

The Boyer soils are similar to the Oshtemo soils and are commonly adjacent to the Spinks soils on the landscape. The Oshtemo soils are thicker over calcareous sand than the Boyer soils. The Spinks soils have a coarser textured discontinuous B horizon. The Oshtemo and Spinks soils are on landscape positions similar to those of the Boyer soils.

Typical pedon of Boyer loamy sand, in an area of Oshtemo-Boyer loamy sands, 0 to 6 percent slopes, 1,650 feet north and 1,155 feet east of the SW corner of sec. 35, T. 4 N., R. 9 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loamy sand; brown (10YR 5/3) dry; moderate medium granular structure; very friable; many fine roots; 5 percent pebbles; medium acid; abrupt smooth boundary.

A2—6 to 18 inches; yellowish brown (10YR 5/6) loamy sand; weak fine subangular blocky structure; very friable; few fine roots; 10 percent pebbles; slightly acid; gradual wavy boundary.

B2t—18 to 27 inches; brown (7.5YR 5/4) gravelly sandy loam; moderate medium subangular blocky structure; friable; few fine roots; 20 percent pebbles; few thin discontinuous clay films on faces of peds; neutral; abrupt irregular boundary.

IIC—27 to 60 inches; light yellowish brown (10YR 6/4) stratified sand and gravelly sand; single grain; loose; 25 percent pebbles; 2 percent cobbles; slight effervescence; moderately alkaline.

The solum thickness ranges from 22 to 40 inches and is the same as the depth to the IIC horizon. Reaction is medium acid to neutral in the A horizon and slightly acid to mildly alkaline in the B2t horizon. Pebble content ranges from 1 to 20 percent in the solum and from 10 to 30 percent in the IIC horizon; cobble content ranges from 1 to 5 percent in the IIC horizon.

The Ap or A1 horizon has value of 3 or 4 and chroma of 2 or 3. It is dominantly loamy sand, but the range includes sandy loam.

The B2t horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 6. It is sandy loam or gravelly sandy loam.

The IIC horizon has value of 5 or 6 and chroma of 2 to 4. It is gravelly sand, coarse sand, or stratified sand and gravel.

Brookston series

The Brookston series consists of very poorly drained, moderately permeable soils on lake plains, moraines, and till plains. These soils formed in calcareous loamy glacial till. The slope is 0 to 1 percent.

The Brookston soils are similar to the Colwood and Sebewa soils and are commonly adjacent to the Capac soils on the landscape. The Colwood soils are stratified throughout. The Sebewa soils are underlain by sand and gravelly sand. The Colwood and Sebewa soils are on landscape positions similar to those of the Brookston

soils. The Capac soils are somewhat poorly drained and are on slightly higher landscape positions.

Typical pedon of Brookston loam, in an area of Brookston and Colwood loams, 2,575 feet north and 700 feet east of the SW corner of sec. 4, T. 2 N., R. 9 E.

Ap—0 to 11 inches; very dark gray (10YR 3/1) loam; gray (10YR 5/1) dry; moderate medium granular structure; friable; many fine and medium roots; 2 percent pebbles; neutral; abrupt smooth boundary.

A12g—11 to 16 inches; very dark gray (10YR 3/1) loam; gray (10YR 6/1) dry; common fine distinct yellowish brown (10YR 5/6) and light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; friable; common fine roots; 2 percent pebbles; neutral; clear irregular boundary.

B21tg—16 to 25 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; faces of peds in upper 4 inches are dark gray (10YR 4/1) and in lower 5 inches are grayish brown (10YR 5/2); moderate medium angular blocky structure; firm; few fine roots; 2 percent pebbles; few very thin clay films on faces of peds; neutral; gradual wavy boundary.

B22g—25 to 31 inches; grayish brown (10YR 5/2) clay loam; few fine distinct yellowish brown (10YR 5/6) and few fine faint gray (10YR 5/1) mottles; moderate medium subangular blocky structure; friable; 2 percent pebbles; neutral; clear wavy boundary.

B3g—31 to 36 inches; grayish brown (10YR 5/2) silty clay loam; common medium faint gray (10YR 5/1) and common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; 2 percent pebbles; neutral; clear wavy boundary.

Cg—36 to 60 inches; gray (10YR 5/1) loam; common medium distinct yellowish brown (10YR 5/6) and brown (7.5YR 5/2) mottles; massive; friable; 2 percent pebbles; slight effervescence; moderately alkaline.

The solum is 30 to 50 inches thick. Reaction is slightly acid or neutral in the Ap and B2 horizons and neutral or mildly alkaline in the B3g horizon. Throughout the pedon, the content of pebbles ranges from 1 to 5 percent.

The Ap horizon has 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 B2g horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is clay loam, loam, sandy clay loam, or silty clay loam.

The C horizon has value of 5 or 6 and chroma of 1 to 4. Commonly it is loam or clay loam, but in a few pedons, it is sandy loam.

Capac series

The Capac series consists of somewhat poorly drained, moderately slowly permeable soils on till plains and moraines. These soils formed in calcareous loamy glacial till. The slope ranges from 0 to 4 percent.

The Capac soils are similar to the Kibbie and Metamora soils and are commonly adjacent to the Brookston, Colwood, Metamora, and Marlette soils on the landscape. The Brookston and Colwood soils are poorly drained and are on lower positions on the landscape. The Metamora soils have coarser texture in the upper part of the subsoil and are on landscape positions similar to those of the Capac soils. The Marlette soils are moderately well drained or well drained and are on higher positions on the landscape than the Capac soils.

Typical pedon of Capac sandy loam, 0 to 4 percent slopes, 2,165 feet east and 2,615 feet north of the SW corner of sec. 3, T. 5 N., R. 7 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sandy loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; 1 percent pebbles; slightly acid; abrupt smooth boundary.

B&A—8 to 14 inches; brown (10YR 5/3) clay loam (Bt); common medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; grayish brown (10YR 5/2) silt loam coatings approximately 2 millimeters thick on vertical faces of peds (A2); common fine roots; 2 percent pebbles; slightly acid; clear wavy boundary.

B21tg—14 to 24 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; 4 percent pebbles; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; clear wavy boundary.

B22tg—24 to 32 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; 2 percent pebbles; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; neutral; abrupt wavy boundary.

C—32 to 60 inches; pale brown (10YR 6/3) loam; common medium distinct yellowish brown (10YR 5/6), brown (7.5YR 5/2), and gray (10YR 6/1) mottles; massive; firm; 3 percent pebbles; white (10YR 8/1) calcium carbonate accumulations; slight effervescence; moderately alkaline.

The solum is 26 to 40 inches thick. It is medium acid to neutral. Throughout the pedon, the content of pebbles ranges from 0 to 10 percent.

The Ap horizon has value of 3 or 4 and chroma of 1 to 3. It is dominantly sandy loam, but the range includes loam and silt loam. In some pedons, a thin A2 horizon is present. It has hue of 10YR, value of 5 or 6, and chroma of 1 or 2.

The B horizon has value of 5 or 6 and chroma of 2 to 4. It is clay loam, silty clay loam, or loam.

The C horizon has value of 5 or 6 and chroma of 2 or 3. It is loam or clay loam.

Cohoctah series

The Cohoctah series consists of very poorly drained or poorly drained, moderately rapidly permeable soils on flood plains. These soils formed in loamy and sandy alluvial material. The slope is 0 to 1 percent.

The Cohoctah soils are similar to the Sloan soils and are commonly adjacent to the Marlette and Riddles soils. The Marlette and Riddles soils are on uplands adjacent to the flood plains.

Typical pedon of Cohoctah fine sandy loam, 200 feet west and 100 feet north of the SE corner of sec. 20, T. 3 N., R. 11 E.

A1—0 to 11 inches; very dark gray (10YR 3/1) fine sandy loam; gray (10YR 5/1) dry; moderate medium granular structure; friable; few fine roots; slightly acid; abrupt wavy boundary.

C1g—11 to 21 inches; dark gray (10YR 4/1) fine sandy loam; weak medium subangular blocky structure; friable; neutral; clear wavy boundary.

C2g—21 to 43 inches; gray (10YR 5/1) sandy loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; 8 percent pebbles; neutral; gradual wavy boundary.

A1b—43 to 48 inches; very dark brown (10YR 2/2) sandy loam; massive; friable; mildly alkaline; gradual wavy boundary.

IIC3g—48 to 60 inches; gray (10YR 5/1) gravelly sand; few medium distinct light yellowish brown (10YR 6/4) mottles; single grain; loose; 5 percent pebbles; slight effervescence; mildly alkaline.

Reaction is slightly acid to mildly alkaline in the A1 horizon and in the upper part of the Cg horizon and mildly alkaline to moderately alkaline in the lower part of the Cg horizon.

The A1 horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly fine sandy loam, but the range includes loam, sandy loam, and loamy sand. It is 10 to 15 inches thick.

The Cg horizon has hue of 10YR or 2.5Y, value of 3 to 6, and chroma of 1 or 2. The C1g and C2g horizons are sandy loam or fine sandy loam. Some pedons have thin strata of sand, loamy sand, or loamy fine sand.

Colwood series

The Colwood series consists of very poorly drained, moderately permeable soils on lake plains, till plains, and moraines. These soils formed in stratified sandy and loamy material. The slope range is 0 to 3 percent.

The Colwood soils are similar to the Brookston soils and are commonly adjacent to the Capac and Kibbie soils on the landscape. The Brookston soils do not have the stratification of the Colwood soils and are on landscape positions similar to those of the Colwood soils. The Capac and Kibbie soils are somewhat poorly drained and are on slightly higher landscape positions.

Typical pedon of Colwood loam, in an area of Brookston and Colwood loams, 2,540 feet south and 590 feet east of the NW corner of sec. 23, T. 4 N., R. 7 E.

Ap—0 to 11 inches; very dark brown (10YR 2/2) loam; grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B1g—11 to 15 inches; dark grayish brown (10YR 4/2) loam; common medium faint grayish brown (10YR 5/2) and common medium distinct very dark brown (10YR 2/2) mottles; moderate thick platy structure; friable; common fine roots; neutral; clear wavy boundary.

B21g—15 to 21 inches; light olive gray (5Y 6/2) loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak thick platy structure; friable; few fine roots; dark grayish brown (10YR 4/2) wormcasts; neutral; clear wavy boundary.

B22g—21 to 30 inches; light olive gray (5Y 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and common fine faint gray (5Y 6/1) mottles; weak coarse subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.

B3g—30 to 37 inches; light brownish gray (2.5Y 6/2) silt loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak thick platy structure; friable; neutral; clear wavy boundary.

Cg—37 to 60 inches; gray (5Y 5/1) stratified silt loam and very fine sand; common medium distinct olive (5Y 5/4) mottles; weak thin platy structure; friable; slight effervescence; moderately alkaline.

The solum is 28 to 50 inches thick and is slightly acid to mildly alkaline.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly loam, but the range includes silt loam. It is 10 to 14 inches thick.

The B2g horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2. It is loam, silt loam, silty clay loam, and clay loam. In many pedons it contains thin strata of very fine sand, fine sand, and silt.

The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2.

Dixboro series

The Dixboro series consists of somewhat poorly drained, moderately permeable soils on lake plains and outwash plains. These soils formed in stratified loamy and sandy material. The slope range is 0 to 3 percent.

The Dixboro soils are similar to the Thetford and Metamora soils and are commonly adjacent to the Thetford and Metamora soils on the landscape. The Thetford soils have less clay in the B horizon. The Metamora soils have a finer textured B horizon and do not have a stratified C horizon. The Thetford and Metamora soils are on landscape positions similar to those of the Dixboro soils.

Typical pedon of Dixboro loamy fine sand, 0 to 3 percent slopes, 2,030 feet west and 1,620 feet north of the SE corner of sec. 1, T. 2 N., R. 11 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; few fine roots; slightly acid; abrupt smooth boundary.

A2—8 to 16 inches; pale brown (10YR 6/3) loamy very fine sand; few medium distinct yellowish brown (10YR 5/6) and few fine faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; slightly acid; clear wavy boundary.

B2t—16 to 35 inches; strong brown (7.5YR 5/6) very fine sandy loam; common medium distinct grayish brown (10YR 5/2) and few medium faint yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few thin clay films on vertical faces of peds; neutral; abrupt wavy boundary.

Cg—35 to 60 inches; grayish brown (10YR 5/2) stratified very fine sand, loamy very fine sand, and very fine sandy loam; few medium distinct light yellowish brown (10YR 6/4) and brownish yellow (10YR 6/6) mottles; massive; friable; slight effervescence; mildly alkaline.

The solum is 24 to 44 inches thick. Reaction in the solum is medium acid to neutral in the upper part and neutral to mildly alkaline in the lower part.

The A1 or Ap horizon has value of 2 or 3 and chroma of 1 to 3. The A1 horizon is dominantly loamy fine sand, but the range includes loamy very fine sand, very fine sandy loam, and fine sandy loam.

The A2 horizon has value of 5 or 6 and chroma of 3 or 4. It is loamy very fine sand, fine sandy loam, or very fine sandy loam.

The B2t horizon has value and chroma of 3 to 6. There are thin, discontinuous strata of silt loam or silty clay loam in some pedons.

The C horizon has value of 5 or 6 and chroma of 2 or 3. It is stratified very fine sand, very fine sandy loam, loamy very fine sand, and silt loam.

Fox series

The Fox series consists of well drained soils on outwash plains and moraines. These soils formed in loamy material and in the underlying gravelly sand. Permeability is moderate in the subsoil and very rapid in the substratum. The slope range is 1 to 25 percent.

The Fox soils are commonly adjacent to Marlette or Riddles soils on the landscape. The Marlette and Riddles soils have finer textures in the C horizon and are on landscape positions similar to those of the Fox soils.

Typical pedon of Fox sandy loam, 1 to 6 percent slopes, 2,400 feet south and 200 feet east of the NW corner of sec. 8, T. 1 N., R. 7 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sandy loam; pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; 12 percent pebbles; medium acid; abrupt smooth boundary.

A2—9 to 16 inches; brown (10YR 5/3) gravelly sandy loam; weak medium subangular blocky structure; friable; many fine roots; 18 percent pebbles; slightly acid; clear wavy boundary.

B2t—16 to 30 inches; dark brown (7.5YR 4/4) gravelly sandy clay loam; moderate medium subangular blocky structure; firm; fine roots; 25 percent pebbles; 3 percent cobbles; many moderately thick dark brown (7.5YR 4/4) clay films on faces of peds; neutral; gradual wavy boundary.

IIC—30 to 60 inches; brown (10YR 5/3) gravelly sand; single grain; loose; 25 percent pebbles; 5 percent cobbles; slight effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. Reaction is medium acid to neutral in the Ap and A2 horizons and slightly acid to mildly alkaline in the B2t horizon. Pebbles make up 5 to 35 percent of the solum and 5 to 50 percent of the IIC horizon. Cobbles make up 1 to 5 percent of the IIC horizon.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. It is dominantly sandy loam, but the range includes loam.

The A2 horizon has value of 5 or 6 and chroma of 2 or 3. It is gravelly sandy loam, loam, and sandy loam.

The Bt horizon has hue of 7.5YR or 10YR and value and chroma of 3 or 4. It is gravelly sandy clay loam, gravelly loam, or gravelly clay loam.

The IIC horizon has value of 5 or 6 and chroma of 3 or 4. It is gravelly sand, stratified sand, and gravelly sand or sand.

Gilford series

The Gilford series consists of very poorly drained soils on glacial drainageways and outwash plains. These soils formed in loamy material and in the underlying calcareous sand and gravelly sand. Permeability is moderately rapid in the subsoil and very rapid in the substratum. The slope is 0 to 1 percent.

The Gilford soils are similar to the Granby soils and are commonly adjacent to Wasepi soils on the landscape. The Wasepi soils are somewhat poorly drained and are on slightly higher landscape positions than the Gilford soils.

Typical pedon of Gilford sandy loam, 2,600 feet east and 670 feet south of the NW corner of sec. 14, T. 5 N., R. 7 E.

Ap—0 to 11 inches; very dark brown (10YR 2/2) sandy loam; gray (10YR 5/1) dry; weak medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B21g—11 to 26 inches; dark gray (10YR 4/1) sandy loam; weak medium subangular blocky structure; friable; many fine roots; 5 percent pebbles; slightly acid; clear wavy boundary.

B22g—26 to 38 inches; gray (10YR 5/1) sandy loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; 10 percent pebbles; mildly alkaline; gradual wavy boundary.

IICg—38 to 60 inches; gray (10YR 6/1) gravelly sand; single grain; loose; 20 percent pebbles; strong effervescence; moderately alkaline.

The solum is 25 to 40 inches thick. It is slightly acid or neutral in the upper part and neutral to mildly alkaline in the lower part. Pebble content ranges from 0 to 20 percent in the solum and from 5 to 30 percent in the IICg horizon.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly sandy loam, but the range includes fine sandy loam or loam. It is 10 to 13 inches thick.

The B2g horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is sandy loam or fine sandy loam. In some pedons, there are thin subhorizons of loamy sand.

The IICg horizon has value of 5 or 6 and chroma of 1 or 2. It is coarse sand or gravelly sand.

Glynwood series

The Glynwood series consists of moderately well drained, slowly permeable soils on moraines and till plains. These soils formed in loamy material. The slope range is 2 to 12 percent.

The Glynwood soils are commonly adjacent to the Blount and Lenawee soils on the landscape. The Blount soils are somewhat poorly drained and are on lower landscape positions than the Glynwood soils. The Lenawee soils are poorly drained and are in drainageways and depressions.

Typical pedon of Glynwood loam, 2 to 6 percent slopes, 2,640 feet south and 540 feet east of the NW corner of sec. 3, T. 2 N., R. 9 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam; light brownish gray (10YR 6/2) dry; fine medium granular structure; friable; many fine roots; 2 percent pebbles; slightly acid; abrupt smooth boundary.

A2—8 to 12 inches; pale brown (10YR 6/3) loam; moderate medium subangular blocky structure; friable; common fine roots; 2 percent pebbles; dark grayish brown (10YR 4/2) wormcasts in root channels; medium acid; clear wavy boundary.

B21t—12 to 18 inches; dark yellowish brown (10YR 4/4) clay; moderate medium angular blocky structure; firm; few fine roots; 3 percent pebbles; few thin pale brown (10YR 6/3) silt coatings on faces of peds; few thin clay films on faces of peds; slightly acid; gradual wavy boundary.

B22t—18 to 31 inches; dark yellowish brown (10YR 4/4) clay; few fine distinct grayish brown (10YR 5/2) mottles; strong medium angular blocky structure; very firm; few fine roots; 3 percent pebbles; continuous thin clay films on faces of peds; medium acid; abrupt wavy boundary.

C—31 to 60 inches; pale brown (10YR 6/3) clay loam; common medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; massive; firm; 5 percent pebbles; light gray (10YR 7/2) carbonate accumulations; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick and is medium acid to mildly alkaline. Pebble content is 0 to 5 percent in the solum.

The Ap horizon has chroma of 1 or 2. The A2 horizon has value of 5 or 6 and chroma of 2 or 3. The A horizon is dominantly loam, but the range includes silt loam.

The Bt horizon has value of 4 or 5 and chroma of 3 or 4. It is clay loam, silty clay loam, clay, or silty clay.

The C horizon has value of 5 or 6 and chroma of 2 or 3. It is clay loam or silty clay loam.

Granby series

The Granby series consists of poorly drained, rapidly permeable soils on lake plains and outwash plains. These soils formed in sandy material. The slope is 0 to 3 percent.

The Granby soils are commonly adjacent to the Adrian or Gilford soils on the landscape. The Adrian soils have organic material above the gravelly sand. The Gilford soils have finer textures in the A and B horizons and are underlain by calcareous gravelly sand. The Adrian and

Gilford soils are on landscape positions similar to those of the Granby soils.

Typical pedon of Granby loamy sand, 1,420 feet west and 920 feet north of the SE corner of sec. 9, T. 2 N., R. 8 E.

A1—0 to 11 inches; black (10YR 2/1) loamy sand; dark gray (10YR 4/1) dry; weak medium granular structure; very friable; many fine roots; slightly acid; abrupt wavy boundary.

B2g—11 to 20 inches; dark gray (10YR 4/1) loamy sand; few fine faint gray (10YR 6/1) mottles; weak medium subangular blocky structure; very friable; many fine roots; slightly acid; clear wavy boundary.

B3g—20 to 38 inches; gray (10YR 5/1) sand; common medium distinct yellowish brown (10YR 5/6) mottles; single grain; loose; few fine roots; thin lenses of loamy sand 1/4 to 1 inch thick, total accumulation of 3 inches; neutral; gradual wavy boundary.

Cg—38 to 60 inches; light gray (10YR 6/1) sand; common fine distinct brownish yellow (10YR 6/6) mottles; single grain; loose; mildly alkaline.

The solum is 30 to 50 inches thick and is medium acid to mildly alkaline. The content of pebbles ranges from 0 to 5 percent.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly loamy sand, but the range includes sand and sandy loam. It is 11 to 14 inches thick.

The B horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is fine sand, sand, or loamy sand.

The C horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 1 to 3. It is fine sand or sand.

In some pedons, the B and C horizons have thin lenses of sandy loam.

Houghton series

The Houghton series consists of very poorly drained, moderately slowly to moderately rapidly permeable soils in bogs or depressions on moraines, till plains, or outwash plains. These soils formed in organic sediments. The slope is 0 to 1 percent.

The Houghton soils are similar to the Adrian and Napoleon soils and are commonly adjacent to the Adrian soils on the landscape. The Adrian soils have sand and gravelly sand below the muck horizons and are on landscape positions similar to those of the Houghton soils. The Napoleon soils have mucky peat horizons and are extremely acid throughout. They are on lowlands with no natural drainage outlet in most places.

Typical pedon of Houghton muck, in an area of Houghton and Adrian mucks, 2,610 feet south and 1,310 feet west of the NE corner of sec. 19, T. 4 N., R. 9 E.

Oa1—0 to 4 inches; black (5YR 2/1) broken face and rubbed sapric material; about 8 percent fibers, less than 5 percent after rubbing; moderate medium subangular blocky structure; friable; neutral; clear wavy boundary.

Oa2—4 to 8 inches; black (5YR 2/1) broken face and rubbed sapric material; less than 5 percent fibers; moderate medium platy structure; friable; neutral; gradual wavy boundary.

Oa3—8 to 20 inches; black (5YR 2/1) broken face and rubbed sapric material; less than 5 percent fibers; strong coarse angular blocky structure; friable; neutral; gradual wavy boundary.

Oa4—20 to 40 inches; black (5YR 2/1) broken face and rubbed sapric material; less than 5 percent fibers; weak medium platy structure; friable; mildly alkaline; gradual wavy boundary.

Oa5—40 to 60 inches; black (10YR 2/1) broken face and rubbed sapric material; less than 5 percent fibers; weak medium platy structure; friable; neutral.

This organic material is more than 50 inches thick and ranges from medium acid to mildly alkaline. It is primarily herbaceous. Some pedons contain small woody fragments that cannot be crushed between the fingers. Some pedons have thin layers of hemic material that are less than 10 inches thick.

This material has hue of 5YR, 7.5YR, and 10YR, value of 2 or 3, and chroma of 0 to 3; or it is neutral and has value of 2 or 3.

Kibbie series

The Kibbie series consists of somewhat poorly drained, moderately permeable soils on lake plains and moraines. These soils formed in stratified loamy and sandy material. The slope range is 0 to 4 percent.

The Kibbie soils are commonly adjacent to the Colwood and Sisson soils. The Colwood soils are poorly drained and are on lower landscape positions than the Kibbie soils. The Sisson soils are well drained and are on higher landscape positions.

Typical pedon of Kibbie fine sandy loam, 0 to 4 percent slopes, 1,650 feet north and 1,485 feet west of the SE corner of sec. 30, T. 2 N., R. 9 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam; grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

B2t—9 to 20 inches; brown (10YR 5/3) clay loam; common medium distinct dark brown (10YR 3/3) and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; many thin clay films on faces of peds; few fine roots; medium acid; gradual wavy boundary.

B3—20 to 32 inches; brown (10YR 5/3) silt loam; common medium distinct yellowish brown (10YR 5/6) and common medium faint grayish brown (10YR 5/2) mottles; moderate medium platy structure; friable; slightly acid; abrupt wavy boundary.

C—32 to 60 inches; light yellowish brown (10YR 6/4) stratified very fine sand and silt loam; few medium distinct brownish yellow (10YR 6/6), light gray (10YR 7/1), grayish brown (10YR 5/2), and light brownish gray (10YR 6/2) mottles; moderate thin platy structure; friable; slight effervescence; moderately alkaline.

The solum is 24 to 40 inches thick and is medium acid to neutral.

The Ap horizon has value of 2 or 3 and chroma of 2 or 3. It is dominantly fine sandy loam, but the range includes loam, silt loam, and sandy loam.

The B2t horizon has value of 4 or 5 and chroma of 3 to 6. It is silt loam, silty clay loam, or clay loam. In some pedons, the B horizon has thin lenses of fine sand, silt loam, or very fine sand.

The C horizon has value of 5 or 6 and chroma of 3 or 4.

Lenawee series

The Lenawee series consists of poorly drained soils on lake plains, in depressional areas, and on till plains and moraines. These soils formed in clayey and loamy lacustrine sediments. Permeability is moderately slow in the subsoil and moderate in the substratum. The slope is 0 to 1 percent. The Lenawee soils in this survey area are taxadjuncts to the Lenawee series because they have a lighter colored surface layer than is defined in the range for the Lenawee series. This difference, however, does not alter the use and behavior of the soils.

The Lenawee soils are generally adjacent to the Blount and Glynwood soils on the landscape. The Blount soils are somewhat poorly drained and are on slightly higher landscape positions than the Lenawee soils. The Glynwood soils are moderately well drained and are on higher landscape positions.

Typical pedon of Lenawee silty clay loam, 1,290 feet north and 490 feet west of the SE corner of sec. 30, T. 2 N., R. 9 E.

Ap—0 to 8 inches; dark gray (10YR 4/1) silty clay loam; light gray (10YR 6/1) dry; common fine faint dark yellowish brown (10YR 4/4) mottles; strong medium granular structure; friable; many medium and fine roots; 2 percent pebbles; neutral; abrupt smooth boundary.

B21g—8 to 12 inches; dark gray (10YR 4/1) silty clay loam; common medium faint gray (10YR 5/1) and common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; many medium and fine roots; 2 percent pebbles; neutral; clear wavy boundary.

B22g—12 to 24 inches; gray (10YR 5/1) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; strong medium prismatic structure parting to strong medium angular blocky; very firm; many fine and medium roots; 2 percent pebbles; neutral; gradual wavy boundary.

B23g—24 to 53 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; very firm; few fine roots; 2 percent pebbles; mildly alkaline; clear wavy boundary.

C—53 to 60 inches; light yellowish brown (10YR 6/4) silty clay loam; common medium distinct gray (10YR 5/1) and light gray (10YR 7/1) mottles; massive; firm; few fine roots; 2 percent pebbles; carbonate accumulations of light gray (10YR 7/1); slight effervescence; moderately alkaline.

The solum is 25 to 55 inches thick and is slightly acid to mildly alkaline.

The Ap horizon has value of 3 or 4 and chroma of 1 or 2. It is dominantly silty clay loam, but the range includes clay loam, loam, and silt loam.

The B2g horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is clay loam, silty clay loam, or silty clay.

The Cg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 6. It is clay loam or silty clay loam. In some pedons, the Cg horizon has thin strata of silt loam or very fine sand.

Leoni series

The Leoni series consists of well drained soils on outwash plains and moraines. These soils formed in gravelly and cobbly loamy and sandy material. Permeability is moderate in the subsoil and moderately rapid or rapid in the substratum. The slope range is 1 to 12 percent.

The Leoni soils are similar to the Fox soils and are commonly adjacent to the Fox soils on the landscape. The Fox soils have fewer pebbles and cobbles in the solum and the IIC horizon than the Leoni soils and are on landscape positions similar to those of the Leoni soils.

Typical pedon of Leoni gravelly sandy loam, 1 to 6 percent slopes, 1,460 feet west and 540 feet north of the SE corner of sec. 7, T. 4 N., R. 10 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) gravelly sandy loam; brown (10YR 5/3) dry; weak medium granular structure; friable; common fine roots; 25 percent pebbles and cobbles; slightly acid; abrupt smooth boundary.

A2—8 to 15 inches; pale brown (10YR 6/3) gravelly sandy loam; weak medium subangular blocky structure; friable; few fine roots; 25 percent pebbles and cobbles; slightly acid; clear wavy boundary.

B21t—15 to 26 inches; yellowish brown (10YR 5/6) gravelly sandy clay loam; weak medium subangular blocky structure; friable; few fine roots; few thin clay films on faces of peds; 45 percent pebbles and cobbles; slightly acid; gradual wavy boundary.

B22t—26 to 33 inches; dark brown (7.5YR 4/4) very gravelly sandy clay loam; weak medium subangular blocky structure; friable; common thin clay films on faces of peds and on pebbles and cobbles; 55 percent pebbles and cobbles; neutral; gradual wavy boundary.

B3—33 to 46 inches; light yellowish brown (10YR 6/4) gravelly sandy loam; weak medium subangular blocky structure; friable; 50 percent pebbles and cobbles; mildly alkaline; abrupt irregular boundary.

IIC—46 to 60 inches; pale brown (10YR 6/3) gravelly sand; single grain; loose; 30 percent pebbles and cobbles; strong effervescence; moderately alkaline.

The solum is 32 to 66 inches thick. It is medium acid to neutral in the upper part and slightly acid to mildly alkaline in the lower part. The content of pebbles and cobbles averages 35 to 65 percent in the solum. The amount of cobbles generally increases with depth.

The Ap or A1 horizon has value of 3 or 4 and chroma of 2 or 3. The A2 horizon has value of 5 or 6 and chroma of 3 or 4. The A horizon is dominantly gravelly sandy loam, but the range includes cobbly sandy loam and gravelly or cobbly loamy sand.

The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. It consists of gravelly or cobbly phases of sandy clay loam, loam, or sandy loam.

The IIC horizon has value of 5 or 6 and chroma of 3 to 6.

Marlette series

The Marlette series consists of well drained or moderately well drained, moderately slowly permeable soils on till plains and moraines. These soils formed in calcareous loamy glacial till. The slope range is 1 to 35 percent.

The Marlette soils commonly are adjacent to the Capac, Fox, and Owosso soils on the landscape. The Capac soils are somewhat poorly drained and are on lower positions on the landscape than the Marlette soils. The Fox soils are more permeable and are on landscape positions similar to those of the Marlette soils. The Owosso soils are coarser textured in the A horizon and upper part of the B horizon and are on the top of knolls or ridges.

Typical pedon of Marlette sandy loam, 1 to 6 percent slopes, 670 feet east and 80 feet south of the NW corner of sec. 11, T. 5 N., R. 7 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) sandy loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; 3 percent pebbles; medium acid; abrupt smooth boundary.

B&A—8 to 22 inches; dark yellowish brown (10YR 4/4) clay loam (B part) and brown (10YR 5/3) sandy loam, light gray (10YR 7/2) dry (A part) as coatings more than 2 millimeters thick on faces of peds and along worm and root channels; moderate medium subangular blocky structure; firm; common fine roots to a depth of 14 inches, then few fine roots; dark grayish brown (10YR 4/2) wormcasts; 4 percent pebbles; slightly acid; clear wavy boundary.

B2t—22 to 31 inches; yellowish brown (10YR 5/4) clay loam; few fine faint yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm; few fine roots; thick clay films around pebbles and faces of peds; 5 percent pebbles; slightly acid; abrupt wavy boundary.

C1—31 to 48 inches; yellowish brown (10YR 5/4) loam, common medium faint yellowish brown (10YR 5/6) mottles; massive; firm; 5 percent pebbles; slight effervescence; moderately alkaline; clear wavy boundary.

C2—48 to 60 inches; pale brown (10YR 6/3) loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; firm; 5 percent pebbles; slight effervescence; moderately alkaline.

The solum is 25 to 40 inches thick. Commonly it is medium acid to neutral. In some pedons the lower part of the B2 horizon is slightly acid to mildly alkaline. Throughout the pedon, the content of pebbles and cobbles ranges from 2 to 10 percent.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. The value dry is 6. Wooded areas have a thin A1 horizon having value of 2 or 3 and chroma of 1 or 2. The A2 horizon, if present, has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. The A horizon is dominantly sandy loam or loam, but the range includes silt loam.

The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is loam, sandy clay loam, or clay loam.

The C horizon has value of 4 to 6 and chroma of 2 or 3. It is loam or clay loam.

Matherton series

The Matherton series consists of somewhat poorly drained soils on outwash plains. These soils formed in loamy and gravelly sandy material. Permeability is moderate in the subsoil and rapid or very rapid in the substratum. The slope range is 0 to 3 percent.

The Matherton soils are similar to the Wasepi soils and are commonly adjacent to the Sebewa soils on the landscape. The Wasepi soils have a coarser textured subsoil and are on landscape positions similar to those of the Matherton soils. The Sebewa soils are poorly drained and are on lower landscape positions.

Typical pedon of Matherton sandy loam, 0 to 3 percent slopes, 700 feet west and 1,430 feet south of the NE corner of sec. 22, T. 1 N., R. 7 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sandy loam; grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; 5 percent pebbles; slightly acid; abrupt smooth boundary.

A2g—8 to 13 inches; grayish brown (10YR 5/2) loam; few fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; few fine roots; friable; 5 percent pebbles; slightly acid; clear wavy boundary.

B21tg—13 to 28 inches; grayish brown (10YR 5/2) sandy clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few thin dark grayish brown (10YR 4/2) clay films on faces of peds; 8 percent pebbles; slightly acid; gradual wavy boundary.

B22t—28 to 34 inches; brown (10YR 5/3) sandy clay loam; common fine distinct yellowish brown (10YR 5/6) and common fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few thin dark grayish brown (10YR 4/2) clay films on faces of peds; 13 percent pebbles; neutral; gradual wavy boundary.

IICg—34 to 60 inches; light brownish gray (10YR 6/2) gravelly sand; common fine distinct yellowish brown (10YR 5/6) mottles; single grain; loose; 25 percent pebbles; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick and is medium acid to neutral. Pebble content ranges from 5 to 25 percent in the solum and from 10 to 45 percent in the IIC horizon.

The Ap or A1 horizon has value of 2 or 3 and chroma of 1 or 2. The A2g horizon has value of 5 or 6 and chroma of 2. The A horizon is dominantly sandy loam, but the range includes loam.

The B2t horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 3. It is sandy clay loam, clay loam, loam, or gravelly phases of these textures.

The IIC horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 4.

Metamora series

The Metamora series consists of somewhat poorly drained soils on till plains and moraines. These soils formed in loamy material. Permeability is moderately rapid in the upper part of the pedon and moderately slow in the lower part. The slope range is 0 to 3 percent.

The Metamora soils are similar to the Capac and Dixboro soils and are commonly adjacent to the Capac soils on the landscape. The Capac soils have finer textures in the upper part of the B horizons than the Metamora soils. The Dixboro soils have stratified C horizons. The Capac and Dixboro soils are on landscape positions similar to those of the Metamora soils.

Typical pedon of Metamora sandy loam, 0 to 3 percent slopes, 710 feet west and 270 feet south of the NE corner of sec. 25, T. 2 N., R. 8 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sandy loam; grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; 5 percent pebbles; neutral; abrupt smooth boundary.

A21—9 to 13 inches; grayish brown (10YR 5/2) sandy loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; many fine roots; 5 percent pebbles; very dark grayish brown (10YR 3/2) organic coatings; neutral; clear wavy boundary.

A22—13 to 28 inches; pale brown (10YR 6/3) sandy loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine roots; 5 percent pebbles; dark grayish brown (10YR 4/2) wormcasts; neutral; abrupt irregular boundary.

IIB2tg—28 to 36 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/6) and common medium faint gray (10YR 6/1) mottles; moderate medium subangular blocky structure; firm; few fine roots; few thin clay films on faces of peds; dark grayish brown (10YR 4/2) wormcasts; neutral; abrupt wavy boundary.

IICg—36 to 60 inches; grayish brown (10YR 5/2) loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; light gray (10YR 7/1) calcium carbonate accumulations; slight effervescence; mildly alkaline.

The IIBtg horizon is 20 to 35 inches thick. Reaction is strongly acid to neutral in the solum. The content of pebbles ranges from 0 to 10 percent.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The A2 horizon has value of 5 or 6 and chroma of 2 or 3. The A horizon is dominantly sandy loam, but the range includes loamy sand and fine sandy loam.

The IIB2tg horizon has value of 5 or 6. It is clay loam, sandy clay loam, loam, or silty clay loam.

The IICg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 3. It is loam, silt loam, silty clay loam, or clay loam.

Metea series

The Metea series consists of well drained soils on moraines. These soils formed in sandy material and in the underlying loamy glacial till. Permeability is very rapid in the upper part of the pedon and moderate in the lower part. The slope range is 0 to 12 percent.

The Metea soils are similar to the Marlette, Ormas, and Arkport soils and are commonly adjacent to the Marlette and Arkport soils on the landscape. The Marlette soils have finer textures in the A horizon and in the upper part of the B horizon and are on lower landscape positions similar to those of the Metea soils. The Arkport and Ormas soils have coarser textures in the C horizon and are on landscape positions similar to those of the Metea soils.

Typical pedon of Metea loamy sand, 0 to 6 percent slopes, 600 feet east and 900 feet north of the SW corner of sec. 13, T. 5 N., R. 7 E.

Ap—0 to 10 inches; dark brown (10YR 4/3) loamy sand; pale brown (10YR 6/3) dry; weak fine granular structure; very friable; common fine roots; less than 5 percent pebbles; medium acid; abrupt smooth boundary.

A21—10 to 25 inches; brown (7.5YR 5/4) sand; single grain; loose; few fine roots; less than 5 percent pebbles; medium acid; clear wavy boundary.

A22—25 to 30 inches; yellowish brown (10YR 5/6) loamy sand; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; very friable; few fine roots; less than 5 percent pebbles; medium acid; gradual wavy boundary.

IIB2t—30 to 38 inches; brown (10YR 5/3) loam; common medium faint dark yellowish brown (10YR 4/4) mottles; moderate coarse subangular blocky structure; friable; less than 5 percent pebbles; few thin clay films; slightly acid; abrupt wavy boundary.

IIC—38 to 60 inches; brown (10YR 5/3) loam; massive; firm; 5 percent pebbles; common very pale brown (10YR 7/3) carbonate accumulations; slight effervescence; moderately alkaline.

The depth to the IIBt horizon ranges from 20 to 40 inches. Reaction in the sandy part of the solum is medium acid to neutral.

The A1 or Ap horizon has value of 3 or 4 and chroma of 2 or 3. It is dominantly loamy sand, but the range includes sand.

The A2 horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is sand or loamy sand.

The IIB2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam, clay loam, sandy clay loam, or sandy loam.

The IIC horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is loam, clay loam, or silty clay loam.

Napoleon series

The Napoleon series consists of very poorly drained, moderately or moderately rapidly permeable, acid muck and mucky peat on outwash plains and moraines. The slope is 0 to 1 percent.

The Napoleon soils are similar to the Houghton soils.

Typical pedon of Napoleon muck, 300 feet east and 20 feet south of the NW corner of sec. 14, T. 2 N., R. 8 E.

Oa1—0 to 10 inches; black (10YR 2/1) broken face and rubbed sapric material; about 8 percent fibers, less than 5 percent after rubbing; about 10 percent mineral content; moderate fine granular structure; friable; extremely acid; abrupt wavy boundary.

Oe1—10 to 48 inches; dark reddish brown (5YR 3/4) broken face and very dark gray (10YR 3/1) rubbed hemic material; about 55 percent fiber, 20 percent rubbed; weak medium to thick platy structure; friable; extremely acid; gradual smooth boundary.

Oa2—48 to 60 inches; very dark gray (10YR 3/1) broken face and very dark brown (10YR 2/2) rubbed sapric material; about 30 percent fiber, 10 percent rubbed; massive; friable; extremely acid.

This organic material is more than 50 inches thick. It is primarily herbaceous. A few pedons contain small woody fragments that cannot be crushed between the fingers.

The Oa horizon has hue of 10YR, 7.5YR, or 5YR and chroma of 1 or 2.

The Oe horizon has hue of 7.5YR, 5YR, or 10YR, value of 2 to 4, and chroma of 1 to 4.

Oakville series

The Oakville series consists of well drained or moderately well drained, rapidly permeable soils on outwash plains and moraines. These soils formed in sandy material. The slope range is 0 to 18 percent.

The Oakville soils are commonly adjacent to the Spinks, Tedrow, and Thetford soils on the landscape. The Spinks soils have a banded Bt horizon and are on landscape positions similar to those of the Oakville soils. The Tedrow and Thetford soils are somewhat poorly drained and are on slightly lower landscape positions.

Typical pedon of Oakville fine sand, 0 to 6 percent slopes, 1,695 feet south and 321 feet west of the NE corner of sec. 36, T. 5 N., R. 10 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) fine sand; pale brown (10YR 6/3) dry; weak fine granular structure; very friable; common fine roots; medium acid; abrupt smooth boundary.
B21—7 to 17 inches; yellowish brown (10YR 5/6) fine sand; single grain; loose; few fine roots; medium acid; gradual wavy boundary.
B22—17 to 37 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; slightly acid; clear wavy boundary.
C1—37 to 52 inches; brownish yellow (10YR 6/6) fine sand; single grain; loose; slightly acid; abrupt wavy boundary.
C2—52 to 60 inches; pale brown (10YR 6/3) fine sand; single grain; loose; 2 percent pebbles; slightly acid.

The solum is 30 to 40 inches thick. Reaction is strongly acid to neutral throughout the pedon.

The A1 or Ap horizon has value of 3 or 4 and chroma of 1 to 3. It is dominantly fine sand, but the range includes loamy fine sand.

The B2 horizon has value of 4 or 5 and chroma of 4 to 6.

The C horizon has value of 5 or 6 and chroma of 3 to 6. It is fine sand or sand.

Ormas series

The Ormas series consists of well drained soils on outwash plains. These soils formed in sandy and loamy material and in the underlying gravelly sand. Permeability is moderately rapid in the subsoil and very rapid in the substratum. The slope range is 0 to 12 percent.

The Ormas soils are similar to the Metea soils and are commonly adjacent to the Spinks and Fox soils on the landscape. The Metea soils have finer textures in the C horizon than the Ormas soils. The Spinks soils have a coarser textured discontinuous B horizon. The Fox soils do not have a thick, coarser textured A horizon. The Metea, Spinks, and Fox soils are on landscape positions similar to those of the Ormas soils.

Typical pedon of Ormas loamy sand, 0 to 6 percent slopes, 2,330 feet east and 400 feet north of the SW corner of sec. 20, T. 3 N., R. 7 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loamy sand; pale brown (10YR 6/3) dry; weak fine granular structure; very friable; common fine roots; 10 percent pebbles; medium acid; abrupt smooth boundary.
A21—9 to 18 inches; pale brown (10YR 6/3) loamy sand; weak fine subangular blocky structure; very friable; few fine roots; 5 percent pebbles; medium acid; clear wavy boundary.
A22—18 to 32 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; 8 percent pebbles; slightly acid; clear wavy boundary.
IIB2t—32 to 43 inches; dark brown (7.5YR 4/4) gravelly sandy clay loam; moderate coarse subangular blocky structure; firm; few thin clay films; 30 percent pebbles; slightly acid; gradual wavy boundary.
IIC—43 to 60 inches; pale brown (10YR 6/3) gravelly sand; single grain; loose; 30 percent pebbles; strong effervescence; moderately alkaline.

The A1 or Ap horizon has value of 3 or 4 and chroma of 2 or 3. It is dominantly loamy sand or loamy fine sand, but the range includes sand.

The A2 horizon has value of 5 or 6 and chroma of 3 or 4. It is dominantly loamy sand, but the range includes sand or loamy fine sand.

The IIB2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. It is gravelly sandy clay loam, sandy clay loam, gravelly loam, sandy loam, or gravelly sandy loam.

The IIC horizon has value of 5 or 6 and chroma of 3 to 6.

Oshtemo series

The Oshtemo series consists of well drained soils on outwash plains, beach ridges, and moraines. These soils formed in sandy and loamy material and in the underlying calcareous sand and gravelly sand. Permeability is moderately rapid in the subsoil and rapid in the substratum. The slope range is 0 to 40 percent.

The Oshtemo soils are similar to the Boyer soils and are commonly adjacent to the Spinks soils on the landscape. The Spinks soils have a coarser textured discontinuous B horizon than the Oshtemo soils and do not have the underlying calcareous sand and gravelly sand. The Spinks soils are on landscape positions similar to those of the Oshtemo soils.

Typical pedon of Oshtemo loamy sand, in an area of Oshtemo-Boyer loamy sands, 0 to 6 percent slopes, 1,660 feet west and 2,055 feet north of the SE corner of sec. 28, T. 4 N., R. 9 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) loamy sand, pale brown (10YR 6/3) dry; weak medium granular structure; very friable; many fine roots; 5 percent pebbles; medium acid; abrupt smooth boundary.
A2—7 to 18 inches; yellowish brown (10YR 5/6) loamy sand; weak medium granular structure; very friable; many fine roots; 8 percent pebbles; medium acid; clear wavy boundary.
B2t—18 to 41 inches; reddish brown (5YR 4/4) sandy loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; friable; few fine roots; 12 percent pebbles; few thin clay films on faces of peds; slightly acid; abrupt irregular boundary.

B3—41 to 55 inches; yellowish brown (10YR 5/4) loamy sand; very weak medium subangular blocky structure; very friable; 12 percent pebbles; neutral; abrupt wavy boundary.
IIC—55 to 60 inches; pale brown (10YR 6/3) stratified sand and gravelly sand; single grain; loose; 25 percent pebbles; slight effervescence; moderately alkaline.

Solum thickness ranges from 40 to 66 inches but typically is 45 to 60 inches. The solum is strongly acid to neutral. It is 5 to 30 percent pebbles. The IIC horizon is 5 to 40 percent pebbles and 0 to 5 percent cobbles.

The A horizon has value of 4 to 6 and chroma of 2 to 6. It is dominantly loamy sand, but the range includes sandy loam.

The B2t horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 or 5, and chroma of 3 to 6. It is sandy loam or gravelly sandy loam.

The IIC horizon has value of 5 or 6 and chroma of 2 or 3. It is sand, stratified sand and gravel, or gravelly sand.

Owosso series

The Owosso series consists of well drained soils on moraines. These soils formed in loamy material. Permeability is moderately rapid in the upper part of the pedon and moderately slow in the lower part. The slope range is 1 to 12 percent.

The Owosso soils are commonly adjacent to the Marlette and Riddles soils on the landscape. The Marlette soils have finer textures in the upper part of the B horizon than the Owosso soils. The Riddles soils have a more permeable C horizon. The Marlette and Riddles soils are on landscape positions similar to those of the Owosso soils.

Typical pedon of Owosso sandy loam, 1 to 6 percent slopes, 1,450 feet west and 200 feet north of the SE corner of sec. 24, T. 2 N., R. 8 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) sandy loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; 5 percent pebbles; medium acid; abrupt smooth boundary.
A2—7 to 11 inches; pale brown (10YR 6/3) fine sandy loam; moderate medium subangular blocky structure; friable; common fine roots; 5 percent pebbles; brown (10YR 4/3) coatings on root channels and wormcasts; medium acid; clear wavy boundary.
B21—11 to 31 inches; yellowish brown (10YR 5/4) fine sandy loam; moderate medium subangular blocky structure; friable; few fine roots to a depth of 24 inches, none below; 5 percent pebbles; medium acid; clear wavy boundary.
B22t—31 to 38 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; 5 percent pebbles; clay bridging of sand particles; medium acid; clear wavy boundary.
IIB23t—38 to 45 inches; dark yellowish brown (10YR 4/4) clay loam; common medium faint dark yellowish brown (10YR 3/4) mottles; moderate coarse subangular blocky structure; firm; 5 percent pebbles; thin clay films on stone casts and some faces of peds; slightly acid; abrupt wavy boundary.
IIC—45 to 60 inches; yellowish brown (10YR 5/4) loam; massive; friable; 5 percent pebbles; slight effervescence; moderately alkaline.

The solum is 24 to 50 inches thick and is strongly acid to neutral. The content of pebbles ranges from 0 to 10 percent.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. The A2 horizon has value of 5 or 6 and chroma of 3 or 4. The A horizon is dominantly sandy loam, but the range includes loamy sand and fine sandy loam.

The B2t horizon has value of 4 or 5 and chroma of 3 to 6. It is sandy loam or fine sandy loam.

The IIB23t horizon has value of 4 or 5 and chroma of 3 to 6. It is loam, clay loam, or silty clay loam.

The IIC horizon has value of 4 to 6 and chroma of 3 or 4. It is loam, silt loam, clay loam, or silty clay loam.

Riddles series

The Riddles series consists of well drained, moderately permeable soils on moraines. These soils formed in calcareous, loamy glacial till. The slope range is 1 to 18 percent.

The Riddles soils are commonly adjacent to the Fox and Owosso soils on the landscape. The Fox soils have gravelly textures in the B and C horizons and more sand in the C horizons than the Riddles soils. The Owosso soils have a less permeable C horizon. The Fox and Owosso soils are on landscape positions similar to those of the Riddles soils.

Typical pedon of Riddles sandy loam, 1 to 6 percent slopes, 2,230 feet north and 90 feet east of the SW corner of sec. 7, T. 2 N., R. 8 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) sandy loam; light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; 3 percent pebbles; slightly acid; abrupt smooth boundary.
A2—8 to 12 inches; brown (10YR 5/3) sandy loam; moderate medium subangular blocky structure; friable; many fine roots; 3 percent pebbles; slightly acid; clear wavy boundary.

B21t—12 to 18 inches; yellowish brown (10YR 5/4) sandy clay loam; moderate medium subangular blocky structure; friable; few fine roots; 3 percent pebbles; thin brown (10YR 5/3) silt coatings on faces of peds; slightly acid; gradual wavy boundary.
B22t—18 to 34 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; few fine roots; 3 percent pebbles; few thin dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.
B3—34 to 46 inches; yellowish brown (10YR 5/4) sandy clay loam; common fine distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; 3 percent pebbles; neutral; abrupt wavy boundary.
C—46 to 60 inches; brown (10YR 5/3) sandy loam; massive; friable; 5 percent pebbles; slight effervescence; moderately alkaline.

The solum is 40 to 60 inches thick and is strongly acid to neutral. Pebble content ranges from 1 to 12 percent in the solum.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. The A2 horizon has value of 5 or 6 and chroma of 2 or 3. The A horizon is dominantly sandy loam, but the range includes loam.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is loam, sandy clay loam, or clay loam.

The C horizon has value of 5 or 6 and chroma of 3 or 4. It is sandy loam, loamy sand, or loam.

Sebewa series

The Sebewa series consists of poorly drained soils on glacial drainageways and outwash plains. These soils formed in loamy material and in the underlying gravelly sand. Permeability is moderate in the subsoil and very rapid in the substratum. The slope is 0 to 1 percent.

The Sebewa soils are similar to the Brookston soils and are commonly adjacent to the Matherton soils on the landscape. The Matherton soils are somewhat poorly drained and are on slightly higher landscape positions than the Sebewa soils.

Typical pedon of Sebewa loam, 2,580 feet east and 400 feet south of the NW corner of sec. 14, T. 5 N., R. 7 E.

Ap—0 to 11 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; many fine roots; less than 5 percent pebbles; neutral; abrupt smooth boundary.
B21tg—11 to 21 inches; gray (5Y 6/1) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; less than 5 percent pebbles; dark gray (10YR 4/1) wormcasts; neutral; clear wavy boundary.
B22tg—21 to 32 inches; gray (10YR 6/1) clay loam; common medium distinct light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; 5 percent pebbles; few thin clay films on faces of peds; neutral; abrupt wavy boundary.
IICg—32 to 60 inches; grayish brown (10YR 5/2) gravelly sand; common medium distinct yellowish brown (10YR 5/6) mottles; single grain; loose; 25 percent pebbles; strong effervescence; moderately alkaline.

The solum is 22 to 40 inches thick and is slightly acid to mildly alkaline. Pebble content ranges from 0 to 20 percent in the solum and from 15 to 40 percent in the IIC horizon.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly loam, but the range includes sandy loam and silt loam. It is 10 to 13 inches thick.

The B2tg horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 or 2. It is clay loam, silty clay loam, sandy clay loam, or loam.

The IIC horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 3.

Selfridge series

The Selfridge series consists of somewhat poorly drained soils on till plains. These soils formed in sand and in the underlying loamy material. Permeability is rapid in the upper part of the pedon and moderately slow in the lower part. The slope range is 0 to 3 percent.

The Selfridge soils are commonly adjacent to the Capac and Metamora soils on the landscape. The Capac and Metamora soils have finer textures in the A horizon and in the upper part of the B horizon and are on landscape positions similar to those of the Selfridge soils.

A typical pedon of Selfridge loamy sand, 0 to 3 percent slopes, 1,020 feet east and 60 feet south of the NW corner of sec. 30, T. 2 N., R. 9 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy sand; light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; few fine roots; neutral; abrupt smooth boundary.
A21—9 to 22 inches; brown (10YR 5/3) loamy sand; many fine faint grayish brown (10YR 5/2) and few medium distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; very friable; neutral; clear wavy boundary.
A22—22 to 32 inches; light yellowish brown (10YR 6/4) sand; common fine distinct grayish brown (10YR 5/2) and few medium faint yellowish brown (10YR 5/6) mottles; single grain; loose; neutral; clear wavy boundary.

IIB2t—32 to 41 inches; brown (10YR 5/3) loam; common medium faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; thin discontinuous clay films on faces of peds; 4 percent pebbles; neutral; clear irregular boundary.

IIC—41 to 60 inches; grayish brown (10YR 5/2) loam; many fine and medium faint brown (10YR 5/3) and few medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; slight effervescence; mildly alkaline.

Depth to the IIC horizon ranges from 24 to 48 inches. Reaction ranges from medium acid to neutral in the solum.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly loamy sand, but the range includes sand.

The A2 horizon has value of 5 or 6 and chroma of 3 to 6. It is sand, fine sand, loamy fine sand, or loamy sand.

The IIB2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is loam, sandy loam, or sandy clay loam.

The IIC horizon has value of 5 or 6 and chroma of 1 to 3. It is loam, clay loam, or silty clay loam.

Sisson series

The Sisson series consists of well drained, moderately permeable soils on moraines. These soils formed in sandy and loamy sediments deposited by water. The slope range is 1 to 12 percent.

The Sisson soils are commonly adjacent to the Kibbie and Marlette soils on the landscape. The Kibbie soils are somewhat poorly drained and are on lower landscape positions than the Sisson soils. The Marlette soils do not have a stratified C horizon and are on landscape positions similar to those of the Sisson soils.

Typical pedon of Sisson fine sandy loam, 1 to 6 percent slopes, 2,280 feet north and 2,140 feet west of the SE corner of sec. 9, T. 3 N., R. 8 E.

Ap—0 to 8 inches; dark brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A2—8 to 12 inches; brown (10YR 5/3) fine sandy loam; moderate medium subangular blocky structure; friable; many fine roots; slightly acid; gradual wavy boundary.

B21t—12 to 22 inches; yellowish brown (10YR 5/4) loam; moderate fine subangular blocky structure; firm; common fine roots; slightly acid; clear wavy boundary.

B22t—22 to 35 inches; yellowish brown (10YR 5/6) loam; moderate medium angular blocky structure; firm; few fine roots; discontinuous thin strong brown (7.5YR 5/6) clay films on faces of peds; neutral; abrupt wavy boundary.

C1—35 to 60 inches; yellowish brown (10YR 5/6) stratified silt loam and very fine sand; massive; friable and very friable; strong effervescence; moderately alkaline.

The solum is 24 to 42 inches thick and is slightly acid to moderately alkaline.

The Ap horizon has chroma of 2 or 3. The A2 horizon has value of 5 or 6. The A horizon is dominantly fine sandy loam, but the range includes loam, loamy fine sand, and silt loam.

The B horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 6. It is loam, silt loam, or silty clay loam.

The C horizon has value of 4 to 6 and chroma of 3 to 6.

Sloan series

The Sloan series consists of very poorly drained, moderately or moderately slowly permeable soils on flood plains. These soils formed in loamy water-laid material. The slope is 0 to 1 percent.

The Sloan soils are similar to the Cohoctah soils.

Typical pedon of Sloan silt loam, 1,320 feet east and 65 feet south of the NW corner of sec. 36, T. 2 N., R. 9 E.

A11—0 to 11 inches; very dark brown (10YR 2/2) silt loam; gray (10YR 5/1) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt wavy boundary.

A12g—11 to 14 inches; dark gray (10YR 4/1) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; many fine roots; mildly alkaline; abrupt wavy boundary.

B2g—14 to 36 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) and common medium faint gray (10YR 5/1) mottles; massive; friable; few fine roots; mildly alkaline; clear wavy boundary.

C1g—36 to 50 inches; gray (10YR 5/1) silty clay loam and thin lenses of sandy loam and silt loam; common medium faint dark gray (10YR 4/1) and common medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; mildly alkaline; abrupt wavy boundary.

A1b—50 to 52 inches; very dark brown (10YR 2/2) fine sandy loam; massive; friable; some partially decomposed leaves; mildly alkaline; abrupt wavy boundary.

C2g—52 to 60 inches; gray (10YR 5/1) fine sandy loam; massive; friable; slight effervescence; mildly alkaline.

The depth to calcareous material ranges from 38 to 55 inches. Thin strata of sand or gravel occur in some pedons. Reaction ranges from slightly acid to moderately alkaline in the solum.

The A1 horizon has value of 2 or 3 and chroma of 1 or 2. It is 10 to 15 inches thick. The A12g horizon has value of 3 or 4 and chroma of 1 or 2. The A horizon is dominantly silt loam, but the range includes loam.

The B2g horizon has hue of 10YR, 2.5Y, or 5Y, value of 2 to 5, and chroma of 1 or 2. It is silty clay loam, silt loam, clay loam, or loam. There is some variation because of stratification.

The Cg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2.

Spinks series

The Spinks series consists of well drained, moderately rapidly permeable soils on outwash plains and moraines. These soils formed in sandy material. The slope range is 0 to 35 percent.

The Spinks soils are commonly adjacent to the Thetford, Arkport, and Oakville soils on the landscape. The Thetford soils are somewhat poorly drained and generally are on lower landscape positions than the Spinks soils. The Arkport soils have finer textured B lamellae in the A&B horizon. The Oakville soils do not have a banded Bt horizon. The Arkport and Oakville soils are on landscape positions similar to those of the Spinks soils.

Typical pedon of Spinks loamy sand, 0 to 6 percent slopes, 2,260 feet east and l,010 feet south of the NW corner of sec. 28, T. 2 N., R. 8 E.

Ap—0 to 9 inches; dark brown (10YR 3/3) loamy sand; brown (10YR 5/3) dry; medium granular structure; very friable; common fine roots; medium acid; abrupt smooth boundary.

A2—9 to 26 inches; pale brown (10YR 6/3) sand; single grain; loose; fine roots; 3 percent pebbles; medium acid; clear wavy boundary.

A&B—26 to 60 inches; brown (10YR 5/3) sand (A2); single grain; loose; lamellae and bands of reddish brown (5YR 4/4) loamy sand (B2t); massive; very friable; clay bridging of sand grains; 4 percent pebbles; wavy discontinuous lamellae and bands 1/8 inch to 2 inches thick; slightly acid.

The solum is 38 to 70 inches thick. Reaction is medium acid to neutral in the A horizon and medium acid to mildly alkaline in the A&B horizon. Throughout the solum, the content of pebbles ranges from 1 to 15 percent.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. It is dominantly loamy sand, but the range includes sand, fine sand, or loamy fine sand.

The A2 horizon has value of 4 to 6 and chroma of 3 to 6. It is sand, fine sand, or loamy sand.

The B part of the A&B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The depth of the first band of the B horizon ranges from 15 to about 36 inches. The individual bands or lamellae of the B horizon range from loamy sand to sandy loam. The bands are generally discontinuous, 1/8 inch to 5 inches thick, and about 5 to 10 inches apart.

Tedrow series

The Tedrow series consists of somewhat poorly drained, rapidly permeable soils on outwash plains and lake plains. These soils formed in sandy material. The slope range is 0 to 3 percent.

The Tedrow soils are commonly adjacent to the Thetford and Granby soils on the landscape. The Thetford soils have a discontinuous Bt horizon and are on landscape positions similar to those of the Tedrow soils. The Granby soils are poorly drained and are on lower landscape positions.

Typical pedon of Tedrow loamy sand, 0 to 3 percent slopes, 2,630 feet east and 380 feet south of the NW corner of sec. 28, T. 2 N., R. 8 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; many fine roots; slightly acid; abrupt smooth boundary.

B21—9 to 17 inches; yellowish brown (10YR 5/4) sand; few fine faint brown (10YR 5/3) mottles; single grain; loose; slightly acid; gradual wavy boundary.

B22—17 to 29 inches; brown (10YR 5/3) sand; common fine faint grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; single grain; loose; neutral; gradual irregular boundary.

B3—29 to 45 inches; pale brown (10YR 6/3) sand; many fine and medium faint light brownish gray (10YR 6/2) and few fine distinct brownish yellow (10YR 6/6) mottles; single grain; loose; neutral; abrupt wavy boundary.

C—45 to 60 inches; light brownish gray (10YR 6/2) sand; 4 percent pebbles; single grain; loose; slight effervescence; mildly alkaline.

Solum thickness and depth to carbonates range from 36 to 54 inches. Reaction in the solum ranges from slightly acid to neutral.

The A horizon has value of 2 or 3 and chroma of 1 or 3. It is dominantly loamy sand, but the range includes fine sand.

The B horizon has value of 4 to 6 and chroma of 3 to 6. It is sand or fine sand.

The C horizon has value of 5 or 6 and chroma of 2 or 3. It is sand or fine sand.

Thetford series

The Thetford series consists of somewhat poorly drained, moderately rapidly permeable soils on lake plains and outwash plains. These soils formed in stratified sandy material. The slope range is 0 to 3 percent.

The Thetford soils are commonly adjacent to the Dixboro and Spinks soils on the landscape. The Dixboro soils have finer textures in the B horizon and are on landscape positions similar to those of the Thetford soils. The Spinks soils are well drained and are on higher landscape positions.

Typical pedon of Thetford loamy fine sand, 0 to 3 percent slopes, 960 feet north and 200 feet east of the SW corner of sec. 28, T. 2 N., R. 8 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy fine sand; light brownish gray (10YR 6/2) dry; very weak fine granular structure; very friable; many fine roots; medium acid; abrupt smooth boundary.

A2—9 to 20 inches; light yellowish brown (10YR 6/4) loamy fine sand; weak medium subangular blocky structure; very friable; few fine roots; slightly acid; clear wavy boundary.

A&B—20 to 45 inches; pale brown (10YR 6/3) fine sand (A2); common fine distinct yellowish brown (10YR 5/4) and few fine faint light brownish gray (10YR 6/2) mottles; single grain; loose; lamellae and bands of dark brown (7.5YR 4/4) loamy sand (B2t); few medium distinct grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; very friable; clay bridging of sand grains; wavy and discontinuous 1/4- to 2-inch-thick lamellae and bands; slightly acid; gradual wavy boundary.

C1—45 to 52 inches; pale brown (10YR 6/3) fine sand; common medium distinct yellowish brown (10YR 5/6) mottles; single grain; loose; neutral; clear wavy boundary.

C2—52 to 60 inches; light brownish gray (10YR 6/2) sand; single grain; loose; mildly alkaline.

The solum is 35 to 60 inches thick and is medium acid to mildly alkaline. Pebble content in the solum ranges from 0 to 5 percent.

The Ap horizon has value of 3 or 4 and chroma of 1 to 3. It is dominantly loamy fine sand, but the range includes loamy sand or sand.

The A2 horizon has value of 4 to 6 and chroma of 3 to 6. It is loamy fine sand, fine sand, or sand.

In the A&B horizon, the A part has value of 4 to 7 and chroma of 3 or 4. It is fine sand or sand. The Bt part of this horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is loamy sand, loamy fine sand, and sandy loam.

The C horizon has value of 5 or 6 and chroma of 2 to 4. It is fine sand, sand, or very fine sand and is 0 to 10 percent pebbles.

Thomas series

The Thomas series consists of very poorly drained soils on lake plains and glacial drainageways. These soils formed in loamy and mucky lacustrine sediments. Permeability is moderate in the upper part of the pedon and slow or moderately slow in the lower part. The slope is 0 to 1 percent.

The Thomas soils are commonly adjacent to the Brookston, Colwood, or Houghton soils on the landscape. The Brookston and Colwood soils do not have an organic horizon. The Houghton soils have organic material throughout. The Brookston, Colwood, and Houghton soils are on landscape positions similar to those of the Thomas soils.

Typical pedon of Thomas muck, 1,120 feet west and 50 feet north of the SE corner of sec. 23, T. 5 N., R. 9 E.

Oap—0 to 11 inches; black (10YR 2/1) broken face and rubbed sapric material; less than 5 percent fibers before and after rubbing; weak fine and medium granular structure; friable; many roots; neutral; abrupt smooth boundary.

B2g—11 to 20 inches; dark gray (10YR 4/1) clay loam; few medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; 3 percent pebbles; common roots; slight effervescence; mildly alkaline; clear wavy boundary.

C1g—20 to 46 inches; gray (10YR 5/1) clay loam; common fine to medium distinct yellowish brown (10YR 5/4) and few medium and coarse distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm; 2 percent pebbles; slight effervescence; mildly alkaline; abrupt wavy boundary.

C2g—46 to 60 inches; gray (10YR 6/1) loam; common medium distinct yellowish brown (10YR 5/6) and few medium distinct light yellowish brown (10YR 6/4) mottles; massive; friable; 2 percent pebbles; strong effervescence; moderately alkaline.

The solum is 10 to 24 inches thick.

The Oa horizon has value of 2 or 3 and chroma of 1 or 2 and in some pedons is neutral and has value of 2. It is dominantly sapric organic material 8 to 15 inches thick.

The B2g horizon has value of 4 to 6 and chroma of 1 or 2. It is loam, clay loam, silty clay loam, silt loam, or sandy clay loam.

The Cg horizon has value of 5 or 6 and chroma of 1 to 4. It is loam, silt loam, silty clay loam, and clay loam.

Wasepi series

The Wasepi series consists of somewhat poorly drained soils on outwash plains. These soils formed in loamy material and in the underlying sandy material. Permeability is moderately rapid in the subsoil and very

rapid in the substratum. The slope range is 0 to 3 percent.

The Wasepi soils are commonly adjacent to the Gilford and Boyer soils on the landscape. The Gilford soils are very poorly drained and are on slightly lower landscape positions than the Wasepi soils. The Boyer soils are well drained and are on higher landscape positions.

Typical pedon of Wasepi sandy loam, 0 to 3 percent slopes, 2,310 feet south and 300 feet west of the NE corner of sec. 10, T. 2 N., R. 8 E.

Ap—0 to 8 inches; very dark gray (10YR 3/1) sandy loam; dark gray (10YR 4/1) dry; moderate medium granular structure; friable; many fine roots; 5 percent pebbles; neutral; abrupt smooth boundary.

A2—8 to 15 inches; brown (10YR 5/3) sandy loam; weak medium subangular blocky structure; friable; many fine roots; 7 percent pebbles; neutral; clear wavy boundary.

B2t—15 to 30 inches; brown (10YR 5/3) sandy loam; common medium faint grayish brown (10YR 5/2) and common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; 12 percent pebbles; few thin dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

IICg—30 to 60 inches; grayish brown (2.5YR 5/2) gravelly sand; single grain; loose; 20 percent pebbles; slight effervescence; moderately alkaline.

The solum is 24 to 40 inches thick and is medium acid to neutral. The content of pebbles ranges from 2 to 25 percent in the solum and from 10 to 30 percent in the IICg horizon. The content of cobbles ranges from 1 to 5 percent in the IICg horizon.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly sandy loam, but the range includes loamy sand. The A2 horizon has value of 5 or 6 and chroma of 2 or 3.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is gravelly sandy loam and sandy loam, but the range includes thin layers of gravelly loamy sand or sandy clay loam.

The IICg horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 2 to 4. It is gravelly sand or stratified sand and gravelly sand.

Formation of the soils

The paragraphs that follow describe the factors of soil formation, relate them to the formation of soils in the survey area, and explain the processes of soil formation.

Factors of soil formation

Soil forms through the interaction of five major factors: the physical, chemical, and mineral composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the processes of soil formation have acted on the parent material (*3*).

Climate and plant and animal life are the active forces in soil formation. They slowly change the parent material into a natural body of soil that has genetically related layers, called horizons. The effects of climate and plant and animal life are conditioned by relief. The nature of the parent material also affects the kind of soil profile that is formed. In extreme cases, it determines the soil profile almost entirely. Finally, time is needed to change the parent material into soil. It may be long or short, but some time is required for differentiation of soil horizons. Generally, a long time is required for the formation of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soils that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil formation are unknown.

Parent material

Parent material, the unconsolidated mass from which a soil forms, determines the limits of the chemical and mineralogical composition of the soil. The parent materials of the soils of Oakland County were deposited by glaciers or by melt water from glaciers that covered the county 10,000 to 12,000 years ago. Some of these materials have been reworked and redeposited by subsequent action of water and wind. Although the parent materials are of common glacial origin, their properties vary greatly, sometimes within a small area, depending on how the materials were deposited. The dominant parent materials in Oakland County were deposited as glacial till, outwash deposits, lacustrine deposits, alluvium, and organic material.

Glacial till is material that was deposited directly by glaciers with a minimum of water action. It is a mixture of particles of different sizes. The small pebbles in glacial till have sharp corners, indicating that they have not been worn by water. The glacial till in Oakland County is calcareous. Its texture is loam, clay loam, or sandy loam. Marlette soils, for example, formed in glacial till. They typically are moderately fine textured and have a well developed subsoil.

Outwash material is deposited by running water from melting glaciers. The size of the particles varies according to the speed of the stream that carries them. As the speed of the stream decreases, the coarser particles are deposited. Only the finer particles, such as the very fine sand, silt, and clay, can be carried by slowly moving water. Outwash deposits generally consist of layers of particles of similar size, such as sandy loam, sand, gravel, and other coarse particles. The Fox soils, for example, formed in deposits of outwash material.

Lacustrine material is deposited from still, or ponded, glacial melt water. Because the coarser fragments drop out of the moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, remain to settle out in still water. In Oakland County the soils that formed in lacustrine deposits typically are medium textured, moderately fine textured, and fine textured. Lenawee soils, for example, formed in lacustrine material.

Alluvium is material recently deposited by floodwaters of streams. This material varies in texture, depending on the speed of the water from which it was deposited. The Sloan and Cohoctah soils are alluvial soils.

Organic material is made up of deposits of plant remains. After the glaciers receded, water was left standing in depressions in the outwash plains, flood plains, moraines, and till plains. Because of the wetness, the grasses, sedges, and water-tolerant plants that grew around the edge of these depressions did not decompose quickly after they died. Eventually the plant residue filled the depressions and decomposed to form muck. Houghton soils, for example, formed in organic material.

Plant and animal life

Green plants have been the principal organisms influencing the soil in Oakland County. Bacteria, fungi, earthworms, and the activities of man have also been important. The chief contribution of plant and animal life is the addition of organic matter and nitrogen to the soil. The kind of organic material on the soil depends on the

kinds of plants that grew on the soil. The remains of these plants accumulate on the surface, decay, and eventually become organic matter. The roots of the plants provide channels for downward movement of water through the soil and also add organic matter as they decay. Bacteria in the soil help to break down the organic matter so that it can be used by growing plants.

The vegetation in Oakland County was mainly deciduous forest. Differences in natural soil drainage and minor changes in parent material affected the composition of the forest species.

In general, the well drained upland soils, such as Boyer, Marlette, and Oshtemo soils, were mainly covered by sugar maple, oak, and hickory trees. The poorly drained and very poorly drained soils were covered with soft maple, elm, and ash. The Colwood and Brookston soils formed under wet conditions, and they contain a considerable amount of organic matter.

Climate

Climate determines the kind of plant and animal life on and in the soil. It also determines the amount of water available for the weathering of minerals and for the transporting of soil material. Through its influence on soil temperature, climate determines the rate of chemical reaction in the soil.

The climate in Oakland County, presumably similar to that in which the soils formed, is cool and humid. It is uniform throughout the county. Its effect is modified locally according to the proximity to large lakes. Differences in climate account for only minor differences in the soils in Oakland County.

Relief

Relief, or topography, affects the natural drainage of soils, the rate of erosion, the kind of plant cover, and the soil temperature. The slopes range from 0 to 40 percent. Runoff is most rapid on the steeper slopes. In low areas, water is temporarily ponded.

The soils in Oakland County range from well drained, on the ridgetops, to very poorly drained, in the depressions.

Through its effect on the aeration of the soil, drainage partly determines the color of the soil. Water and air move freely through soils that are well drained and slowly through soils that are very poorly drained. In well aerated soils, the iron and aluminum compounds are brightly colored and oxidized. In poorly aerated soils, the color is dull gray and mottled. The Riddles soils are examples of well drained, well aerated soils. The Brookston soils are examples of very poorly drained, poorly aerated soils. The Riddles and Brookston soils formed in similar parent material.

Time

In general, a long time is required for the development of distinct horizons from parent material. The differences in the length of time that parent material has been in place is commonly reflected in the degree of development of the soil profile. Some soils develop rapidly. Others develop slowly.

The soils in Oakland County range from young to mature. The glacial deposits in which many of the soils in Oakland County formed have been exposed to soil-forming factors long enough for the development of distinct horizons. The soils that formed in recent alluvial sediments, however, have not been in place long enough for the development of distinct horizons.

The Cohoctah soils, formed in alluvial material, are an example of young soils. The Riddles soils are an example of mature soils. They are old enough that distinct horizons have formed and lime has leached from the solum.

Processes of soil formation

The processes responsible for the development of the soil horizons from the unconsolidated parent material are referred to as soil genesis. The physical, chemical, and biological properties of the horizons are referred to as soil morphology.

Several processes were involved in the development of horizons in the soils of Oakland County: (1) the accumulation of organic matter, (2) the leaching of lime (calcium carbonate) and other bases, (3) the reduction and transfer of iron, and (4) the formation and translocation of silicate clay minerals. In most of the soils in Oakland County, more than one of these processes have been active in the development of the horizons.

As organic matter accumulates at the surface of a soil, an A1 horizon is formed. If the soil is plowed, the A1 horizon is mixed into the plow layer, or Ap horizon. In the soils in Oakland County, the surface layer ranges from high to low in content of organic matter. The Brookston soils, for example, are high in content of organic matter in the surface layer. The Spinks soils are low in 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 Oakland County are moderately to strongly leached. For example, Riddles soils are leached of carbonates to a depth of 46 inches, whereas Marlette soils are leached to a depth of 31 inches. This difference in the depth of leaching is a result of time, relief, and parent material as soil-forming factors.

The reduction and transfer of iron, a process called gleying, is evident in the somewhat poorly drained, poorly drained, and very poorly drained soils. The gray subsoil of the soils indicates the reduction and loss of iron. The Lenawee soils, for example, are strongly gleyed.

Translocation of clay minerals contributes to horizon development. The eluviated, or leached, A2 horizon

typically has a platy structure, is lower in content of clay, and typically is lighter in color than the illuviated B horizon. 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 translocation of silicate clays occurred. The leaching of bases and the translocation of silicate clays are among the more important processes in horizon differentiation in soils. The Marlette soils are an example of soils having translocated silicate clays in the form of clay films accumulated in the B horizon.

References

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.
(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.
(3) Jenny, Hans. 1941. Factors of soil formation. McGraw-Hill Book Company, Inc., 281 pp., illus.
(4) Michigan State University. 1976. Fertilizer recommendations for vegetables and field crops in Michigan. Ext. Bull. E-550, 24 pp.
(5) Mokma, D. L., E. P. Whiteside, and I. F. Schneider. 1978. Soil management units and land use planning. Mich. State Univ. Ext. Bull. E-1262, 12 pp.
(6) Soil Science Society of America and American Society of Agronomy. 1966. Soil surveys and land use planning. 196 pp., illus.
(7) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]
(8) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.
(9) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.
(10) United States Department of Commerce. 1976. 1974 Census of agriculture. Vol. 1, Part 22.

Glossary

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—

	Inches
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.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

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.

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.

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.

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) 15.2 to 38.1 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 (7.5 to 25 centimeters) in diameter.

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.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

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. The Lco horizon is a limnic layer that contains many fecal pellets.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

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.

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.

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.

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 the

activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

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, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Forb. Any herbaceous plant not a grass or a sedge.

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 melt water.

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 melt water. 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.

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 7.5 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 (7.5 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 underlying 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.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

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 upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

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 A or B 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, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock 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

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.5 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.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and 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 the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, 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.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

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.

Parent material. The unconsolidated organic and mineral material in which soil forms.

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 0.20 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. For example, 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.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

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.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

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 degree of acidity or alkalinity is expressed as—

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

Relief. The elevations or inequalities of a land surface, considered collectively.

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.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

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.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

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 underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

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.

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.

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.

Slope (in tables). Slope is great enough that special practices are required to insure 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 intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

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 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
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 and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

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 wind 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 grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A horizon. Includes all subdivisions of this horizon (A1, A2, and A3).

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.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

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, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1949-78 at Pontiac, Michigan]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	30.2	15.8	23.0	55	-8	0	1.67	.8	2.4	5	8.7
February---	33.4	17.0	25.2	55	-8	0	1.50	.7	2.2	4	6.7
March------	43.0	24.7	33.9	71	3	10	2.25	1.4	3.1	6	5.9
April------	58.1	35.9	47.0	82	17	85	2.83	1.9	3.7	6	1.0
May--------	70.3	46.6	58.4	88	28	293	2.77	1.5	3.9	7	T**
June-------	79.6	56.5	68.1	94	39	549	3.49	2.1	4.7	7	0
July-------	83.6	60.6	72.1	95	46	692	2.76	1.6	3.8	6	0
August-----	81.8	59.1	70.4	94	44	641	2.94	1.8	4.0	6	0
September--	74.3	52.1	63.2	93	33	408	2.44	1.4	3.4	5	0
October----	63.3	42.3	52.8	84	23	166	2.38	.9	3.6	5	.1
November---	47.0	31.6	39.3	71	9	25	2.29	1.4	3.1	6	3.6
December---	34.4	21.0	27.7	59	-2	0	2.25	1.1	3.3	5	8.6
Year-----	58.2	38.6	48.4	97	-10	2,869	29.55	24.9	34.0	68	34.6

* 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° F).

** Trace.

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1949-78 at Pontiac, Michigan]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 25	May 3	May 19
2 years in 10 later than--	April 20	April 29	May 14
5 years in 10 later than--	April 10	April 21	May 6
First freezing temperature in fall:			
1 year in 10 earlier than--	October 23	October 11	September 29
2 years in 10 earlier than--	October 28	October 16	October 4
5 years in 10 earlier than--	November 7	October 26	October 13

TABLE 3.--GROWING SEASON

[Recorded in the period 1949-78 at Pontiac, Michigan]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	187	166	141
8 years in 10	195	174	147
5 years in 10	210	187	159
2 years in 10	225	200	171
1 year in 10	232	207	177

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
10B	Marlette sandy loam, 1 to 6 percent slopes	43,280	7.4
10C	Marlette sandy loam, 6 to 12 percent slopes	25,600	4.4
10D	Marlette loam, 12 to 18 percent slopes	5,810	1.0
10E	Marlette loam, 18 to 35 percent slopes	5,270	0.9
11B	Capac sandy loam, 0 to 4 percent slopes	23,360	4.1
12	Brookston and Colwood loams	10,180	1.8
13B	Oshtemo-Boyer loamy sands, 0 to 6 percent slopes	22,370	3.9
13C	Oshtemo-Boyer loamy sands, 6 to 12 percent slopes	15,420	2.7
13E	Oshtemo-Boyer loamy sands, 12 to 40 percent slopes	11,415	2.0
14B	Oakville fine sand, 0 to 6 percent slopes	4,135	0.7
14C	Oakville fine sand, 6 to 18 percent slopes	2,315	0.4
15B	Spinks loamy sand, 0 to 6 percent slopes	21,300	3.7
15C	Spinks loamy sand, 6 to 12 percent slopes	10,735	1.9
15E	Spinks loamy sand, 12 to 35 percent slopes	6,695	1.2
17A	Wasepi sandy loam, 0 to 3 percent slopes	5,050	0.9
18B	Fox sandy loam, 1 to 6 percent slopes	14,155	2.5
18C	Fox sandy loam, 6 to 12 percent slopes	11,365	2.0
18D	Fox sandy loam, 12 to 25 percent slopes	6,860	1.2
19	Sebewa loam	2,965	0.5
20B	Glynwood loam, 2 to 6 percent slopes	4,150	0.7
20C	Glynwood loam, 6 to 12 percent slopes	1,695	0.3
23B	Sisson fine sandy loam, 1 to 6 percent slopes	1,630	0.3
23C	Sisson fine sandy loam, 6 to 12 percent slopes	745	0.1
25B	Owosso sandy loam, 1 to 6 percent slopes	3,155	0.5
25C	Owosso sandy loam, 6 to 12 percent slopes	1,780	0.3
26	Sloan silt loam	2,410	0.4
27	Houghton and Adrian mucks	47,635	8.2
31B	Metea loamy sand, 0 to 6 percent slopes	2,770	0.5
31C	Metea loamy sand, 6 to 12 percent slopes	860	0.1
32B	Blount loam, 0 to 4 percent slopes	6,360	1.1
33	Lenawee silty clay loam	3,195	0.6
34B	Kibbie fine sandy loam, 0 to 4 percent slopes	2,610	0.5
35A	Thetford loamy fine sand, 0 to 3 percent slopes	5,540	1.0
36A	Metamora sandy loam, 0 to 3 percent slopes	3,130	0.5
38	Napoleon muck	1,590	0.3
39	Granby loamy sand	2,820	0.5
40B	Udorthents, loamy, undulating	5,690	1.0
40C	Udorthents, loamy, rolling	1,245	0.2
41B	Aquents, sandy and loamy, undulating	13,790	2.4
42	Pits	3,960	0.7
43	Sloan-Marlette association	1,380	0.2
44B	Riddles sandy loam, 1 to 6 percent slopes	15,850	2.8
44C	Riddles sandy loam, 6 to 12 percent slopes	12,350	2.1
44D	Riddles sandy loam, 12 to 18 percent slopes	3,335	0.6
45B	Arkport loamy fine sand, 2 to 6 percent slopes	2,140	0.4
45C	Arkport loamy fine sand, 6 to 12 percent slopes	1,765	0.3
45D	Arkport loamy fine sand, 12 to 25 percent slopes	560	0.1
46A	Dixboro loamy fine sand, 0 to 3 percent slopes	2,700	0.5
47B	Fox-Riddles sandy loams, 1 to 6 percent slopes	2,020	0.4
47C	Fox-Riddles sandy loams, 6 to 12 percent slopes	1,390	0.2
48	Gilford sandy loam	3,625	0.6
49	Cohoctah fine sandy loam	1,615	0.3
50B	Udipsamments, undulating	5,885	1.0
50D	Udipsamments, rolling to steep	3,240	0.6
51B	Leoni gravelly sandy loam, 1 to 6 percent slopes	765	0.1
51C	Leoni gravelly sandy loam, 6 to 12 percent slopes	435	0.1
52A	Selfridge loamy sand, 0 to 3 percent slopes	3,600	0.6
53A	Tedrow loamy sand, 0 to 3 percent slopes	1,455	0.3
54A	Matherton sandy loam, 0 to 3 percent slopes	4,665	0.8
56A	Urban land-Blount-Lenawee complex, 0 to 3 percent slopes	10,255	1.8
59	Urban land	27,065	4.7
60B	Urban land-Marlette complex, 0 to 8 percent slopes	16,225	2.8
60C	Urban land-Marlette complex, 8 to 15 percent slopes	3,575	0.6
60D	Urban land-Marlette complex, 15 to 25 percent slopes	290	0.1
61A	Urban land-Capac complex, 0 to 3 percent slopes	9,990	1.7
62B	Urban land-Spinks complex, 0 to 8 percent slopes	17,095	3.0
62C	Urban land-Spinks complex, 8 to 15 percent slopes	1,800	0.3
63A	Urban land-Thetford complex, 0 to 3 percent slopes	17,850	3.1
67B	Ormas loamy sand, 0 to 6 percent slopes	3,960	0.7
67C	Ormas loamy sand, 6 to 12 percent slopes	2,580	0.4
68	Cohoctah-Fox association	2,040	0.4
69	Thomas muck	1,755	0.3

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
	Water areas less than 40 acres	6,265	1.1
	Water areas greater than 40 acres	20,800	3.6
	Total	575,360	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Oats	Winter wheat	Soybeans	Grass-legume hay	Alfalfa-grass pasture	Grass pasture
	Bu	Bu	Bu	Bu	Tons	AUM*	AUM*
10B---- Marlette	110	75	60	35	4.0	9.6	8.0
10C---- Marlette	100	75	56	30	3.5	9.0	6.8
10D---- Marlette	85	65	48	---	3.2	7.6	6.2
10E---- Marlette	---	---	---	---	---	---	---
11B---- Capac	120	100	65	40	4.0	9.0	8.0
12---- Brookston and Colwood	130	110	65	49	5.0	---	8.5
13B---- Oshtemo-Boyer	76	62	33	28	2.3	6.3	5.4
13C---- Oshtemo-Boyer	72	58	32	24	2.3	5.5	5.2
13E---- Oshtemo-Boyer	---	---	---	---	1.5	---	---
14B---- Oakville	60	55	30	---	2.5	4.0	4.0
14C---- Oakville	---	35	---	---	1.8	3.6	3.6
15B---- Spinks	75	60	30	27	3.0	6.0	5.0
15C---- Spinks	68	55	30	23	2.4	4.8	4.8
15E---- Spinks	---	---	---	---	1.8	---	---
17A---- Wasepi	80	60	35	30	3.4	7.5	6.8
18B---- Fox	95	70	42	30	4.5	9.0	8.0
18C---- Fox	90	65	38	28	4.0	8.0	7.0
18D---- Fox	70	60	32	---	4.0	7.0	6.0
19---- Sebewa	105	90	50	36	4.6	---	8.5
20B---- Glynwood	106	90	55	40	5.0	9.0	8.0
20C---- Glynwood	90	80	45	35	4.7	8.6	6.5

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Winter wheat	Soybeans	Grass-legume hay	Alfalfa-grass pasture	Grass pasture
	Bu	Bu	Bu	Bu	Tons	AUM*	AUM*
23B---- Sisson	105	80	50	35	4.0	9.0	8.0
23C---- Sisson	90	70	47	32	3.6	7.5	7.0
25B---- Owosso	105	80	55	35	4.5	9.5	8.0
25C---- Owosso	90	75	50	33	4.0	9.0	7.0
26---- Sloan	---	---	---	---	---	---	5.0
27---- Houghton and Adrian	---	---	---	---	---	---	5.4
31B---- Metea	85	---	42	30	2.8	7.5	6.0
31C---- Metea	75	---	38	26	2.5	7.0	5.5
32B---- Blount	106	64	48	35	4.3	8.5	7.5
33---- Lenawee	125	100	60	42	4.0	---	8.0
34B---- Kibbie	120	100	65	40	4.5	9.0	8.0
35A---- Thetford	80	60	35	30	3.0	6.4	6.4
36A---- Metamora	115	95	60	40	3.5	8.5	7.5
38---- Napoleon	---	---	---	---	---	---	---
39---- Granby	75	55	35	30	---	---	6.0
40B**, 40C**. Udorthents							
41B**. Aquents							
42**. Pits							
43**:							
Sloan----	---	---	---	---	---	---	5.0
Marlette----	---	---	---	---	---	---	---
44B---- Riddles	115	110	56	37	4.2	9.0	7.8
44C---- Riddles	105	105	52	35	3.8	8.5	6.3
44D---- Riddles	90	---	46	32	3.5	7.0	6.0

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Winter wheat	Soybeans	Grass-legume hay	Alfalfa-grass pasture	Grass pasture
	Bu	Bu	Bu	Bu	Tons	AUM*	AUM*
45B---- Arkport	90	70	45	28	3.5	7.5	6.5
45C---- Arkport	70	55	40	25	3.0	6.5	6.5
45D---- Arkport	55	45	35	---	2.5	5.0	5.0
46A---- Dixboro	100	60	45	35	4.0	8.0	8.0
47B---- Fox-Riddles	102	---	43	34	4.2	9.0	8.2
47C---- Fox-Riddles	96	---	40	32	3.8	8.0	8.0
48---- Gilford	90	75	45	30	3.8	---	8.0
49---- Cohoctah	---	---	---	---	3.0	---	9.0
50B**, 50D**. Udipsamments							
51B---- Leoni	70	50	30	28	2.5	5.0	5.0
51C---- Leoni	65	45	28	24	2.2	4.4	4.4
52A---- Selfridge	90	70	42	33	3.2	7.2	6.4
53A---- Tedrow	85	---	35	30	3.2	5.4	5.4
54A---- Matherton	105	80	45	36	---	8.5	8.0
56A---- Urban land-Blount-Lenawee	---	---	---	---	---	---	---
59**. Urban land							
60B, 60C, 60D---- Urban land-Marlette	---	---	---	---	---	---	---
61A---- Urban land-Capac	---	---	---	---	---	---	---
62B---- Urban land-Spinks	---	---	---	---	---	---	---
62C---- Urban land-Spinks	---	---	---	---	---	---	---
63A---- Urban land-Thetford	---	---	---	---	---	---	---
67B---- Ormas	75	60	30	25	3.0	5.6	4.8
67C---- Ormas	65	55	28	22	2.5	4.6	3.6

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Winter wheat	Soybeans	Grass-legume hay	Alfalfa-grass pasture	Grass pasture
	Bu	Bu	Bu	Bu	Tons	AUM*	AUM*
68**: Cohoctah	---	---	---	---	3.0	---	9.0
Fox	---	---	---	---	---	---	---
69 Thomas	---	---	---	---	---	---	7.0

* Animal-unit-month: The amount of forage or feed required to feed one mature riding horse for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	---	---	---	---
II	145,545	86,380	59,165	---
III	157,155	89,490	17,815	49,850
IV	23,520	16,565	2,820	4,135
V	56,835	---	56,835	---
VI	10,600	6,695	1,590	2,315
VII	16,685	16,685	---	---
VIII	---	---	---	---

TABLE 7.--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				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
10B, 10C, 10D---------- Marlette	2o	Slight	Slight	Slight	Slight	Sugar maple----------	61	Black walnut, eastern white pine, red pine.
						Northern red oak-----	---	
						White ash------------	---	
						Black walnut---------	---	
						American basswood----	---	
						Black cherry---------	---	
						White oak------------	---	
10E---------- Marlette	2r	Moderate	Moderate	Slight	Slight	Sugar maple----------	61	Black walnut, eastern white pine, red pine.
						Northern red oak-----	---	
						White ash------------	---	
						Black walnut---------	---	
						American basswood----	---	
						Black cherry---------	---	
						White oak------------	---	
11B---------- Capac	3o	Slight	Slight	Slight	Slight	Northern red oak-----	56	Eastern white pine, white spruce, Norway spruce, northern white-cedar, Carolina poplar.
						American basswood----	---	
						Northern pin oak-----	---	
						White ash------------	---	
						Red maple------------	---	
						Bitternut hickory----	---	
12*:								
Brookston----------	2w	Slight	Severe	Severe	Moderate	Northern red oak-----	66	Eastern white pine, white spruce, northern white-cedar, Carolina poplar.
						White oak------------	---	
						Silver maple---------	---	
						Red maple------------	---	
						White ash------------	---	
						American basswood----	---	
						American sycamore----	---	
Colwood----------	3w	Slight	Severe	Severe	Severe	Red maple------------	56	Eastern white pine, white spruce, Carolina poplar.
						White ash------------	---	
						Silver maple---------	---	
						Green ash------------	---	
						Swamp white oak------	---	
13B*, 13C*:								
Oshtemo----------	2s	Slight	Slight	Moderate	Slight	Northern red oak-----	66	Eastern white pine, red pine, white spruce, Norway spruce, Carolina poplar, northern red oak.
						White oak------------	---	
						American basswood----	66	
						Sugar maple----------	61	
Boyer----------	2s	Slight	Slight	Moderate	Slight	Northern red oak-----	66	Eastern white pine, red pine, Norway spruce, Carolina poplar.
						White oak------------	---	
						American basswood----	---	
						Sugar maple----------	---	
						Black oak------------	---	
13E*:								
Oshtemo----------	2s	Moderate	Moderate	Moderate	Slight	Northern red oak-----	66	Eastern white pine, red pine, white spruce, Norway spruce, Carolina poplar, northern red oak.
						White oak------------	---	
						American basswood----	66	
						Sugar maple----------	61	
Boyer----------	2s	Moderate	Moderate	Moderate	Slight	Northern red oak-----	66	Eastern white pine, red pine, Norway spruce, Carolina poplar.
						White oak------------	---	
						American basswood----	---	
						Sugar maple----------	---	
						Black oak------------	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
14B Oakville	2s	Slight	Slight	Severe	Slight	Northern red oak White oak Red pine Quaking aspen Black oak Eastern white pine	66 --- --- --- --- 65	Red pine, eastern white pine, Carolina poplar, Norway spruce.
14C Oakville	2s	Slight	Slight	Severe	Slight	Northern red oak White oak Red pine Quaking aspen Black oak Eastern white pine	66 --- --- --- --- ---	Red pine, eastern white pine, Carolina poplar, Norway spruce.
15B, 15C Spinks	2s	Slight	Slight	Moderate	Slight	Northern red oak White oak Black oak Black cherry	66 --- --- ---	Red pine, eastern white pine, Carolina poplar, northern red oak.
15E Spinks	2s	Moderate	Moderate	Moderate	Slight	Northern red oak White oak Black oak Black cherry	66 --- --- ---	Red pine, eastern white pine, Carolina poplar, northern red oak.
17A Wasepi	3o	Slight	Slight	Slight	Slight	Quaking aspen Red maple Silver maple Paper birch	60 --- --- ---	White spruce, eastern white pine, Norway spruce, Carolina poplar, northern red oak.
18B, 18C Fox	2o	Slight	Slight	Slight	Slight	Northern red oak White oak Sugar maple	65 --- ---	Red pine, eastern white pine, white spruce, Norway spruce, Carolina poplar, northern red oak.
18D Fox	2r	Moderate	Moderate	Slight	Slight	Northern red oak White oak Sugar maple	65 --- ---	Red pine, eastern white pine, white spruce, Norway spruce, Carolina poplar, northern red oak.
19 Sebewa	2w	Slight	Severe	Moderate	Moderate	Red maple White ash American basswood Swamp white oak Pin oak Northern red oak	66 66 --- --- 66 66	White spruce, eastern white pine, Norway spruce, northern red oak.
20B, 20C Glynwood	3c	Slight	Slight	Severe	Slight	Northern red oak White ash Red maple Pin oak Swamp white oak American beech	55 55 55 --- --- ---	Eastern white pine, yellow-poplar, Carolina poplar, northern red oak.
23B, 23C Sisson	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar White ash American basswood White oak Sugar maple Black walnut Black cherry	65 65 65 65 --- 61 65 ---	Yellow-poplar, black walnut, eastern white pine, white spruce, Norway spruce, red pine.
25B, 25C Owosso	1o	Slight	Slight	Slight	Slight	Quaking aspen Northern red oak White ash Sugar maple American basswood Red maple Yellow-poplar	80 --- --- --- --- --- ---	Black walnut, Carolina poplar, eastern white pine, yellow-poplar.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
26---------- Sloan	2w	Slight	Severe	Severe	Severe	Red maple----------	66	Northern white-cedar, eastern white pine, white spruce.
						Eastern cottonwood--	---	
						White ash----------	---	
						Green ash----------	---	
						Swamp white oak-----	---	
						Pin oak----------	---	
27*:								
Houghton----------	3w	Slight	Severe	Severe	Severe	Red maple----------	56	
						Silver maple--------	---	
						White ash----------	---	
						Quaking aspen-------	---	
						Tamarack----------	---	
						Green ash----------	---	
						Northern white-cedar	---	
Adrian----------	3w	Slight	Severe	Severe	Severe	Red maple----------	56	
						Silver maple--------	---	
						White ash----------	---	
						Quaking aspen-------	---	
						Tamarack----------	---	
						Green ash----------	---	
31B, 31C---------- Metea	2s	Slight	Slight	Moderate	Slight	Northern red oak----	66	Eastern white pine, red pine, black walnut, Norway spruce, Carolina poplar, northern red oak.
						White oak----------	---	
						Sugar maple---------	---	
						American basswood---	---	
						Black cherry--------	---	
						Black walnut--------	---	
						Shagbark hickory----	---	
32B---------- Blount	3c	Slight	Slight	Severe	Slight	Northern red oak----	57	Eastern white pine, northern white-cedar, white spruce, Norway spruce, yellow-poplar.
						White oak----------	---	
						White ash----------	---	
						Sugar maple---------	---	
33---------- Lenawee	3w	Slight	Severe	Severe	Moderate	Red maple----------	55	White spruce, Norway spruce, eastern white pine.
						White ash----------	---	
						American basswood---	---	
						Silver maple--------	---	
34B---------- Kibbie	2o	Slight	Slight	Slight	Slight	Northern red oak----	66	Northern red oak, eastern white pine, Norway spruce.
						Red maple----------	---	
						White ash----------	66	
						American basswood---	66	
						Quaking aspen-------	70	
35A---------- Thetford	3s	Slight	Slight	Moderate	Slight	Red maple----------	56	White spruce, Norway spruce, eastern white pine, Carolina poplar.
						White ash----------	---	
						Quaking aspen-------	---	
						Eastern cottonwood--	---	
						Northern red oak----	---	
						Swamp white oak-----	---	
						Bitternut hickory---	---	
36A---------- Metamora	2o	Slight	Slight	Slight	Slight	Northern red oak----	66	White spruce, Norway spruce, eastern white pine, northern white-cedar, northern red oak.
						White ash----------	---	
						Bitternut hickory---	---	
						Green ash----------	---	
						Shagbark hickory----	---	
						American basswood---	---	
						Sugar maple---------	---	
						Red maple----------	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
38---------- Napoleon	3w	Slight	Severe	Severe	Severe	Red maple----------	56	
						Silver maple--------	---	
						White ash----------	---	
						Quaking aspen-------	---	
						Tamarack----------	---	
						Black ash----------	---	
39---------- Granby	5w	Slight	Severe	Severe	Severe	Red maple----------	40	Eastern white pine, Norway spruce, white spruce.
						Silver maple--------	---	
						American basswood---	---	
						Pin oak------------	---	
						Quaking aspen-------	---	
						Eastern cottonwood--	---	
						White ash----------	---	
43*:								
Sloan----------	2w	Slight	Severe	Severe	Severe	Red maple----------	66	Northern white-cedar, eastern white pine, white spruce.
						Eastern cottonwood--	---	
						White ash----------	---	
						Green ash----------	---	
						Swamp white oak-----	---	
						Pin oak------------	---	
Marlette----------	2r	Moderate	Moderate	Slight	Slight	Sugar maple---------	61	Black walnut, eastern white pine, red pine.
						Northern red oak----	---	
						White ash----------	---	
						Black walnut--------	---	
						American basswood---	---	
						Black cherry--------	---	
						White oak----------	---	
44B, 44C, 44D------ Riddles	1o	Slight	Slight	Slight	Slight	Northern red oak----	75	Black walnut, red pine, white spruce, yellow-poplar, eastern white pine, northern red oak.
						Red maple----------	---	
						White ash----------	---	
						Green ash----------	---	
						Black walnut--------	---	
						Yellow-poplar-------	---	
45B, 45C---------- Arkport	2o	Slight	Slight	Moderate	Slight	Sugar maple---------	62	Norway spruce, red pine, eastern white pine, Carolina poplar.
						Red pine-----------	---	
						Eastern white pine--	---	
45D---------- Arkport	2r	Slight	Moderate	Moderate	Slight	Sugar maple---------	62	Norway spruce, eastern white pine, red pine, Carolina poplar.
						Eastern white pine--	---	
						Red pine-----------	---	
						Northern red oak----	---	
46A---------- Dixboro	2s	Slight	Slight	Moderate	Slight	Northern red oak----	65	Eastern white pine, white spruce, Norway spruce, red pine, northern red oak.
						White oak----------	---	
						Northern pin oak----	---	
						Black oak----------	---	
						Shagbark hickory----	---	
						Bitternut hickory---	---	
						American basswood---	---	
						Sugar maple---------	---	
47B*, 47C*:								
Fox----------	2o	Slight	Slight	Slight	Slight	Northern red oak----	65	Red pine, eastern white pine, white spruce, Norway spruce, Carolina poplar, northern red oak.
						White oak----------	---	
						Sugar maple---------	---	
Riddles----------	1o	Slight	Slight	Slight	Slight	Northern red oak----	75	Black walnut, red pine, white spruce, Norway spruce, eastern white pine, yellow-poplar, northern red oak.
						Red maple----------	---	
						White ash----------	---	
						Green ash----------	---	
						Black walnut--------	---	
						Yellow-poplar-------	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
48---------- Gilford	3w	Slight	Severe	Severe	Severe	Red maple----------	56	Eastern white pine, Norway spruce, white spruce, Carolina poplar.
						Silver maple--------	---	
						American basswood---	---	
						Pin oak----------	---	
						White ash----------	---	
						Swamp white oak-----	---	
						Bur oak----------	---	
49---------- Cohoctah	3w	Slight	Severe	Severe	Moderate	Red maple----------	56	
						Eastern cottonwood--	---	
						Silver maple--------	---	
						White ash----------	---	
						Swamp white oak-----	---	
						American sycamore---	---	
51B, 51C---------- Leoni	2o	Slight	Slight	Slight	Slight	Northern red oak----	65	Red pine, eastern white pine, Norway spruce, northern red oak.
						White oak----------	---	
						American basswood---	---	
						Sugar maple---------	---	
						White ash----------	---	
						Black walnut--------	---	
						Black cherry--------	---	
52A---------- Selfridge	3s	Slight	Slight	Moderate	Slight	Quaking aspen-------	60	Eastern white pine, Norway spruce, Carolina poplar.
						American beech------	---	
						Northern red oak----	---	
						Red maple----------	---	
						Sugar maple---------	---	
						Black cherry--------	---	
						American basswood---	---	
53A---------- Tedrow	3s	Slight	Slight	Moderate	Moderate	White ash----------	55	Norway spruce, Carolina poplar, white spruce, eastern white pine.
						Silver maple--------	---	
						Eastern white pine--	---	
54A---------- Matherton	2o	Slight	Slight	Slight	Slight	Northern red oak----	66	White spruce, Norway spruce, eastern white pine, Carolina poplar, northern red oak.
						Swamp white oak-----	---	
						White oak----------	---	
						White ash----------	---	
						American basswood---	---	
						Red maple----------	---	
67B, 67C---------- Ormas	2s	Slight	Slight	Moderate	Slight	Black oak----------	65	Black walnut, Norway spruce, red pine, eastern white pine, yellow-poplar, Carolina poplar.
						White oak----------	---	
						Bigtooth aspen------	---	
						Black cherry--------	---	
						Yellow-poplar-------	---	
68*:								
Cohoctah----------	3w	Slight	Severe	Severe	Moderate	Red maple----------	56	
						Eastern cottonwood--	---	
						Silver maple--------	---	
						White ash----------	---	
						Swamp white oak-----	---	
						American sycamore---	---	
Fox----------	2r	Moderate	Moderate	Slight	Slight	Northern red oak----	65	Red pine, eastern white pine, white spruce, Norway spruce, Carolina poplar.
						White oak----------	---	
						Sugar maple---------	---	
69---------- Thomas	2w	Slight	Severe	Severe	Severe	Red maple----------	66	
						White ash----------	---	
						Black ash----------	---	
						Bur oak----------	---	
						Swamp white oak-----	---	
						Silver maple--------	---	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--ENVIRONMENTAL PLANTINGS

[Absence of an entry indicates that the soil is not suited to the plants or the plants generally are not grown on the soil]

Soil name and map symbol	Street borders*	Shade trees	Ornamentals*	Screens*	Plants for shaded areas, roadsides, and steep banks*	Wildlife food and cover*
10B, 10C, 10D, 10E Marlette	Green ash, littleleaf linden, Norway maple, ruby red horse-chestnut, thornless honeylocust.	American basswood, American beech, green ash, thornless honeylocust, Norway maple, pin oak, sugar maple, yellow-poplar.	Amur maple, blue spruce, European mountainash, flowering dogwood, forsythia, lilac, eastern redbud, ruby red horse-chestnut, winged euonymus.	Austrian pine, Carolina poplar, Douglas-fir, eastern red-cedar, eastern white pine, Norway spruce, red pine, Russian-olive.	Andorra juniper, Epimedium, bugleweed, creeping cotoneaster, Hall honeysuckle, moss pink, myrtle, Sargent juniper.	American cranberrybush, arrowwood, autumn-olive, eastern redcedar, European mountainash, fragrant sumac, gray dogwood, Norway spruce, Siberian crab-apple, silky dogwood, silver buffaloberry, Tatarian honeysuckle.
11B---------- Capac	Green ash, littleleaf linden, Norway maple, ruby red horse-chestnut.	American basswood, American beech, Carolina poplar, green ash, silver maple.	Amur maple, nannyberry viburnum, northern white-cedar, red maple, white spruce.	Austrian pine, Carolina poplar, eastern white pine, green ash, Norway spruce.	Baltic ivy, bugleweed, goutweed, Japanese spurge, myrtle, purple-leaf wintercreeper, camby paxistima, wintergreen.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, Siberian crabapple, silky dogwood, Tatarian honeysuckle, Washington hawthorn, grape.
12**:						
Brookston--------	Green ash------	American basswood, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberrry viburnum, northern white-cedar, red maple.	Carolina poplar, eastern white pine, green ash.	Baltic ivy, bigleaf wintercreeper, bugleweed, goutweed, mountain cranberry, purple-leaf wintercreeper, rock cotoneaster.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, silky dogwood, grape.
Colwood----------	Green ash------	American basswood, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple.	Carolina poplar, eastern white pine, green ash.	Baltic ivy, bigleaf wintercreeper, bugleweed, goutweed, mountain cranberry, purple-leaf wintercreeper, rock cotoneaster.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, silky dogwood, grape.

See footnotes at end of table.

TABLE 8.--ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Street borders*	Shade trees	Ornamentals*	Screens*	Plants for shaded areas, roadsides, and steep banks*	Wildlife food and cover*
13B, 13C, 13E**: Oshtemo---------- Oshtemo	Green ash, littleleaf linden, thornless honeylocust, white oak.	Green ash, sugar maple, thornless honeylocust, white oak.	Eastern redcedar, forsythia, lilac, red pine, Russian-olive, white spruce.	Carolina poplar, eastern redcedar, eastern white pine, red pine, Russian-olive.	Epimedium, bugleweed, creeping thyme, acre stonecrop, Hall honeysuckle, lilyofthe-valley, moss pink, myrtle, Waukegan juniper.	Amur privet, autumn-olive, bayberry, bearberry, blackberry, fragrant sumac, gray dogwood, Siberian crabapple, Siberian peashrub, silky dogwood, silver buffaloberry, Tatarian honeysuckle, grape.
Boyer----------	Green ash, littleleaf linden, thornless honeylocust, white oak.	Green ash, sugar maple, thornless honeylocust, white oak.	Eastern redcedar, forsythia, lilac, red pine, Russian-olive, white spruce.	Carolina poplar, eastern redcedar, eastern white pine, red pine, Russian-olive.	Epimedium, bugleweed, creeping thyme, acre stonecrop, Hall honeysuckle, lilyofthe-valley, moss pine, myrtle, Waukegan juniper.	Amur privet, autumn-olive, bayberry, bearberry, blackberry, Siberian crabapple, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, grape.
14B, 14C---------- Oakville	Green ash, thornless honeylocust, white oak.	Green ash, thornless honeylocust, sugar maple, white oak.	Forsythia, lilac, red pine, Russian-olive.	Carolina poplar, eastern redcedar, eastern white pine, red pine, Russian-olive.	Aarons-beard, bearberry, cotoneaster, creeping liriope, English ivy, acre stonecrop, lilyofthe-valley, Waukegan juniper.	Amur privet, autumn-olive, bayberry, bearberry, blackberry, fragrant sumac, Siberian crabapple, Siberian peashrub, Tatarian honeysuckle.
15B, 15C, 15E----- Spinks	Green ash, thornless honeylocust, white oak.	Green ash, thornless honeylocust, sugar maple, white oak.	Eastern redcedar, forsythia, lilac, red pine, Russian-olive.	Carolina poplar, eastern redcedar, red pine, Russian-olive.	Aarons-beard, bearberry, cotoneaster, creeping liriope, English ivy, acre stonecrop, lilyofthe-valley, Waukegan juniper.	Amur privet, autumn-olive, bayberry, bearberry, blackberry, fragrant sumac, Siberian crabapple, Siberian peashrub, Tatarian honeysuckle.

See footnotes at end of table.

TABLE 8.--ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Street borders*	Shade trees	Ornamentals*	Screens*	Plants for shaded areas, roadsides, and steep banks*	Wildlife food and cover*
17A---------- Wasepi	Green ash, littleleaf linden.	American basswood, American beech, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple, red mulberry, white spruce.	Austrian pine, Carolina poplar, eastern white pine, green ash, Norway spruce.	Baltic ivy, bugleweed, goutweed, Japanese spurge, myrtle, purple-leaf wintercreeper, camby paxistima, wintergreen.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, Siberian crabapple, silky dogwood, Tatarian honeysuckle, Washington hawthorn, grape.
18B, 18C, 18D----- Fox	Green ash, littleleaf linden, ruby red horsechestnut, thornless honeylocust, white oak.	American basswood, American beech, green ash, thornless honeylocust, ruby red horsechestnut, Norway maple, pin oak, sugar maple, yellow-poplar.	Amur maple, blue spruce, European mountainash, flowering dogwood, forsythia, lilac, eastern redbud, ruby red horsechestnut, winged euonymus.	Austrian pine, Carolina poplar, Douglas-fir, eastern redcedar, eastern white pine, Norway spruce, red pine, Russian-olive.	Andorra juniper, Epimedium, bugleweed, creeping cotoneaster, Hall honeysuckle, moss pink, myrtle, Sargent juniper.	American cranberrybush, arrowwood, autumn-olive, eastern redcedar, European mountainash, fragrant sumac, gray dogwood, Norway spruce, Siberian crabapple, silky dogwood, silver buffaloberry, Tatarian honeysuckle.
19---------- Sebewa	Green ash------	American basswood, blackgum, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple.	Carolina poplar, eastern white pine, green ash.	Baltic ivy, bigleaf wintercreeper, bugleweed, goutweed, mountain cranberry, purple-leaf wintercreeper, rock cotoneaster.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, silky dogwood, grape.
20B, 20C---------- Glynwood	Green ash, littleleaf linden, ruby red horsechestnut, thornless honeylocust.	American basswood, American beech, green ash, thornless honeylocust, ruby red horsechestnut, Norway maple, pin oak, sugar maple, yellow-poplar.	Amur maple, blue spruce, European mountainash, flowering dogwood, forsythia, lilac, eastern redbud, ruby red horsechestnut, winged euonymus.	Austrian pine, Carolina poplar, Douglas-fir, eastern redcedar, eastern white pine, Norway spruce, red pine, Russian-olive.	Andorra juniper, Epimedium, bugleweed, creeping cotoneaster, moss pink, myrtle, Sargent juniper.	American cranberrybush, arrowwood, autumn-olive, eastern redcedar, European mountainash, fragrant sumac, gray dogwood, Norway spruce, Siberian crabapple, silky dogwood, silver buffaloberry, Tatarian honeysuckle.

See footnotes at end of table.

TABLE 8.--ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Street borders*	Shade trees	Ornamentals*	Screens*	Plants for shaded areas, roadsides, and steep banks*	Wildlife food and cover*
23B, 23C---------- Sisson	Green ash, littleleaf linden, ruby red horse-chestnut, thornless honeylocust.	American bass-wood, American beech, green ash, thornless honeylocust, ruby red horsechestnut, Norway maple, pin oak, sugar maple, yellow-poplar.	Amur maple, blue spruce, European mountainash, flowering dogwood, forsythia, lilac, eastern redbud, ruby red horsechestnut, winged euonymus.	Austrian pine, Carolina poplar, Douglas-fir, eastern redcedar, eastern white pine, Norway spruce, red pine, Russian-olive.	Andorra juniper, Epimedium, bugleweed, creeping cotoneaster, Hall honey-suckle, moss pink, myrtle, Sargent juniper.	American cranberrybush, arrowwood, autumn-olive, eastern redcedar, European mountainash, fragrant sumac, gray dogwood, Norway spruce, Siberian crabapple, silky dogwood, Tatarian honeysuckle.
25B, 25C---------- Owosso	Green ash, littleleaf linden, ruby red horse-chestnut, thornless honeylocust.	American bass-wood, American beech, green ash, thornless honeylocust, ruby red horsechestnut, Norway maple, pin oak, sugar maple, yellow-poplar.	Amur maple, blue spruce, European mountainash, green ash, flowering dogwood, forsythia, lilac, eastern redbud, ruby red horse-chestnut, winged euonymus.	Austrian pine, Carolina poplar, Douglas-fir, eastern redcedar, eastern white pine, Norway spruce, Russian-olive.	Andorra juniper, Epimedium, bugleweed, creeping cotoneaster, Hall honey-suckle, moss pink, myrtle, Sargent juniper.	American cranberrybush, arrowwood, autumn-olive, eastern redcedar, European mountainash, fragrant sumac, gray dogwood, Norway spruce, Siberian crabapple, silky dogwood, Tatarian honeysuckle.
26---------- Sloan	---	American bass-wood, Carolina poplar, green ash.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar.	Carolina poplar, eastern white pine, green ash.	Baltic ivy, bigleaf wintercreeper, bugleweed, creeping liriope, goutweed, purple-leaf wintercreeper, rock cotoneaster.	American cranberrybush, bayberry, gray dogwood, nanny-berry viburnum, northern white-cedar, redosier dogwood, silky dogwood, grape.
27**: Houghton----------	---	---	---	---	---	American cranberrybush, gray dogwood, nannyberry virburnum, northern white-cedar, redosier dogwood, silky dogwood.
Adrian----------	---	---	---	---	---	American cranberrybush, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, silky dogwood.

See footnotes at end of table.

TABLE 8.--ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Street borders*	Shade trees	Ornamentals*	Screens*	Plants for shaded areas, roadsides, and steep banks*	Wildlife food and cover*
31B, 31C---------- Metea	Green ash, thornless honeylocust, white oak.	Green ash, thornless honeylocust, sugar maple, white oak.	Eastern redcedar, forsythia, lilac, red pine, Russian-olive, white spruce.	Austrian pine, Carolina poplar, Douglas-fir, eastern redcedar, eastern white pine, Norway spruce, red pine, Russian-olive.	Andorra juniper, Epimedium, bugleweed, creeping cotoneaster, Hall honeysuckle, pink moss, myrtle, Sargent juniper.	American cranberrybush, arrowwood, autumn-olive, eastern redcedar, European mountainash, fragrant sumac, gray dogwood, Norway spruce, Siberian crabapple, silky dogwood, silver buffaloberry, Tatarian honeysuckle.
32B---------- Blount	Green ash, littleleaf linden, Norway maple, ruby red horsechestnut.	American basswood, American beech, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple, white spruce.	Austrian pine, Carolina poplar, eastern white pine, green ash, Norway spruce.	Baltic ivy, bugleweed, goutweed, Japanese spurge, myrtle, purple-leaf wintercreeper, camby paxistima, wintergreen.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, Siberian crabapple, silky dogwood, Tatarian honeysuckle, Washington hawthorn, grape.
33---------- Lenawee	Green ash------	American basswood, blackgum, Carolina poplar, green ash, red maple, silver maple.	Amur maple, northern white-cedar, red maple.	Carolina poplar, eastern white pine, green ash.	Baltic ivy, bigleaf wintercreeper, bugleweed, goutweed, mountain cranberry, purple-leaf wintercreeper, rock cotoneaster.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, silky dogwood, grape.
34B---------- Kibbie	Green ash, littleleaf linden, Norway maple, ruby red horsechestnut.	American basswood, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple, white spruce.	Austrian pine, Carolina poplar, eastern white pine, green ash, Norway spruce.	Baltic ivy, bugleweed, goutweed, Japanese spurge, myrtle, purple-leaf wintercreeper, camby paxistima, wintergreen.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, Siberian crabapple, silky dogwood, Tatarian honeysuckle, Washington hawthorn, grape.

See footnotes at end of table.

TABLE 8.--ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Street borders*	Shade trees	Ornamentals*	Screens*	Plants for shaded areas, roadsides, and steep banks*	Wildlife food and cover*
35A---------- Thetford	Green ash, littleleaf linden.	American basswood, American beech, Carolina poplar, green ash, red maple, silver maple.	Amur maple, northern white-cedar, red maple, red mulberry, Siberian crabapple, white spruce.	Carolina poplar, eastern white pine, green ash, Norway spruce.	Aarons-beard, bearberry, cotoneaster, creeping liriope, English ivy, acre stonecrop, lilyofthevalley, Waukegan juniper.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, Siberian crabapple, silky dogwood, Tatarian honeysuckle, Washington hawthorn, grape.
36A---------- Metamora	Green ash, littleleaf linden, Norway maple, ruby red horsechestnut.	American basswood, American beech, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple, Siberian crabapple, white spruce.	Austrian pine, Carolina poplar, eastern white pine, green ash, Norway spruce.	Baltic ivy, bugleweed, goutweed, Japanese spurge, myrtle, purple-leaf wintercreeper, wintergreen.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, Siberian crabapple, silky dogwood, Tatarian honeysuckle, Washington hawthorn, grape.
38. Napoleon muck						
39---------- Granby	Green ash------	Carolina poplar, green ash, red maple, silver maple.	Amur maple, northern white-cedar, red maple, red mulberry, Siberian crabapple.	Eastern white pine, Carolina poplar.	Baltic ivy, bigleaf wintercreeper, bugleweed, goutweed, mountain cranberry, purple-leaf wintercreeper, rock cotoneaster.	American cranberrybush, Amur privet, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, silky dogwood.
40B, 40C. Udorthents						
41B. Aquents						
42**. Pits						
43**: Sloan----------	---	American basswood, Carolina poplar, green ash.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar.	Carolina poplar, eastern white pine, green ash.	Baltic ivy, bigleaf wintercreeper, bugleweed, goutweed, purple-leaf wintercreeper, rock cotoneaster.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, silky dogwood, grape.

See footnotes at end of table.

TABLE 8.--ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Street borders*	Shade trees	Ornamentals*	Screens*	Plants for shaded areas, roadsides, and steep banks*	Wildlife food and cover*
43**: Marlette	---	American basswood, American beech, green ash, thornless honeylocust, Norway maple, pin oak, red maple, sugar maple, yellow-poplar.	Amur maple, blue spruce, European mountainash, flowering dogwood, forsythia, lilac, eastern redbud, ruby red horsechestnut, winged euonymus.	Austrian pine, Carolina poplar, Douglas-fir, eastern redcedar, eastern white pine, Norway spruce, red pine, Russian-olive.	Andorra juniper, Epimedium, bugleweed, creeping cotoneaster, Hall honeysuckle, moss pink, myrtle, Sargent juniper.	American cranberrybush, arrowwood, autumn-olive, eastern redcedar, European mountainash, fragrant sumac, gray dogwood, Norway spruce, Siberian crabapple, silky dogwood, silver buffaloberry, Tatarian honeysuckle.
44B, 44C, 44D----- Riddles	Green ash, littleleaf linden, Norway maple, ruby red horsechestnut, thornless honeylocust.	American basswood, American beech, green ash, thornless honeylocust, Norway maple, pin oak, sugar maple, yellow-poplar.	Amur maple, blue spruce, European mountainash, flowering dogwood, forsythia, lilac, eastern redbud, ruby red horsechestnut, winged euonymus.	Austrian pine, Carolina poplar, Douglas-fir, eastern redcedar, eastern white pine, Norway spruce, Russian-olive.	Andorra juniper, Epimedium, bugleweed, creeping cotoneaster, Hall honeysuckle, moss pink, myrtle, Sargent juniper.	American cranberrybush, arrowwood, autumn-olive, eastern redcedar, European mountainash, fragrant sumac, gray dogwood, Norway spruce, Siberian crabapple, silky dogwood, silver buffaloberry, Tatarian honeysuckle.
45B, 45C, 45D----- Arkport	Green ash, littleleaf linden, thornless honeylocust, white oak.	Green ash, thornless honeylocust, sugar maple, white oak.	Eastern redcedar, forsythia, lilac, red pine, Russian-olive, white spruce.	Carolina poplar, eastern redcedar, eastern white pine, red pine, Russian-olive.	Epimedium, bugleweed, creeping thyme, acre stonecrop, Hall honeysuckle, lilyofthevalley, moss pink, myrtle, Waukegan juniper.	Amur privet, autumn-olive, bayberry, bearberry, blackberry, fragrant sumac, Siberian crabapple, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, grape.
46A----- Dixboro	Green ash, littleleaf linden.	American basswood, American beech, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple, red mulberry, Siberian crabapple, white spruce.	Austrian pine, Carolina poplar, eastern white pine, green ash, Norway spruce.	Baltic ivy, buglewood, goutweed, Japanese spurge, myrtle, purple-leaf wintercreeper, camby paxistima, wintergreen.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, Siberian crabapple, silky dogwood, Tatarian honeysuckle, Washington hawthorn, grape.

See footnotes at end of table.

TABLE 8.--ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Street borders*	Shade trees	Ornamentals*	Screens*	Plants for shaded areas, roadsides, and steep banks*	Wildlife food and cover*
47B, 47C**--------- Fox	Green ash, littleleaf linden, ruby red horse-chestnut, thornless honeylocust.	American basswood, American beech, green ash, thornless honeylocust, ruby red horsechestnut, Norway maple, pin oak, sugar maple, yellow-poplar.	Amur maple, blue spruce, European mountainash, flowering dogwood, forsythia, lilac, eastern redbud, ruby red horse-chestnut, winged euonymus.	Austrian pine, Carolina poplar, Douglas-fir, eastern redcedar, eastern white pine, Norway spruce, Russian-olive.	Andorra juniper, Epimedium, bugleweed, creeping cotoneaster, Hall honeysuckle, moss pink, myrtle, Sargent juniper.	American cranberrybush, arrowwood, autumn-olive, eastern redcedar, European mountainash, gray dogwood, Norway spruce, redosier dogwood, Siberian crabapple, silky dogwood, Tatarian honeysuckle.
Riddles-----------	Green ash, littleleaf linden, Norway maple, ruby red horse-chestnut, thornless honeylocust.	American basswood, American beech, green ash, thornless honeylocust, Norway maple, pin oak, sugar maple, yellow-poplar.	Amur maple, blue spruce, European mountainash, flowering dogwood, forsythia, lilac, eastern redbud, ruby red horse-chestnut, winged euonymus.	Austrian pine, Carolina poplar, Douglas-fir, eastern redcedar, eastern white pine, Norway spruce, Russian-olive.	Andorra juniper, Epimedium, bugleweed, creeping cotoneaster, Hall honeysuckle, moss pink, myrtle, Sargent juniper.	American cranberrybush, arrowwood, autumn-olive, eastern redcedar, European mountainash, fragrant sumac, gray dogwood, Norway spruce, redosier dogwood, Siberian crabapple, silky dogwood, silver buffaloberry, Tatarian honeysuckle.
48---------------- Gilford	Green ash------	American basswood, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple, red mulberry.	Carolina poplar, eastern white pine, green ash.	Baltic ivy, bigleaf wintercreeper, bugleweed, goutweed, mountain cranberry, purple-leaf wintercreeper, rock cotoneaster.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, silky dogwood, grape.
49---------------- Cohoctah	---	American basswood, Carolina poplar, green ash, silver maple, red maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple.	Carolina poplar, eastern white pine, green ash.	Baltic ivy, bigleaf wintercreeper, bugleweed, goutweed, mountain cranberry, purple-leaf wintercreeper, rock cotoneaster.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, silky dogwood, grape.
50B, 50D**. Udipsamments						

See footnotes at end of table.

TABLE 8.--ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Street borders*	Shade trees	Ornamentals*	Screens*	Plants for shaded areas, roadsides, and steep banks*	Wildlife food and cover*
51B, 51C---------- Leoni	Green ash, littleleaf linden, thornless honeylocust, white oak.	Green ash, sugar maple, thornless honeylocust, white oak.	Blue spruce, eastern redcedar, forsythia, lilac, red pine, Russian-olive.	Carolina poplar, eastern redcedar, eastern white pine, red pine, Russian-olive.	Epimedium, bugleweed, creeping thyme, acre stonecrop, lilyofthe-valley, moss pink, Waukegan juniper.	Amur privet, autumn-olive, bayberry, bearberry, blackberry, fragrant sumac, Siberian crabapple, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, grape.
52A---------- Selfridge	Green ash, littleleaf linden.	American basswood, American beech, blackgum, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple, red mulberry, white spruce.	Austrian pine, Carolina poplar, eastern white pine, green ash, Norway spruce.	Baltic ivy, bugleweed, goutweed, Japanese spurge, myrtle, purple-leaf wintercreeper, camby paxistima, wintergreen.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, Siberian crabapple, silky dogwood, Tatarian honeysuckle, Washington hawthorn, grape.
53A---------- Tedrow	Green ash------	Carolina poplar, green ash, red maple, silver maple.	Amur maple, northern white-cedar, red maple, red mulberry.	Eastern white pine, pin oak, red pine.	Aarons-beard, bearberry, cotoneaster, creeping liriope, English ivy, acre stonecrop, lilyofthe-valley, Waukegan juniper.	American cranberrybush, autumn-olive, bayberry, nannyberry viburnum, northern white-cedar, Siberian crabapple, Tatarian honeysuckle, Washington hawthorn, grape.
54A---------- Matherton	Green ash, littleleaf linden.	American basswood, American beech, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple, red mulberry, Siberian crabapple, white spruce.	Austrian pine, Carolina poplar, eastern white-pine, green ash, Norway spruce.	Baltic ivy, bugleweed, goutweed, Japanese spurge, myrtle, purple-leaf wintercreeper, camby paxistima, wintergreen.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, Siberian crabapple, silky dogwood, Tatarian honeysuckle, Washington hawthorn, grape.

See footnotes at end of table.

TABLE 8.--ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Street borders*	Shade trees	Ornamentals*	Screens*	Plants for shaded areas, roadsides, and steep banks*	Wildlife food and cover*
56A**: Urban land.						
Blount	Green ash, littleleaf linden, Norway maple, ruby red horsechestnut.	American basswood, American beech, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple, white spruce.	Austrian pine, Carolina poplar, eastern white pine, green ash, Norway spruce.	Baltic ivy, bugleweed, goutweed, Japanese spurge, myrtle, purple-leaf wintercreeper, camby paxistima, wintergreen.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, Siberian crabapple, silky dogwood, Tatarian honeysuckle, Washington hawthorn, grape.
Lenawee	Green ash	American basswood, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple.	Carolina poplar, eastern white pine, green ash.	Baltic ivy, bigleaf wintercreeper, bugleweed, goutweed, mountain cranberry, purple-leaf wintercreeper, rock cotoneaster.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, silky dogwood, grape.
59**. Urban land.						
60B, 60C, 60D**: Urban land.						
Marlette	Green ash, littleleaf linden, Norway maple, ruby red horsechestnut, thornless honeylocust.	American basswood, American beech, green ash, thornless honeylocust, Norway maple, pin oak, red maple, sugar maple, yellow-poplar.	Amur maple, blue spruce, European mountainash, flowering dogwood, forsythia, lilac, eastern redbud, ruby red horsechestnut, winged euonymus.	Carolina poplar, Douglas-fir, eastern redcedar, eastern white pine, Norway spruce, Russian-olive.	Andorra juniper, Epimedium, bugleweed, creeping cotoneaster, Hall honeysuckle, moss pink, myrtle, Sargent juniper.	American cranberrybush, arrowwood, autumn-olive, eastern redcedar, European mountainash, gray dogwood, Norway spruce, Siberian crabapple, silky dogwood, Tatarian honeysuckle.
51A**: Urban land.						
Capac	Green ash, littleleaf linden, Norway maple, ruby red horsechestnut.	American basswood, American beech, Carolina poplar, green ash, red maple, silver maple.	American cranberry, Amur maple, nannyberry viburnum, northern white-cedar, red maple, white spruce.	Austrian pine, Carolina poplar, eastern white pine, green ash, Norway spruce.	Baltic ivy, bugleweed, goutweed, Japanese spurge, myrtle, purple-leaf wintercreeper, camby paxistima, wintergreen.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, Siberian crabapple, silky dogwood, Tatarian honeysuckle, Washington hawthorn, grape.

See footnotes at end of table.

TABLE 8.--ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Street borders*	Shade trees	Ornamentals*	Screens*	Plants for shaded areas, roadsides, and steep banks*	Wildlife food and cover*
62B, 62C**: Urban land.						
Spinks	Green ash, thornless honeylocust, white oak.	Green ash, thornless honeylocust, sugar maple, white oak.	Blue spruce, eastern redcedar, forsythia, lilac, red pine, Russian-olive.	Carolina poplar, eastern redcedar, eastern white pine, red pine, Russian-olive.	Aarons-beard, bearberry, cotoneaster, creeping liriope, English ivy, acre stonecrop, lilyofthevalley, Waukegan juniper.	Amur privet, autumn-olive, bayberry, bearberry, blackberry, fragrant sumac, Siberian crabapple, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, grape.
63A**: Urban land.						
Thetford	Green ash, littleleaf linden.	American basswood, American beech, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple, red mulberry, white spruce.	Austrian pine, Carolina poplar, eastern white pine, green ash, Norway spruce.	Aarons-beard, bearberry, cotoneaster, creeping liriope, English ivy, acre stonecrop, lilyofthevalley, Waukegan juniper.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, Siberian crabapple, silky dogwood, Tatarian honeysuckle, Washington hawthorn, grape.
67B, 67C Ormas	Green ash, littleleaf linden, thornless honeylocust, white oak.	Green ash, sugar maple, thornless honeylocust, white oak.	Eastern redcedar, forsythia, lilac, red pine, Russian-olive, white spruce.	Carolina poplar, eastern redcedar, eastern white pine, red pine, Russian-olive.	Epimedium, bugleweed, creeping thyme, acre stonecrop, lilyofthevalley, moss pink, plantain lily, Waukegan juniper.	Amur privet, autumn-olive, bayberry, bearberry, blackberry, gray dogwood, redosier dogwood, Siberian peashrub, silky dogwood, Tatarian honeysuckle, grape.
68**: Cohoctah	---	American basswood, Carolina poplar, green ash, red maple, silver maple.	American cranberrybush, Amur maple, nannyberry viburnum, northern white-cedar, red maple.	Carolina poplar, eastern white pine, green ash.	Baltic ivy, bigleaf wintercreeper, bugleweed, goutweed, mountain cranberry, purple-leaf creeper, rock cotoneaster.	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, silky dogwood, grape.

See footnotes at end of table.

TABLE 8.--ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Street borders*	Shade trees	Ornamentals*	Screens*	Plants for shaded areas, roadsides, and steep banks*	Wildlife food and cover*
68**: Fox	---	American basswood, American beech, green ash, thornless honeylocust, ruby red horsechestnut, Norway maple, pin oak, sugar maple, yellow-poplar.	Amur maple, blue spruce, European mountainash, flowering dogwood, forsythia, lilac, eastern redbud, ruby red horsechestnut, winged euonymus.	Austrian pine, Carolina poplar, Douglas-fir, eastern redcedar, eastern white pine, Norway spruce, red pine, Russian-olive.	Andorra juniper, Epimedium, bugleweed, creeping cotoneaster, Hall honeysuckle, moss pink, myrtle, Sargent juniper.	American cranberrybush, arrowwood, autumn-olive, eastern redcedar, European mountainash, gray dogwood, Norway spruce, redosier dogwood, Siberian crabapple, silky dogwood, Tatarian honeysuckle.
69---------- Thomas muck	---	---	---	---	---	American cranberrybush, bayberry, gray dogwood, nannyberry viburnum, northern white-cedar, redosier dogwood, silky dogwood, grape.

* This is a partial listing of plants that have been effectively used in recent years.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
10B Marlette	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
10C Marlette	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
10D Marlette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
10E Marlette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
11B Capac	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
12*: Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Colwood	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
13B*: Oshtemo	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
Boyer	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: droughty.
13C*: Oshtemo	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
Boyer	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: droughty, slope.
13E*: Oshtemo	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Boyer	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
14B Oakville	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
14C Oakville	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: slope, droughty.
15B Spinks	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
15C Spinks	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
15E Spinks	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
17A Wasepi	Severe: wetness.	Severe: wetness.	Severe: small stones, wetness.	Severe: wetness.	Severe: wetness.
18B Fox	Slight	Slight	Moderate: slope.	Slight	Slight.
18C Fox	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
18D Fox	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
19 Sebewa	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
20B Glynwood	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: wetness, slope, percs slowly.	Moderate: wetness.	Slight.
20C Glynwood	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
23B Sisson	Slight	Slight	Moderate: slope.	Slight	Slight.
23C Sisson	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
25B Owosso	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Slight.
25C Owosso	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
26 Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
27*: Houghton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
Adrian	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
31B Metea	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
31C Metea	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
32B Blount	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
33--Lenawee	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
34B--Kibbie	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
35A--Thetford	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
36A--Metamora	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
38--Napoleon	Severe: ponding, excess humus, too acid.	Severe: ponding, excess humus, too acid.	Severe: excess humus, ponding, too acid.	Severe: ponding, excess humus.	Severe: too acid, ponding, excess humus.
39--Granby	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
40B*, 40C*. Udorthents					
41B*. Aquents					
42*. Pits					
43*: Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Marlette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
44B--Riddles	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
44C--Riddles	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
44D--Riddles	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
45B--Arkport	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
45C--Arkport	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
45D--Arkport	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
46A--Dixboro	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
47B*: Fox	Slight	Slight	Moderate: slope.	Slight	Slight.
Riddles	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
47C*:					
Fox	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Riddles	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
48--- Gilford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
49--- Cohoctah	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: flooding, wetness.
50B*, 50D*. Udipsamments					
51B--- Leoni	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
51C--- Leoni	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
52A--- Selfridge	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
53A--- Tedrow	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
54A--- Matherton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
56A*: Urban land.					
Blount	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Lenawee	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
59*. Urban land					
60B*: Urban land.					
Marlette	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
60C*: Urban land.					
Marlette	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
60D*: Urban land.					
Marlette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
61A*: Urban land.					
Capac	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
62B*: Urban land.					
Spinks	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
62C*: Urban land.					
Spinks	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
63A*: Urban land.					
Thetford	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
67B Ormas	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
67C Ormas	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
68*: Cohoctah	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: flooding, wetness.
Fox	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
69 Thomas	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--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
10B---------- Marlette	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
10C---------- Marlette	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10D---------- Marlette	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
10E---------- Marlette	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
11B---------- Capac	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
12*:										
Brookston----------	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Colwood----------	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
13B*, 13C*, 13E*:										
Oshtemo----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Boyer----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
14B---------- Oakville	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
14C---------- Oakville	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
15B---------- Spinks	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
15C, 15E---------- Spinks	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
17A---------- Wasepi	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
18B, 18C---------- Fox	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
18D---------- Fox	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
19---------- Sebewa	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
20B---------- Glynwood	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
20C---------- Glynwood	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
23B---------- Sisson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
23C---------- Sisson	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 10.--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
25B---- Owosso	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
25C---- Owosso	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
26---- Sloan	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Poor	Good.
27*:										
Houghton----	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Adrian----	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
31B---- Metea	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
31C---- Metea	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
32B---- Blount	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
33---- Lenawee	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
34B---- Kibbie	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
35A---- Thetford	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
36A---- Metamora	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
38---- Napoleon	Very poor.	Very poor.	Poor	Poor	Poor	Good	Good	Very poor.	Poor	Good.
39---- Granby	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
40B*, 40C*. Udorthents										
41B*. Aquents										
42*. Pits										
43*:										
Sloan----	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Poor	Good.
Marlette----	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
44B---- Riddles	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
44C---- Riddles	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
44D---- Riddles	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 10.--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
45B---------- Arkport	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
45C---------- Arkport	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
45D---------- Arkport	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
46A---------- Dixboro	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
47B*:										
Fox----------	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Riddles----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
47C*:										
Fox----------	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Riddles----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
48---------- Gilford	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
49---------- Cohoctah	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
50B*, 50D*. Udipsamments										
51B---------- Leoni	Poor	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
51C---------- Leoni	Poor	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
52A---------- Selfridge	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
53A---------- Tedrow	Fair	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
54A---------- Matherton	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
56A*: Urban land.										
Blount----------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Lenawee----------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
59*. Urban land										
60B*: Urban land.										
Marlette----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 10.--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
60C*: Urban land.										
Marlette	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
60D*: Urban land.										
Marlette	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
61A*: Urban land.										
Capac	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
62B*: Urban land.										
Spinks	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
62C*: Urban land.										
Spinks	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
63A*: Urban land.										
Thetford	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
67B--- Ormas	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
67C--- Ormas	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
68*:										
Cohoctah	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Fox	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
69--- Thomas	Fair	Good	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--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]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
10B--Marlette	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Severe: low strength.	Slight.
10C--Marlette	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
10D, 10E--Marlette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
11B--Capac	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
12*:						
Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Colwood	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
13B*:						
Oshtemo	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: small stones.
Boyer	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
13C*:						
Oshtemo	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, slope.
Boyer	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
13E*:						
Oshtemo	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Boyer	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
14B--Oakville	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty.
14C--Oakville	Severe; cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, droughty.
15B--Spinks	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
15C--Spinks	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
15E--Spinks	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 11.--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
17A---------- Wasepi	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
18B---------- Fox	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Moderate: frost action, shrink-swell.	Slight.
18C---------- Fox	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
18D---------- Fox	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
19---------- Sebewa	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
20B---------- Glynwood	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: slope, shrink-swell, wetness.	Severe: frost action, low strength.	Slight.
20C---------- Glynwood	Severe: wetness.	Moderate: slope, shrink-swell, wetness.	Severe: wetness.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
23B---------- Sisson	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Severe: low strength.	Slight.
23C---------- Sisson	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
25B---------- Owosso	Slight----------	Slight----------	Slight----------	Slight----------	Severe: low strength.	Slight.
25C---------- Owosso	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
26---------- Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
27*: Houghton---------	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength, frost action.	Severe: excess humus, ponding.
Adrian----------	Severe: ponding, cutbanks cave, excess humus.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, low strength, frost action.	Severe: excess humus, ponding.
31B---------- Metea	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Moderate: frost action.	Moderate: droughty.
31C---------- Metea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.

See footnote at end of table.

TABLE 11.--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
32B---------- Blount	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
33---------- Lenawee	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
34B---------- Kibbie	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
35A---------- Thetford	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
36A---------- Metamora	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
38---------- Napoleon	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: too acid, ponding, excess humus.
39---------- Granby	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
40B*, 40C*. Udorthents						
41B*. Aquents						
42*. Pits						
43*: Sloan----------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Marlette----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
44B---------- Riddles	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
44C---------- Riddles	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
44D---------- Riddles	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
45B---------- Arkport	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
45C---------- Arkport	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.

See footnote at end of table.

TABLE 11.--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
45D--- Arkport	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
46A--- Dixboro	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
47B*:						
Fox---	Severe: cutbanks cave.	Slight---	Slight---	Slight---	Moderate: frost action, shrink-swell.	Slight.
Riddles---	Slight---	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
47C*:						
Fox---	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
Riddles---	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
48--- Gilford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
49--- Cohoctah	Severe: wetness, cutbanks cave.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: flooding, frost action, wetness.	Severe: flooding, wetness.
50B*, 50D*. Udipsamments						
51B--- Leoni	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate---	Moderate: shrink-swell, large stones.	Moderate: large stones, droughty.
51C--- Leoni	Severe: cutbanks cave.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, shrink-swell, large stones.	Moderate: large stones, droughty, slope.
52A--- Selfridge	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
53A--- Tedrow	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
54A--- Matherton	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
56A*: Urban land.						
Blount---	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.

See footnote at end of table.

TABLE 11.--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
56A*: Lenawee	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
59*. Urban land						
60B*: Urban land.						
Marlette	Moderate: wetness.	Slight	Moderate: wetness.	Moderate: slope.	Severe: low strength.	Slight.
60C*: Urban land.						
Marlette	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
60D*: Urban land.						
Marlette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
61A*: Urban land.						
Capac	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
62B*: Urban land.						
Spinks	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
62C*: Urban land.						
Spinks	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
63A*: Urban land.						
Thetford	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
67B Ormas	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
67C Ormas	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
68*: Cohoctah	Severe: wetness, cutbanks cave.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: flooding, frost action, wetness.	Severe: flooding, wetness.
Fox	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 11.--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
69---------- Thomas	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding, excess humus.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
10B Marlette	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
10C Marlette	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
10D, 10E Marlette	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
11B Capac	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
12*: Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, hard to pack.
Colwood	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, thin layer.
13B*: Oshtemo	Severe: poor filter.**	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Boyer	Severe: poor filter.**	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
13C*: Oshtemo	Severe: poor filter.**	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Boyer	Severe: poor filter.**	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
13E*: Oshtemo	Severe: poor filter,** slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, slope.
Boyer	Severe: poor filter,** slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
14B Oakville	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
14C Oakville	Severe: poor filter.**	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.

See footnotes at end of table.

TABLE 12.--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
15B Spinks	Slight	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
15C Spinks	Moderate: slope.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
15E Spinks	Severe: slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
17A Wasepi	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
18B Fox	Severe: poor filter.**	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
18C Fox	Severe: poor filter.**	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
18D Fox	Severe: poor filter,** slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
19 Sebewa	Severe: poor filter, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: small stones, seepage, too sandy.
20B Glynwood	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
20C Glynwood	Severe: percs slowly, wetness.	Severe: slope.	Moderate: wetness, too clayey, slope.	Moderate: slope, wetness.	Fair: slope, too clayey, wetness.
23B Sisson	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Severe: slope.	Poor: thin layer.
23C Sisson	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.	Poor: thin layer.
25B Owosso	Severe: percs slowly.	Moderate: slope.	Slight	Severe: seepage.	Good.
25C Owosso	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Severe: seepage.	Fair: slope.
26 Sloan	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.

See footnotes at end of table.

TABLE 12.--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
27*:					
Houghton	Severe: ponding, percs slowly.	Severe: seepage, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
Adrian	Severe: ponding, poor filter.	Severe: seepage, ponding, excess humus.	Severe: ponding, seepage.	Severe: ponding, seepage.	Poor: ponding, excess humus.
31B Metea	Moderate: percs slowly.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
31C Metea	Moderate: slope, percs slowly.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
32B Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
33 Lenawee	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
34B Kibbie	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy, wetness.
35A Thetford	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness, thin layer.
36A Metamora	Severe: percs slowly, wetness.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
38 Napoleon	Severe: ponding.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus, too acid.
39 Granby	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
40B*, 40C*. Udorthents					
41B*. Aquents					
42*. Pits					
43*:					
Sloan	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Marlette	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnotes at end of table.

TABLE 12.--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---------- Riddles	Slight----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
44C---------- Riddles	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
44D---------- Riddles	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
45B---------- Arkport	Slight----------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Fair: too sandy, thin layer.
45C---------- Arkport	Moderate: slope.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage.	Fair: slope, too sandy, thin layer.
45D---------- Arkport	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage, too sandy.	Severe: slope, seepage.	Poor: slope.
46A---------- Dixboro	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
47B*:					
Fox----------	Severe: poor filter.**	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Riddles----------	Slight----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
47C*:					
Fox----------	Severe: poor filter.**	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Riddles----------	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
48---------- Gilford	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
49---------- Cohoctah	Severe: wetness, flooding.	Severe: wetness, flooding, seepage.	Severe: wetness, flooding, seepage.	Severe: wetness, flooding, seepage.	Poor: wetness, thin layer.
50B*, 50D*. Udipsamments					
51B---------- Leoni	Slight----------	Severe: seepage, large stones.	Severe: seepage, large stones.	Severe: seepage.	Poor: large stones.

See footnotes at end of table.

TABLE 12.--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
51C---------- Leoni	Moderate: slope.	Severe: seepage, slope, large stones.	Severe: seepage, large stones.	Severe: seepage.	Poor: large stones.
52A---------- Selfridge	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
53A---------- Tedrow	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
54A---------- Matherton	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
56A*: Urban land.					
Blount----------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Lenawee----------	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
59*. Urban land					
60B*: Urban land.					
Marlette----------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
60C*: Urban land.					
Marlette----------	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
60D*: Urban land.					
Marlette----------	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
61A*: Urban land.					
Capac----------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
62B*: Urban land.					
Spinks----------	Slight----------	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.

See footnotes at end of table.

TABLE 12.--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
62C*: Urban land.					
Spinks	Moderate: slope.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
63A*: Urban land.					
Thetford	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness, thin layer.
67B Ormas	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
67C Ormas	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
68*: Cohoctah	Severe: wetness, flooding.	Severe: wetness, flooding, seepage.	Severe: wetness, flooding, seepage.	Severe: wetness, flooding, seepage.	Poor: wetness, thin layer.
Fox	Severe: poor filter,** slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
69 Thomas	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

** The effluent drains satisfactorily, but there is a danger of ground water pollution.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
10B---------- Marlette	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
10C---------- Marlette	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
10D---------- Marlette	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
10E---------- Marlette	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
11B---------- Capac	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
12*:				
Brookston----------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Colwood----------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
13B*, 13C*:				
Oshtemo----------	Good----------	Probable----------	Probable----------	Poor: small stones.
Boyer----------	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.
13E*:				
Oshtemo----------	Fair: slope.	Probable----------	Probable----------	Poor: small stones, slope.
Boyer----------	Fair: slope.	Probable----------	Probable----------	Poor: small stones, area reclaim, slope.
14B, 14C---------- Oakville	Good----------	Probable----------	Improbable: too sandy.	Poor: too sandy.
15B---------- Spinks	Good----------	Probable----------	Improbable: too sandy.	Fair: too sandy.
15C---------- Spinks	Good----------	Probable----------	Improbable: too sandy.	Fair: slope, too sandy.
15E---------- Spinks	Fair: slope.	Probable----------	Improbable: too sandy.	Poor: slope.
17A---------- Wasepi	Poor: wetness.	Probable----------	Probable----------	Poor: small stones, area reclaim, wetness.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
18B, 18C---------- Fox	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.
18D---------- Fox	Fair: slope.	Probable----------	Probable----------	Poor: small stones, area reclaim, slope.
19---------- Sebewa	Poor: wetness.	Probable----------	Probable----------	Poor: wetness, small stones, area reclaim.
20B, 20C---------- Glynwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
23B, 23C---------- Sisson	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
25B---------- Owosso	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
25C---------- Owosso	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
26---------- Sloan	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
27*: Houghton----------	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness, excess humus.
Adrian----------	Poor: wetness, low strength.	Probable----------	Improbable: too sandy.	Poor: wetness, excess humus.
31B---------- Metea	Poor: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy.
31C---------- Metea	Poor: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy, slope.
32B---------- Blount	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
33---------- Lenawee	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
34B---------- Kibbie	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
35A---------- Thetford	Fair: wetness.	Probable----------	Improbable: too sandy.	Fair: too sandy, small stones.
36A---------- Metamora	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
38--- Napoleon	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness, too acid.
39--- Granby	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
40B*, 40C*. Udorthents				
41B*. Aquents				
42*. Pits				
43*: Sloan---	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Marlette---	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
44B--- Riddles	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
44C--- Riddles	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
44D--- Riddles	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
45B, 45C--- Arkport	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
45D--- Arkport	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
46A--- Dixboro	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, thin layer.
47B*: Fox---	Good	Probable	Probable	Poor: small stones, area reclaim.
Riddles---	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
47C*: Fox---	Good	Probable	Probable	Poor: small stones, area reclaim.
Riddles---	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
48--- Gilford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
49--- Cohoctah	Poor: wetness.	Probable	Probable	Poor: wetness, area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
50B*, 50D*. Udipsamments				
51B, 51C---------- Leoni	Fair: large stones.	Improbable: large stones.	Improbable: large stones.	Poor: large stones, area reclaim.
52A---------- Selfridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, area reclaim, small stones.
53A---------- Tedrow	Fair: wetness.	Probable----------	Improbable: too sandy.	Fair: too sandy.
54A---------- Matherton	Fair: wetness.	Probable----------	Probable----------	Fair: too clayey, small stones.
56A*: Urban land.				
Blount----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Lenawee----------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
59*. Urban land				
60B*: Urban land.				
Marlette----------	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
60C*: Urban land.				
Marlette----------	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
60D*: Urban land.				
Marlette----------	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
61A*: Urban land.				
Capac----------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
62B*: Urban land.				
Spinks----------	Good----------	Probable----------	Improbable: too sandy.	Fair: too sandy.
62C*: Urban land.				

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
62C*: Spinks	Good	Probable	Improbable: too sandy.	Fair: slope, too sandy.
63A*: Urban land.				
Thetford	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
67B Ormas	Good	Probable	Probable	Fair: too sandy, small stones.
67C Ormas	Good	Probable	Probable	Fair: too sandy, small stones, slope.
68*: Cohoctah	Poor: wetness.	Probable	Probable	Poor: wetness, area reclaim.
Fox	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
69 Thomas	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--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]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Grassed waterways
10B---------- Marlette	Moderate: slope.	Severe: piping.	Severe: slow refill.	Slope----------	Wetness, soil blowing.	Favorable.
10C---------- Marlette	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Slope.
10D, 10E---------- Marlette	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope----------	Slope.
11B---------- Capac	Slight----------	Severe: piping, wetness.	Severe: slow refill.	Frost action---	Wetness, soil blowing.	Wetness.
12*:						
Brookston--------	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding--------	Wetness.
Colwood----------	Moderate: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Ponding, frost action.	Ponding--------	Wetness, erodes easily.
13B*:						
Oshtemo----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Fast intake, soil blowing, slope.	Favorable.
Boyer----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
13C*, 13E*:						
Oshtemo----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Fast intake, soil blowing, slope.	Slope.
Boyer----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, droughty.
14B---------- Oakville	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
14C---------- Oakville	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Fast intake, droughty, soil blowing.	Slope, droughty.
15B---------- Spinks	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
15C, 15E---------- Spinks	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, droughty.
17A---------- Wasepi	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty.	Wetness, droughty.
18B---------- Fox	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Favorable.
18C, 18D---------- Fox	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Slope.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Grassed waterways
19---------- Sebewa	Severe: seepage.	Severe: seepage, ponding.	Severe: cutbanks cave.	Frost action, cutbanks cave, ponding.	Ponding--------	Wetness.
20B---------- Glynwood	Moderate: slope.	Moderate: wetness, piping.	Severe: no water.	Slope, percs slowly, frost action.	Percs slowly, wetness.	Erodes easily.
20C---------- Glynwood	Severe: slope.	Moderate: wetness, piping.	Severe: no water.	Slope, percs slowly, frost action.	Percs slowly, wetness.	Slope, erodes easily.
23B---------- Sisson	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope----------	Erodes easily.
23C---------- Sisson	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.
25B---------- Owosso	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Erodes easily.
25C---------- Owosso	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Slope, erodes easily.
26---------- Sloan	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Wetness, erodes easily, flooding.	Wetness, erodes easily.
27*:						
Houghton---------	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Frost action, subsides, ponding.	Soil blowing, ponding.	Wetness.
Adrian----------	Severe: seepage.	Severe: seepage, ponding, excess humus.	Severe: slow refill, cutbanks cave.	Ponding, frost action, subsides.	Ponding, soil blowing.	Wetness.
31B---------- Metea	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
31C---------- Metea	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, droughty.
32B---------- Blount	Slight---------	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, erodes easily.
33---------- Lenawee	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding--------	Wetness.
34B---------- Kibbie	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness--------	Wetness, erodes easily.
35A---------- Thetford	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
36A---------- Metamora	Slight---------	Severe: wetness, piping.	Severe: slow refill.	Frost action---	Wetness, soil blowing.	Wetness.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Grassed waterways
38---------- Napoleon	Severe: seepage.	Severe: excess humus, wetness.	Moderate: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing, too acid.	Wetness.
39---------- Granby	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
40B*, 40C*. Udorthents						
41B*. Aquents						
42*. Pits						
43*: Sloan----------	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Wetness, erodes easily, flooding.	Wetness, erodes easily.
Marlette----------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope----------	Slope.
44B---------- Riddles	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Slope, soil blowing.	Favorable.
44C, 44D---------- Riddles	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, soil blowing.	Slope.
45B---------- Arkport	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Droughty.
45C, 45D---------- Arkport	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, droughty.
46A---------- Dixboro	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, fast intake.	Wetness.
47B*: Fox----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Favorable.
Riddles----------	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Slope, soil blowing.	Favorable.
47C*: Fox----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Slope.
Riddles----------	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, soil blowing.	Slope.
48---------- Gilford	Severe: seepage.	Severe: seepage, ponding.	Severe: cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding--------	Wetness.
49---------- Cohoctah	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Flooding, frost action.	Wetness, soil blowing.	Wetness.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Grassed waterways
50B*, 50D*. Udipsamments						
51B---------- Leoni	Severe: seepage.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Large stones, droughty.
51C---------- Leoni	Severe: seepage, slope.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Large stones, slope, droughty.
52A---------- Selfridge	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Frost action---	Wetness, fast intake, soil blowing.	Wetness, erodes easily.
53A---------- Tedrow	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
54A---------- Matherton	Severe: seepage.	Severe: seepage, wetness.	Moderate: slow refill, cutbanks cave.	Frost action, cutbanks cave.	Wetness, soil blowing.	Wetness.
56A*: Urban land.						
Blount----------	Slight---------	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, erodes easily.
Lenawee----------	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding--------	Wetness.
59*. Urban land						
60B*: Urban land.						
Marlette----------	Moderate: slope.	Severe: piping.	Severe: slow refill.	Slope----------	Wetness, soil blowing.	Favorable.
60C*, 60D*: Urban land.						
Marlette---------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Slope.
61A*: Urban land.						
Capac----------	Slight---------	Severe: piping, wetness.	Severe: slow refill.	Frost action---	Wetness, soil blowing.	Wetness.
62B*: Urban land.						
Spinks----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
62C*: Urban land.						
Spinks----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, droughty.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Grassed waterways
63A*: Urban land.						
Thetford	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
67B Ormas	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
67C Ormas	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, droughty.
68*: Cohoctah	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Flooding, frost action.	Wetness, soil blowing.	Wetness.
Fox	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Slope.
69 Thomas	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--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		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
10B, 10C--------- Marlette	0-8	Sandy loam--------	SM, SM-SC	A-4, A-2	0-5	95-100	85-95	60-70	30-40	<25	NP-7
	8-31	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	85-95	80-95	55-90	20-40	5-25
	31-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-95	75-95	50-75	20-40	5-25
10D, 10E--------- Marlette	0-8	Loam--------------	CL, ML, CL-ML	A-4	0-5	95-100	85-95	80-95	60-70	20-30	3-10
	8-31	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	85-95	80-95	55-90	20-40	5-25
	31-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-95	75-95	50-75	20-40	5-25
11B--------------- Capac	0-8	Sandy loam--------	SM, SM-SC	A-4, A-2	0-5	95-100	90-100	60-70	30-40	<25	NP-7
	8-32	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	50-80	25-40	5-20
	32-60	Loam--------------	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	80-95	60-75	15-35	5-15
12*:											
Brookston--------	0-16	Loam--------------	CL	A-4, A-6	0	98-100	98-100	85-100	60-90	22-40	8-18
	16-36	Clay loam, silty clay loam.	CL, CH	A-6, A-7	0	98-100	85-100	75-95	60-85	36-52	18-30
	36-60	Loam, sandy loam, clay loam.	CL	A-4, A-6	0-3	90-100	85-95	78-90	55-70	22-30	7-15
Colwood----------	0-11	Loam--------------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	15-35	2-12
	11-37	Loam, silty clay loam, silt loam.	CL, CL-ML	A-6, A-4	0	100	100	80-100	50-90	20-40	6-20
	37-60	Stratified silt loam to very fine sand.	SM, ML	A-2, A-4	0	100	95-100	70-100	30-80	<35	NP-10
13B*, 13C*, 13E*: Oshtemo---------	0-18	Loamy sand--------	SM	A-2, A-1	0	95-100	60-95	40-70	15-30	---	NP
	18-41	Sandy loam, sandy clay loam, gravelly sandy loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	95-100	60-95	60-85	25-45	12-30	2-16
	41-55	Loamy sand, sandy loam.	SM, SP-SM	A-2	0	85-95	60-95	55-70	10-30	---	NP
	55-60	Stratified coarse sand to gravel.	SP-SM, GP, SP, GP-GM	A-1, A-2, A-3	0-5	40-90	35-85	20-60	0-10	---	NP
Boyer------------	0-18	Loamy sand--------	SM, SM-SC	A-2, A-1	0-5	95-100	65-95	45-75	15-30	<20	NP-6
	18-27	Sandy loam, loam, gravelly sandy loam.	SM, SC, SM-SC, SP-SM	A-2, A-4, A-6	0-5	80-100	65-95	55-85	10-45	10-35	NP-16
	27-60	Gravelly sand, coarse sand, gravel.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2-4	0-10	40-100	35-100	30-70	0-10	---	NP
14B, 14C--------- Oakville	0-7	Fine sand---------	SM, SP, SP-SM	A-2, A-3	0	100	100	50-85	0-35	---	NP
	7-60	Fine sand, sand, loamy fine sand.	SM, SP, SP-SM	A-2, A-3	0	100	95-100	65-95	0-25	---	NP
15B, 15C, 15E---- Spinks	0-9	Loamy sand--------	SM	A-2-4	0	100	80-100	50-90	15-30	---	NP
	9-26	Sand--------------	SM	A-2-4	0	100	80-100	50-90	15-25	---	NP
	26-60	Stratified fine sand to loamy fine sand.	SM, SP-SM	A-2-4	0	100	80-100	60-90	10-30	---	NP
17A-------------- Wasepi	0-15	Sandy loam--------	SM, SM-SC	A-2, A-4	0-5	85-100	70-95	60-95	25-40	<27	NP-7
	15-30	Loamy sand, sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6	0-5	85-100	70-95	55-85	20-45	15-35	2-16
	30-60	Sand, gravel, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2	0-10	40-80	35-70	30-60	0-10	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
18B, 18C, 18D---- Fox	0-16	Sandy loam, gravelly sandy loam.	SM, SM-SC	A-4, A-2	0	95-100	90-100	55-75	30-45	<20	2-7
	16-30	Clay loam, loam, gravelly sandy clay loam.	CL, SC	A-2, A-6, A-7	0-5	85-100	70-95	50-95	20-65	25-45	10-25
	30-60	Stratified sand to gravel.	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
19---------- Sebewa	0-11	Loam----------	CL, CL-ML	A-4, A-6	0	95-100	80-100	75-95	50-90	22-35	6-12
	11-32	Clay loam, loam, gravelly clay loam.	SC, CL	A-4, A-6	0	95-100	65-95	55-85	40-75	25-40	8-20
	32-60	Gravelly sand----	SP, SP-SM, GP, GP-GM	A-1	0-5	40-75	35-70	20-40	0-10	---	NP
20B, 20C---------- Glynwood	0-12	Loam----------	CL-ML, CL	A-4, A-6	0	95-100	90-100	80-100	55-90	23-40	4-15
	12-31	Clay, clay loam, silty clay loam.	CL, CH	A-7, A-6	0-5	95-100	85-100	75-100	65-95	35-55	15-30
	31-60	Clay loam, silty clay loam.	CL	A-6, A-4	0-5	95-100	80-100	75-95	65-90	25-40	7-18
23B, 23C---------- Sisson	0-12	Fine sandy loam	CL, ML, SM, SC	A-4	0	100	100	60-85	35-55	<28	NP-10
	12-35	Loam, clay loam, silt loam.	CL	A-4, A-6	0	100	100	85-100	60-90	18-40	7-25
	35-60	Stratified silt loam to very fine sand.	CL, ML, SM, SC	A-2, A-4, A-6	0	100	95-100	65-95	25-90	<35	NP-15
25B, 25C---------- Owosso	0-11	Sandy loam, fine sandy loam.	SM, SM-SC, SC	A-2, A-4	0-5	95-100	75-100	50-70	20-45	12-29	NP-10
	11-38	Sandy loam, loam, fine sandy loam.	SM, SC, SM-SC	A-2, A-4	0-5	95-100	75-100	60-90	25-45	15-30	NP-10
	38-60	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	90-95	85-95	60-90	25-40	6-21
26---------- Sloan	0-14	Silt loam--------	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	14-50	Silty clay loam, clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	50-60	Stratified gravelly sandy loam to silty clay loam.	ML, CL	A-4, A-6	0	95-100	70-100	60-95	50-90	25-40	3-15
27*:											
Houghton--------	0-60	Sapric material	Pt	A-8	0	---	---	---	---	---	---
Adrian----------	0-30	Sapric material	Pt	A-8	---	---	---	---	---	---	---
	30-60	Gravelly sand, loamy sand, fine sand.	SP, SM	A-2, A-3, A-1	0	80-100	60-100	35-75	0-30	---	NP
31B, 31C---------- Metea	0-10	Loamy sand-------	SM	A-2-4	0	100	100	50-80	15-35	---	NP
	10-30	Loamy sand, loamy fine sand, sand.	SP-SM, SM	A-2-4	0	100	100	50-80	10-35	---	NP
	30-38	Loam, sandy clay loam, silty clay loam.	CL, SC	A-6, A-7	0	90-100	90-95	75-95	40-75	25-50	12-30
	38-60	Loam, silty clay loam, clay loam.	CL, CL-ML	A-4, A-6	0-3	85-95	80-90	75-90	50-75	25-40	5-18
32B---------- Blount	0-7	Loam----------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	7-30	Silty clay loam, clay, clay loam.	CH, CL	A-7, A-6	0-5	95-100	90-100	90-100	80-95	35-60	15-35
	30-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	90-100	90-100	80-100	70-90	30-45	10-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
33---------- Lenawee	0-8	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	50-95	25-45	11-22
	8-53	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	80-95	40-55	20-30
	53-60	Silt loam, silty clay loam, clay loam.	CL, CL-ML	A-6, A-4, A-7	0	100	95-100	95-100	85-95	25-45	6-22
34B---------- Kibbie	0-9	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	75-95	40-60	18-25	2-7
	9-32	Silt loam, clay loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-7	0	90-100	85-100	80-100	35-90	25-45	6-25
	32-60	Stratified silt loam to very fine sand.	ML, SM, SC, CL	A-4, A-2	0	100	95-100	70-95	30-80	<30	NP-10
35A---------- Thetford	0-20	Loamy fine sand	SM	A-2, A-4	0	95-100	90-100	70-85	20-45	<20	NP-4
	20-45	Loamy sand, sandy loam, fine sand.	SM	A-2, A-4	0	95-100	90-100	60-80	20-40	<20	NP-4
	45-60	Very fine sand, fine sand, sand.	SM, SP, SP-SM	A-2, A-4, A-3	0	95-100	70-100	50-85	0-45	<20	NP-4
36A---------- Metamora	0-13	Sandy loam-------	SM, SM-SC	A-2, A-4	0-5	95-100	95-100	60-80	25-45	<25	NP-7
	13-28	Sandy loam, loamy sand.	SM, SM-SC	A-2, A-4	0-5	95-100	90-100	50-80	15-45	<25	NP-7
	28-36	Clay loam, loam, sandy clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	90-100	80-100	60-85	20-45	5-25
	36-60	Clay loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	90-100	80-100	60-85	20-45	5-25
38---------- Napoleon	0-10	Sapric material	Pt	A-8	0	---	---	---	---	---	---
	10-60	Hemic material, sapric material.	Pt	A-8	0	---	---	---	---	---	---
39---------- Granby	0-11	Loamy sand-------	SM	A-2	0	100	100	50-75	15-30	---	NP
	11-38	Sand, fine sand, loamy sand.	SP, SP-SM, SM	A-3, A-2	0	100	95-100	50-75	0-20	---	NP
	38-60	Sand, fine sand	SP, SP-SM	A-3, A-2	0	100	95-100	50-70	0-5	---	NP
40B*, 40C*. Udorthents											
41B*. Aquents											
42*. Pits											
43*:											
Sloan----------	0-14	Silt loam--------	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	14-36	Silty clay loam, clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	36-60	Stratified gravelly sandy loam to silty clay loam.	ML, CL	A-4, A-6	0	95-100	70-100	60-95	50-90	25-40	3-15
Marlette--------	0-8	Loam----------	CL, ML, CL-ML	A-4	0-5	95-100	85-95	80-95	60-70	20-30	3-10
	8-31	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	85-95	80-95	55-90	20-40	5-25
	31-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-95	75-95	50-75	20-40	5-25
44B, 44C, 44D---- Riddles	0-12	Sandy loam-------	SM, SC, SM-SC	A-2-4, A-4	0	95-100	85-95	50-70	25-40	20-30	2-10
	12-46	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	90-100	80-95	75-90	35-75	25-40	10-20
	46-60	Clay loam, sandy loam, loam.	CL, SM, SC, ML	A-4, A-6, A-2	0-3	85-95	80-90	50-90	30-70	15-30	2-15

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
45B, 45C, 45D---- Arkport	0-21	Loamy fine sand	SM	A-2, A-4	0	95-100	95-100	65-85	20-45	---	NP
	21-44	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
	44-60	Loamy fine sand, fine sand, loamy very fine sand.	SM	A-2, A-4	0	95-100	95-100	60-95	15-50	---	NP
46A---------- Dixboro	0-16	Loamy fine sand	SM, ML	A-2-4, A-4	0	100	100	70-95	20-60	<20	NP-4
	16-35	Fine sandy loam, silt loam, very fine sandy loam.	SM, ML, SC, CL	A-4	0	100	100	70-95	40-90	<25	2-10
	35-60	Stratified fine sand to silt loam.	SM, ML, SC, CL	A-2-4, A-4	0	100	95-100	70-95	20-80	<20	NP-8
47B*, 47C*:											
Fox----------	0-16	Sandy loam-------	SM, SM-SC	A-4, A-2	0	95-100	90-100	55-75	30-45	<20	2-7
	16-30	Clay loam, loam, sandy clay loam.	CL, SC	A-2, A-6, A-7	0-5	85-100	70-95	50-95	20-65	25-45	10-25
	30-60	Stratified sand to gravel.	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
Riddles----------	0-12	Sandy loam-------	SM, SC, SM-SC	A-2-4, A-4	0	95-100	85-95	50-70	25-40	20-30	2-10
	12-46	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	90-100	80-95	75-90	35-75	25-40	10-20
	46-60	Clay loam, sandy loam, loam.	CL, SM, SC, ML	A-4, A-6, A-2	0-3	85-95	80-90	50-90	30-70	15-30	2-15
48---------- Gilford	0-11	Sandy loam-------	SC, SM-SC, SM	A-4, A-2-4	0	95-100	90-100	60-70	30-40	20-30	2-10
	11-38	Sandy loam, fine sandy loam.	SM, SC, SM-SC	A-2-4	0	90-100	90-100	55-70	25-35	20-30	NP-8
	38-60	Gravelly sand----	SP, SP-SM	A-1, A-3, A-2-4	5-15	80-95	75-90	40-60	3-10	---	NP
49---------- Cohoctah	0-11	Fine sandy loam	ML, SM	A-4, A-2	0	100	100	65-95	30-75	20-30	NP-6
	11-48	Loam, fine sandy loam, sandy loam.	ML, SM, CL, SC	A-4, A-2	0	100	100	70-90	30-70	20-30	NP-10
	48-60	Sand, gravelly coarse sand, gravelly sand.	SP-SM, SP, GP, GP-GM	A-1, A-3, A-2-4	0-10	40-90	35-85	30-60	0-10	---	NP
50B*, 50D*. Udipsamments											
51B, 51C---------- Leoni	0-15	Gravelly sandy loam.	SM	A-2, A-4	1-20	85-95	75-90	60-80	30-50	<30	NP-7
	15-33	Cobbly clay loam, gravelly sandy clay loam, gravelly clay loam.	CL, SC, GC	A-6, A-4	5-30	70-85	60-85	50-70	40-60	25-40	8-20
	33-46	Gravelly sandy loam, gravelly sandy clay loam, gravelly clay loam.	SM, SC, SM-SC, SP-SM	A-2, A-1	5-30	70-85	60-85	40-50	10-25	<25	NP-8
	46-60	Gravelly sand, gravelly loamy sand, cobbly sandy loam.	SM, SP-SM, SC, SM-SC	A-1, A-2, A-4	5-35	65-85	40-80	35-50	5-40	<22	NP-8
52A---------- Selfridge	0-32	Loamy sand, sand	SM, SM-SC	A-2	0-5	95-100	95-100	70-85	20-35	<20	NP-5
	32-60	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	85-100	60-90	25-50	10-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
53A----------	0-9	Loamy sand-------	SM	A-2, A-4	0	100	95-100	60-80	20-40	---	NP
Tedrow	9-45	Loamy fine sand, loamy sand, sand.	SM	A-2, A-4	0	100	95-100	60-80	20-40	---	NP
	45-60	Sand, fine sand	SM, SP, SP-SM	A-2, A-3	0	100	95-100	50-70	3-35	---	NP
54A----------	0-13	Sandy loam, loam	SM	A-2, A-4	0-5	90-100	80-100	50-70	25-40	<20	NP-4
Matherton	13-34	Sandy clay loam, gravelly clay loam, loam.	SC, CL, CL-ML, SM-SC	A-6, A-4	0-5	90-100	65-95	50-85	35-70	25-40	5-20
	34-60	Gravelly sand, sand.	GP, SP, SP-SM, GP-GM	A-1, A-3, A-2-4	0-10	40-100	35-90	30-55	0-10	---	NP
56A*:											
Urban land.											
Blount----------	0-7	Loam----------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	7-30	Silty clay loam, clay, clay loam. loam.	CH, CL	A-7, A-6	0-5	95-100	90-100	90-100	80-95	35-60	15-35
	30-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	90-100	90-100	80-100	70-90	30-45	10-25
Lenawee----------	0-9	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	50-95	25-45	11-22
	9-33	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	80-95	40-55	20-30
	33-60	Silt loam, silty clay loam, clay loam.	CL, CL-ML	A-6, A-4, A-7	0	100	95-100	95-100	85-95	25-45	6-22
59*.											
Urban land											
60B*, 60C*, 60D*:											
Urban land.											
Marlette--------	0-8	Sandy loam-------	SM, SM-SC	A-4, A-2	0-5	95-100	85-95	60-70	30-40	<25	NP-7
	8-31	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	85-95	80-95	55-90	20-40	5-25
	31-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-95	75-95	50-75	20-40	5-25
61A*:											
Urban land.											
Capac----------	0-8	Sandy loam-------	SM, SM-SC	A-4, A-2	0-5	95-100	90-100	60-70	30-40	<25	NP-7
	8-32	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	50-80	25-40	5-20
	32-60	Loam----------	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	80-95	60-75	15-35	5-15
62B*, 62C*:											
Urban land.											
Spinks----------	0-9	Loamy sand-------	SM	A-2-4	0	100	80-100	50-90	15-30	---	NP
	9-26	Sand----------	SM	A-2-4	0	100	80-100	50-90	15-25	---	NP
	26-60	Stratified fine sand to loamy fine sand.	SM, SP-SM	A-2-4	0	100	80-100	60-90	10-30	---	NP
63A*:											
Urban land.											
Thetford--------	0-20	Loamy fine sand	SM	A-2, A-4	0	95-100	90-100	70-85	20-45	<20	NP-4
	20-45	Loamy sand, sandy loam, fine sand.	SM	A-2, A-4	0	95-100	90-100	60-80	20-40	<20	NP-4
	45-60	Very fine sand, fine sand, sand.	SM, SP, SP-SM	A-2, A-4, A-3	0	95-100	70-100	50-85	0-45	<20	NP-4

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
67B, 67C----------	0-18	Loamy sand-------	SM	A-2-4	0	98-100	95-100	50-75	15-30	---	NP
Ormas	18-32	Sand-------------	SW-SM, SM, SP-SM	A-2-4, A-1-B	0	95-100	90-100	45-70	10-20	---	NP
	32-43	Gravelly sandy clay loam, gravelly sandy loam.	SM-SC, SC, GC, GM-GC	A-4, A-6, A-2-4, A-2-6	0	60-80	55-80	35-70	20-45	20-40	6-20
	43-60	Gravelly sand----	SP, SP-SM	A-3, A-1-B, A-2-4	0	60-80	55-80	30-55	3-12	---	NP
68*:											
Cohoctah---------	0-11	Fine sandy loam	ML, SM	A-4, A-2	0	100	100	65-95	30-75	20-30	NP-6
	11-48	Loam, fine sandy loam, sandy loam.	ML, SM, CL, SC	A-4, A-2	0	100	100	70-90	30-70	20-30	NP-10
	48-60	Sand, gravelly coarse sand, gravelly sand.	SP-SM, SP, GP, GP-GM	A-1, A-3, A-2-4	0-10	40-90	35-85	30-60	0-10	---	NP
Fox--------------	0-16	Sandy loam-------	SM, SM-SC	A-4, A-2	0	95-100	90-100	55-75	30-45	<20	2-7
	16-30	Clay loam, loam, sandy clay loam.	CL, SC	A-2, A-6, A-7	0-5	85-100	70-95	50-95	20-65	25-45	10-25
	30-60	Stratified sand to gravel.	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
69----------	0-11	Sapric material	Pt	A-8	0	---	---	---	---	---	---
Thomas	11-46	Silty clay loam, clay loam, loam.	CL	A-6	0-15	90-95	85-95	85-95	65-95	25-40	12-25
	46-60	Silty clay loam, loam, clay loam.	CL	A-6	0-15	90-95	85-95	80-95	80-95	25-35	12-22

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--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		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm³	In/hr	In/in	pH					Pct
10B, 10C	0-8	10-18	1.30-1.65	2.0-6.0	0.12-0.15	5.6-7.3	Low	0.32	5	3	1-3
Marlette	8-31	18-30	1.30-1.70	0.2-0.6	0.18-0.20	5.6-7.8	Low	0.32			
	31-60	15-25	1.30-1.70	0.2-0.6	0.12-0.19	7.9-8.4	Low	0.32			
10D, 10E	0-8	10-18	1.30-1.65	2.0-6.0	0.18-0.22	5.6-7.3	Low	0.32	5	5	1-3
Marlette	8-31	18-30	1.30-1.70	0.2-0.6	0.18-0.20	5.6-7.8	Low	0.32			
	31-60	15-25	1.30-1.70	0.2-0.6	0.12-0.19	7.9-8.4	Low	0.32			
11B	0-8	5-15	1.40-1.70	2.0-6.0	0.13-0.15	5.6-7.3	Low	0.32	5	3	1-3
Capac	8-32	18-35	1.45-1.70	0.2-0.6	0.14-0.18	5.6-7.3	Low	0.32			
	32-60	10-25	1.50-1.70	0.2-0.6	0.14-0.16	7.4-8.4	Low	0.32			
12*:											
Brookston	0-16	18-27	1.35-1.50	0.6-2.0	0.21-0.24	6.1-7.3	Moderate	0.28	5	6	3-5
	16-36	27-35	1.40-1.60	0.6-2.0	0.15-0.19	6.1-7.3	Moderate	0.28			
	36-60	15-32	1.45-1.70	0.6-2.0	0.05-0.19	7.4-8.4	Moderate	0.28			
Colwood	0-11	5-26	1.15-1.60	0.6-2.0	0.20-0.24	6.1-7.8	Low	0.28	5	5	3-8
	11-37	18-35	1.30-1.60	0.6-2.0	0.17-0.22	6.1-8.4	Moderate	0.43			
	37-60	0-12	1.20-1.45	0.6-2.0	0.12-0.22	7.4-8.4	Low	0.43			
13B*, 13C*, 13E*:											
Oshtemo	0-18	2-12	1.20-1.60	6.0-20	0.10-0.12	5.1-6.5	Low	0.24	5	2	.5-3
	18-41	10-18	1.20-1.60	2.0-6.0	0.12-0.19	5.1-6.5	Low	0.24			
	41-55	5-15	1.20-1.60	2.0-20	0.06-0.10	5.1-7.3	Low	0.17			
	55-60	0-15	1.20-1.50	>20	0.02-0.04	7.4-8.4	Low	0.10			
Boyer	0-18	0-10	1.15-1.60	6.0-20	0.10-0.12	5.6-7.3	Low	0.17	4-3	2	.5-3
	18-27	10-18	1.25-1.60	2.0-6.0	0.12-0.18	5.6-7.8	Low	0.24			
	27-60	0-10	1.20-1.45	>20	0.02-0.04	7.4-8.4	Low	0.10			
14B	0-7	0-10	1.30-1.55	6.0-20	0.07-0.09	5.6-7.3	Low	0.15	5	1	.5-2
Oakville	7-60	0-10	1.30-1.65	6.0-20	0.06-0.08	5.6-7.3	Low	0.15			
14C	0-7	0-10	1.30-1.55	6.0-20	0.07-0.09	5.6-7.3	Low	0.15	5	1	.5-2
Oakville	7-60	0-10	1.30-1.65	6.0-20	0.06-0.10	5.6-7.3	Low	0.15			
15B, 15C, 15E	0-9	2-15	1.20-1.60	6.0-20	0.08-0.10	5.1-7.3	Low	0.17	5	2	2-4
Spinks	9-26	3-15	1.20-1.60	2.0-6.0	0.08-0.10	5.6-7.3	Low	0.17			
	26-60	0-15	1.20-1.50	2.0-6.0	0.04-0.08	5.6-7.8	Low	0.17			
17A	0-15	5-15	1.25-1.40	2.0-6.0	0.13-0.15	5.6-7.3	Low	0.20	4	3	2-4
Wasepi	15-30	10-18	1.35-1.45	2.0-6.0	0.12-0.18	5.6-7.3	Low	0.20			
	30-60	0-10	1.25-1.50	>20	0.02-0.04	7.4-7.8	Low	0.10			
18B, 18C, 18D	0-16	5-15	1.40-1.70	0.6-2.0	0.13-0.15	5.1-7.3	Low	0.24	4	3	1-3
Fox	16-30	25-35	1.55-1.65	0.6-2.0	0.15-0.19	5.6-8.4	Moderate	0.32			
	30-60	0-2	1.30-2.20	>20	0.02-0.04	7.4-8.4	Low	0.10			
19	0-11	10-25	1.15-1.60	0.6-2.0	0.18-0.22	6.1-7.8	Low	0.24	4	5	1-4
Sebewa	11-32	18-35	1.50-1.80	0.6-2.0	0.15-0.19	6.1-7.8	Low	0.24			
	32-60	0-3	1.55-1.75	>20	0.02-0.04	7.4-8.4	Low	0.10			
20B, 20C	0-12	16-27	1.25-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.43	3	6	1-3
Glynwood	12-31	35-55	1.45-1.75	0.06-0.2	0.11-0.18	4.5-8.4	Moderate	0.32			
	31-60	27-36	1.65-1.85	0.06-0.2	0.06-0.10	7.4-8.4	Moderate	0.32			
23B, 23C	0-12	10-20	1.30-1.65	0.6-2.0	0.13-0.18	6.1-7.3	Low	0.24	5	3	1-3
Sisson	12-35	18-35	1.30-1.65	0.6-2.0	0.15-0.22	6.1-8.4	Moderate	0.43			
	35-60	5-22	1.30-1.65	0.6-2.0	0.05-0.22	7.4-8.4	Low	0.43			

See footnote at end of table.

TABLE 16.--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		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm³	In/hr	In/in	pH					Pct
25B, 25C----------	0-11	5-18	1.10-1.65	2.0-6.0	0.13-0.18	5.1-7.3	Low----------	0.24	5	3	1-2
Owosso	11-38	10-22	1.10-1.65	2.0-6.0	0.09-0.17	5.1-7.3	Low----------	0.24			
	38-60	18-35	1.30-1.75	0.2-0.6	0.14-0.20	5.1-8.4	Moderate-----	0.37			
26----------	0-14	15-27	1.20-1.40	0.6-2.0	0.20-0.24	6.1-7.8	Low----------	0.37	5	6	3-6
Sloan	14-50	22-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.37			
	50-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low----------	0.37			
27*:											
Houghton--------	0-60	---	0.15-0.45	0.2-6.0	0.35-0.45	5.6-7.8	----------	----	---	3	>70
Adrian----------	0-30	---	0.30-0.55	0.2-6.0	0.35-0.45	5.1-7.8	----------	----	---	3	55-75
	30-60	2-10	1.40-1.75	6.0-20	0.03-0.08	5.6-8.4	Low----------	----			
31B, 31C----------	0-10	3-8	1.45-1.60	>20	0.10-0.12	5.6-7.3	Low----------	0.17	5	2	.5-2
Metea	10-30	2-10	1.50-1.70	>20	0.06-0.11	5.1-7.3	Low----------	0.17			
	30-38	25-35	1.50-1.70	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.32			
	38-60	20-30	1.40-1.65	0.6-2.0	0.05-0.19	7.4-8.4	Low----------	0.32			
32B----------	0-7	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-6.5	Low----------	0.43	3	6	2-3
Blount	7-30	35-50	1.40-1.70	0.06-0.6	0.12-0.19	4.5-6.5	Moderate-----	0.43			
	30-60	27-38	1.60-1.85	0.06-0.6	0.07-0.10	7.4-8.4	Moderate-----	0.43			
33----------	0-8	20-35	1.40-1.55	0.6-2.0	0.14-0.22	5.6-7.8	Moderate-----	0.28	4	7	3-5
Lenawee	8-53	35-45	1.40-1.70	0.2-0.6	0.14-0.20	6.1-7.8	Moderate-----	0.28			
	53-60	18-40	1.50-1.70	0.2-0.6	0.16-0.22	7.4-8.4	Low----------	0.28			
34B----------	0-9	2-20	1.40-1.65	0.6-2.0	0.16-0.20	5.6-7.3	Low----------	0.20	5	3	2-3
Kibbie	9-32	18-35	1.40-1.65	0.6-2.0	0.17-0.22	5.6-7.3	Low----------	0.43			
	32-60	2-18	1.40-1.70	0.6-2.0	0.12-0.22	7.4-8.4	Low----------	0.43			
35A----------	0-20	2-15	1.25-1.41	2.0-6.0	0.10-0.13	5.6-7.3	Low----------	0.17	5	2	1-4
Thetford	20-45	8-18	1.35-1.45	2.0-6.0	0.08-0.13	5.6-7.8	Low----------	0.17			
	45-60	0-10	1.25-1.50	6.0-20	0.05-0.08	7.4-8.4	Low----------	0.17			
36A----------	0-13	5-15	1.25-1.40	2.0-6.0	0.14-0.18	5.1-7.3	Low----------	0.20	5	3	1-2
Metamora	13-28	5-15	1.40-1.60	2.0-6.0	0.10-0.15	5.1-7.3	Low----------	0.20			
	28-36	18-35	1.45-1.70	0.2-0.6	0.16-0.18	6.1-7.3	Moderate-----	0.32			
	36-60	12-30	1.45-1.70	0.2-0.6	0.14-0.18	6.6-8.4	Moderate-----	0.32			
38----------	0-10	---	0.30-0.40	0.2-6.0	0.35-0.45	<4.5	----------	----	2	2	---
Napoleon	10-60	---	0.10-0.20	0.6-6.0	0.45-0.55	<4.5	----------	----			
39----------	0-11	2-14	1.20-1.60	6.0-20	0.10-0.12	5.6-7.3	Low----------	0.17	5	2	4-6
Granby	11-38	0-14	1.45-1.65	6.0-20	0.05-0.12	5.6-7.8	Low----------	0.17			
	38-60	0-10	1.45-1.65	6.0-20	0.05-0.09	6.6-8.4	Low----------	0.17			
40B*, 40C*. Udorthents											
41B*. Aquents											
42*. Pits											
43*:											
Sloan----------	0-14	15-27	1.20-1.40	0.6-2.0	0.20-0.24	6.1-7.8	Low----------	0.37	5	6	3-6
	14-36	22-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.37			
	36-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low----------	0.37			
Marlette--------	0-8	10-18	1.30-1.65	2.0-6.0	0.18-0.22	5.6-7.3	Low----------	0.32	5	5	1-3
	8-31	18-30	1.30-1.70	0.2-0.6	0.18-0.20	5.6-7.8	Low----------	0.32			
	31-60	15-25	1.30-1.70	0.2-0.6	0.12-0.19	7.9-8.4	Low----------	0.32			

See footnote at end of table.

TABLE 16.--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		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm³	In/hr	In/in	pH					Pct
44B, 44C, 44D----	0-12	4-14	1.35-1.55	2.0-6.0	0.13-0.15	6.1-7.3	Low----------	0.24	5	3	.5-2
Riddles	12-46	18-35	1.40-1.60	0.6-2.0	0.16-0.18	5.1-7.3	Moderate-----	0.32			
	46-60	8-25	1.40-1.60	0.6-2.0	0.05-0.19	6.6-8.4	Low----------	0.32			
45B, 45C, 45D----	0-21	5-15	1.10-1.40	2.0-6.0	0.08-0.09	4.5-7.3	Low----------	0.17	3	---	.5-2
Arkport	21-44	3-15	1.25-1.55	2.0-6.0	0.06-0.16	4.5-7.3	Low----------	0.28			
	44-60	1-5	1.25-1.55	2.0-6.0	0.02-0.06	5.6-8.4	Low----------	0.28			
46A----------	0-16	2-12	1.30-1.65	2.0-6.0	0.10-0.14	5.6-7.3	Low----------	0.20	5	2	2-3
Dixboro	16-35	6-17	1.40-1.70	0.6-2.0	0.15-0.20	5.6-7.3	Low----------	0.20			
	35-60	0-15	1.50-1.65	0.6-2.0	0.07-0.20	6.1-8.4	Low----------	0.20			
47B*, 47C*:											
Fox----------	0-16	5-15	1.40-1.70	0.6-2.0	0.13-0.15	5.1-7.3	Low----------	0.24	4	3	1-3
	16-30	25-35	1.55-1.65	0.6-2.0	0.15-0.19	5.6-8.4	Moderate-----	0.32			
	30-60	0-2	1.30-2.20	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
Riddles----------	0-12	4-14	1.35-1.55	2.0-6.0	0.13-0.15	6.1-7.3	Low----------	0.24	5	3	.5-2
	12-46	18-35	1.40-1.60	0.6-2.0	0.16-0.18	5.1-7.3	Moderate-----	0.32			
	46-60	8-25	1.40-1.60	0.6-2.0	0.05-0.19	6.6-8.4	Low----------	0.32			
48----------	0-11	10-20	1.50-1.70	2.0-6.0	0.16-0.18	5.6-6.5	Low----------	0.20	4	3	2-4
Gilford	11-38	8-17	1.60-1.80	2.0-6.0	0.10-0.14	5.6-7.3	Low----------	0.20			
	38-60	1-5	1.70-1.90	>20	0.02-0.04	6.6-8.4	Low----------	0.10			
49----------	0-11	5-20	1.20-1.60	2.0-6.0	0.13-0.22	6.1-7.8	Low----------	0.28	5	3	1-4
Cohoctah	11-48	5-27	1.45-1.65	2.0-6.0	0.12-0.20	6.1-8.4	Low----------	0.28			
	48-60	5-10	1.40-1.55	>20	0.02-0.07	7.9-8.4	Low----------	0.10			
50B*, 50D*.											
Udipsamments											
51B, 51C----------	0-15	2-18	1.30-1.70	0.6-6.0	0.07-0.15	5.6-7.3	Low----------	0.10	3	8	1-3
Leoni	15-33	18-35	1.30-1.70	0.6-2.0	0.06-0.12	5.1-7.3	Moderate-----	0.10			
	33-46	18-35	1.30-1.70	2.0-6.0	0.03-0.09	5.6-7.8	Low----------	0.10			
	46-60	0-18	1.20-1.50	2.0-20	0.01-0.03	7.4-8.4	Low----------	0.10			
52A----------	0-32	2-15	1.25-1.40	6.0-20	0.10-0.12	5.6-7.3	Low----------	0.15	5	2	1-3
Selfridge	32-60	18-35	1.50-1.90	0.2-0.6	0.10-0.14	7.4-8.4	Moderate-----	0.37			
53A----------	0-9	2-10	1.40-1.60	6.0-20	0.08-0.12	6.1-7.3	Low----------	0.17	5	2	1-3
Tedrow	9-45	2-8	1.50-1.70	6.0-20	0.07-0.11	6.1-7.3	Low----------	0.17			
	45-60	1-8	1.50-1.70	6.0-20	0.05-0.07	6.6-7.8	Low----------	0.17			
54A----------	0-13	10-20	1.30-1.65	2.0-6.0	0.13-0.15	5.6-7.3	Low----------	0.20	4	3	2-4
Matherton	13-34	20-35	1.40-1.70	0.6-2.0	0.16-0.18	5.6-7.3	Low----------	0.28			
	34-60	0-10	1.50-1.65	>6.0	0.02-0.04	7.4-8.4	Low----------	0.10			
56A*:											
Urban land.											
Blount----------	0-7	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-6.5	Low----------	0.43	3	6	2-3
	7-30	35-50	1.40-1.70	0.06-0.6	0.12-0.19	4.5-6.5	Moderate-----	0.43			
	30-60	27-38	1.60-1.85	0.06-0.6	0.07-0.10	7.4-8.4	Moderate-----	0.43			
Lenawee----------	0-9	20-35	1.40-1.55	0.6-2.0	0.14-0.22	5.6-7.8	Moderate-----	0.28	4	7	3-5
	9-33	35-45	1.40-1.70	0.2-0.6	0.14-0.20	6.1-7.8	Moderate-----	0.28			
	33-60	18-40	1.50-1.70	0.2-0.6	0.16-0.22	7.4-8.4	Low----------	0,28			
59*.											
Urban land											
60B*, 60C*, 60D*:											
Urban land.											

See footnote at end of table.

TABLE 16.--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		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm³	In/hr	In/in	pH					Pct
60B*, 60C*, 60D*:											
Marlette	0-8	10-18	1.30-1.65	2.0-6.0	0.12-0.15	5.6-7.3	Low	0.32	5	3	1-3
	8-31	18-30	1.30-1.70	0.2-0.6	0.18-0.20	5.6-7.8	Low	0.32			
	31-60	15-25	1.30-1.70	0.2-0.6	0.12-0.19	7.9-8.4	Low	0.32			
61A*:											
Urban land.											
Capac	0-8	5-15	1.40-1.70	2.0-6.0	0.13-0.15	5.6-7.3	Low	0.32	5	3	1-3
	8-32	18-35	1.45-1.70	0.2-0.6	0.14-0.18	5.6-7.3	Low	0.32			
	32-60	10-25	1.50-1.70	0.2-0.6	0.14-0.16	7.4-8.4	Low	0.32			
62B*, 62C*:											
Urban land.											
Spinks	0-9	2-15	1.20-1.60	6.0-20	0.08-0.10	5.1-7.3	Low	0.17	5	2	2-4
	9-26	3-15	1.20-1.60	2.0-6.0	0.08-0.10	5.6-7.3	Low	0.17			
	26-60	0-15	1.20-1.50	2.0-6.0	0.04-0.08	5.6-7.8	Low	0.17			
63A*:											
Urban land.											
Thetford	0-20	2-15	1.25-1.41	2.0-6.0	0.10-0.13	5.6-7.3	Low	0.17	5	2	1-4
	20-45	8-18	1.35-1.45	2.0-6.0	0.08-0.13	5.6-7.8	Low	0.17			
	45-60	0-10	1.25-1.50	6.0-20	0.05-0.08	7.4-8.4	Low	0.17			
67B, 67C	0-18	5-12	1.40-1.60	2.0-6.0	0.10-0.12	5.6-7.3	Low	0.17	5	2	1-3
Ormas	18-32	3-10	1.45-1.60	2.0-6.0	0.07-0.09	5.6-6.5	Low	0.17			
	32-43	18-25	1.50-1.60	2.0-6.0	0.11-0.14	5.6-7.8	Low	0.32			
	43-60	1-8	1.55-1.70	>20	0.03-0.05	7.4-8.4	Low	0.15			
68*:											
Cohoctah	0-11	5-20	1.20-1.60	2.0-6.0	0.13-0.22	6.1-7.8	Low	0.28	5	3	1-4
	11-48	5-27	1.45-1.65	2.0-6.0	0.12-0.20	6.1-8.4	Low	0.28			
	48-60	5-10	1.40-1.55	>20	0.02-0.07	7.9-8.4	Low	0.10			
Fox	0-16	5-15	1.40-1.70	0.6-2.0	0.13-0.15	5.1-7.3	Low	0.24	4	3	1-3
	16-30	25-35	1.55-1.65	0.6-2.0	0.15-0.19	5.6-8.4	Moderate	0.32			
	30-60	0-2	1.30-2.20	>20	0.02-0.04	7.4-8.4	Low	0.10			
69	0-11	---	0.30-0.55	0.2-6.0	0.35-0.45	6.6-7.8	---	---	2	3	55-75
Thomas	11-46	18-35	1.40-1.80	0.6-2.0	0.12-0.20	7.4-8.4	Moderate	---			
	46-60	18-35	1.50-1.80	0.06-0.6	0.12-0.18	7.4-8.4	Moderate	---			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "frequent," "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	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
10B--- Marlette	B	None	---	---	2.5-6.0	Apparent	Dec-Apr	Moderate	Low	Moderate.
10C, 10D, 10E--- Marlette	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
11B--- Capac	B	None	---	---	1.0-2.0	Apparent	Nov-May	High	High	Low.
12*:										
Brookston	B/D	None	---	---	+.5-1.0	Apparent	Oct-May	High	High	Low.
Colwood	B/D	None	---	---	+1-1.0	Apparent	Oct-May	High	High	Low.
13B*, 13C*, 13E*:										
Oshtemo	B	None	---	---	>6.0	---	---	Low	Low	High.
Boyer	B	None	---	---	>6.0	---	---	Low	Low	Moderate.
14B--- Oakville	A	None	---	---	3.0-6.0	Apparent	Nov-Apr	Low	Low	Moderate.
14C--- Oakville	A	None	---	---	>6.0	---	---	Low	Low	Moderate.
15B, 15C, 15E--- Spinks	A	None	---	---	>6.0	---	---	Low	Low	Low.
17A--- Wasepi	B	None	---	---	0.5-2.0	Apparent	Nov-May	High	Moderate	Low.
18B, 18C, 18D--- Fox	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
19--- Sebewa	B/D	None	---	---	+1-1.0	Apparent	Sep-May	High	High	Low.
20B, 20C--- Glynwood	C	None	---	---	2.0-3.5	Perched	Jan-Apr	High	High	Moderate.
23B, 23C--- Sisson	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
25B, 25C--- Owosso	B	None	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
26--- Sloan	B/D	Frequent	Brief	Nov-Jun	0-1.0	Apparent	Nov-Jun	High	High	Low.
27*:										
Houghton	A/D	None	---	---	+1-1.0	Apparent	Nov-May	High	High	Low.
Adrian	A/D	None	---	---	+1-1.0	Apparent	Nov-May	High	High	Moderate.
31B, 31C--- Metea	B	None	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
32B--- Blount	C	None	---	---	1.0-2.0	Perched	Jan-May	High	High	High.
33--- Lenawee	B/D	None	---	---	+1-1.0	Apparent	Nov-May	High	High	Low.

See footnote at end of table.

TABLE 17.--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					
34B---------- Kibbie	B	None--------	---	---	1.0-2.0	Apparent	Nov-May	High-----	Low------	High.
35A---------- Thetford	A	None--------	---	---	1.0-2.0	Apparent	Feb-May	Moderate	Low------	Moderate.
36A---------- Metamora	B	None--------	---	---	0.5-2.0	Apparent	Nov-May	High-----	Moderate	Moderate.
38---------- Napoleon	A/D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	High-----	Moderate	High.
39---------- Granby	A/D	None--------	---	---	+1-1.0	Apparent	Nov-Jun	Moderate	High-----	Low.
40B*, 40C*. Udorthents										
41B*. Aquents										
42*. Pits										
43*:										
Sloan----------	B/D	Frequent----	Brief-----	Nov-Jun	0-1.0	Apparent	Nov-Jun	High-----	High-----	Low.
Marlette----------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Moderate.
44B, 44C, 44D----- Riddles	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
45B, 45C, 45D----- Arkport	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Moderate.
46A---------- Dixboro	B	None--------	---	---	1.0-2.0	Apparent	Nov-Apr	High-----	Moderate	Moderate.
47B*, 47C*:										
Fox----------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Moderate.
Riddles----------	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
48---------- Gilford	B	None--------	---	---	+.5-1.0	Apparent	Dec-May	High-----	High-----	Moderate.
49---------- Cohoctah	B/D	Frequent----	Long------	Jan-Dec	0-1.0	Apparent	Sep-May	High-----	High-----	Low.
50B*, 50D*. Udipsamments										
51B, 51C---------- Leoni	B	None--------	---	---	>6.0	---	---	Low------	Low------	Moderate.
52A---------- Selfridge	C	None--------	---	---	1.0-2.0	Perched	Nov-May	High-----	High-----	Low.
53A---------- Tedrow	B	None--------	---	---	1.0-2.0	Apparent	Jan-Apr	Moderate	Low------	Low.
54A---------- Matherton	B	None--------	---	---	1.0-2.0	Apparent	Nov-May	High-----	Moderate	Low.
56A*:										
Urban land.										
Blount----------	C	None--------	---	---	1.0-2.0	Perched	Jan-May	High-----	High-----	High.

See footnote at end of table.

TABLE 17.--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					
56A*:										
Lenawee	B/D	None	---	---	+1-1.0	Apparent	Nov-May	High	High	Low.
59*.										
Urban land										
60B*:										
Urban land.										
Marlette	B	None	---	---	2.5-6.0	Apparent	Dec-Apr	Moderate	Low	Moderate.
60C*, 60D*:										
Urban land.										
Marlette	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
61A*:										
Urban land.										
Capac	B	None	---	---	1.0-2.0	Apparent	Nov-May	High	High	Low.
62B*, 62C*:										
Urban land.										
Spinks	A	None	---	---	>6.0	---	---	Low	Low	Low.
63A*:										
Urban land.										
Thetford	A	None	---	---	1.0-2.0	Apparent	Feb-May	Moderate	Low	Moderate.
67B, 67C	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
Ormas										
68*:										
Cohoctah	B/D	Frequent	Long	Jan-Dec	0-1.0	Apparent	Sep-May	High	High	Low.
Fox	B	None	---	---	>6.0	---	---	Moderate	Low	Moderate.
69	D	None	---	---	+1-1.0	Apparent	Nov-Jun	High	High	Low.
Thomas										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Adrian	Sandy or sandy-skeletal, mixed, euic, mesic Terric Medisaprists
Aquents	Sandy and loamy, mixed, mesic Typic Haplaquents
Arkport	Coarse-loamy, mixed, mesic Psammentic Hapludalfs
Blount	Fine, illitic, mesic Aeric Ochraqualfs
Boyer	Coarse-loamy, mixed, mesic Typic Hapludalfs
Brookston	Fine-loamy, mixed, mesic Typic Argiaquolls
Capac	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Cohoctah	Coarse-loamy, mixed, mesic Fluvaquentic Haplaquolls
Colwood	Fine-loamy, mixed, mesic Typic Haplaquolls
Dixboro	Coarse-loamy, mixed, mesic Aquollic Hapludalfs
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Gilford	Coarse-loamy, mixed, mesic Typic Haplaquolls
Glynwood	Fine, illitic, mesic Aquic Hapludalfs
Granby	Sandy, mixed, mesic Typic Haplaquolls
Houghton	Euic, mesic Typic Medisaprists
Kibbie	Fine-loamy, mixed, mesic Aquollic Hapludalfs
Lenawee*	Fine, mixed, nonacid, mesic Mollic Haplaquepts
Leoni	Loamy-skeletal, mixed, mesic Typic Hapludalfs
Marlette	Fine-loamy, mixed, mesic Glossoboric Hapludalfs
Matherton	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Udollic Ochraqualfs
Metamora	Fine-loamy, mixed, mesic Udollic Ochraqualfs
Metea	Loamy, mixed, mesic Arenic Hapludalfs
Napoleon	Dysic, mesic Typic Medihemists
Oakville	Mixed, mesic Typic Udipsamments
Ormas	Loamy, mixed, mesic Arenic Hapludalfs
Oshtemo	Coarse-loamy, mixed, mesic Typic Hapludalfs
Owosso	Fine-loamy, mixed, mesic Typic Hapludalfs
Riddles	Fine-loamy, mixed, mesic Typic Hapludalfs
Sebewa	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Argiaquolls
Selfridge	Loamy, mixed, mesic Aquic Arenic Hapludalfs
Sisson	Fine-loamy, mixed, mesic Typic Hapludalfs
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Spinks	Sandy, mixed, mesic Psammentic Hapludalfs
Tedrow	Mixed, mesic Aquic Udipsamments
Thetford	Sandy, mixed, mesic Psammaquentic Hapludalfs
Thomas	Fine-loamy, mixed (calcareous), mesic Histic Humaquepts
Udipsamments	Mixed, mesic Udipsamments
Udorthents	Loamy, mixed, mesic Udorthents
Wasepi	Coarse-loamy, mixed, mesic Aquollic Hapludalfs

* 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.

* U.S. GOVERNMENT PRINTING OFFICE: 1982-354-245/1110