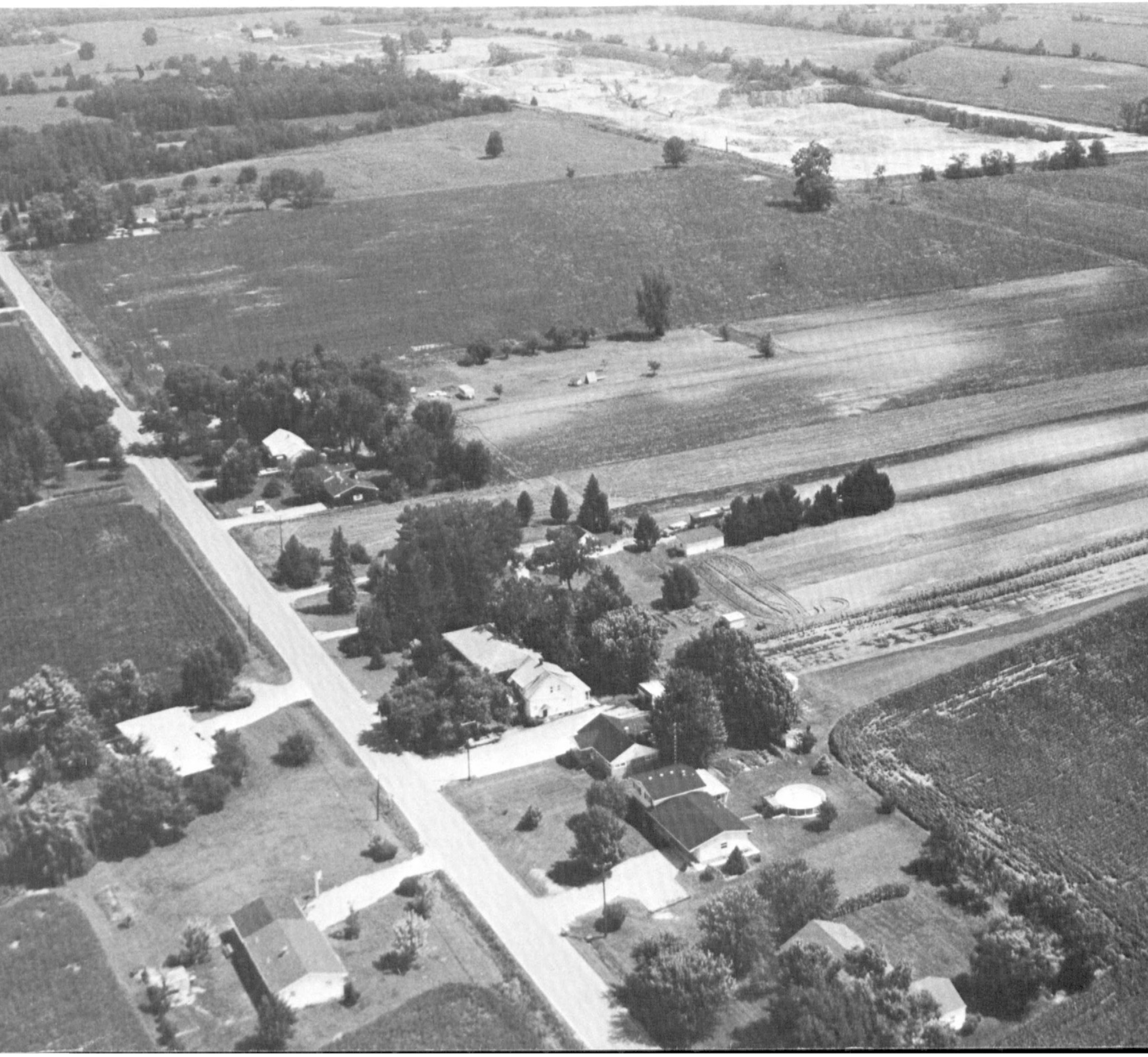
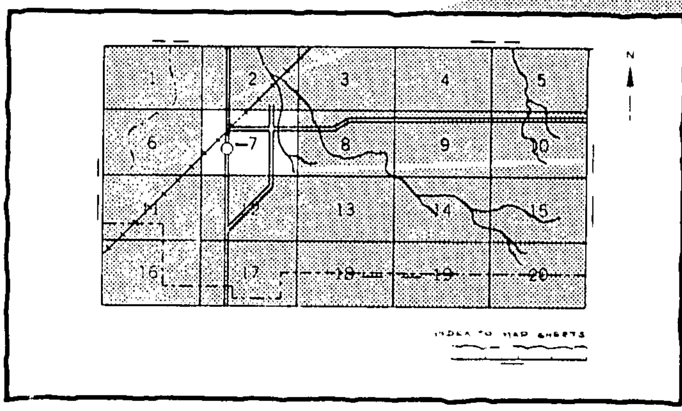
Soil survey of
Monroe County, Michigan

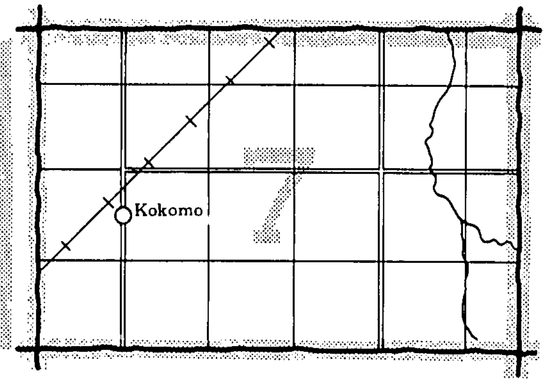
United States Department of Agriculture
Soil Conservation Service in cooperation with
Michigan Agricultural Experiment Station



HOW TO USE

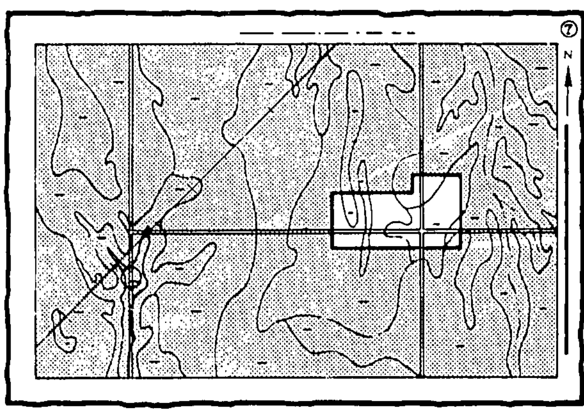
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

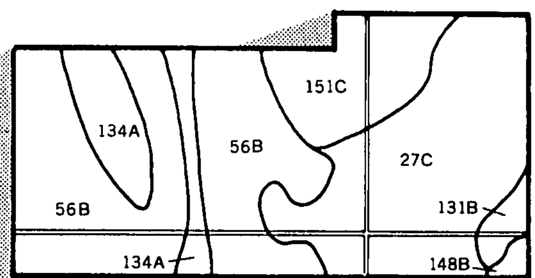




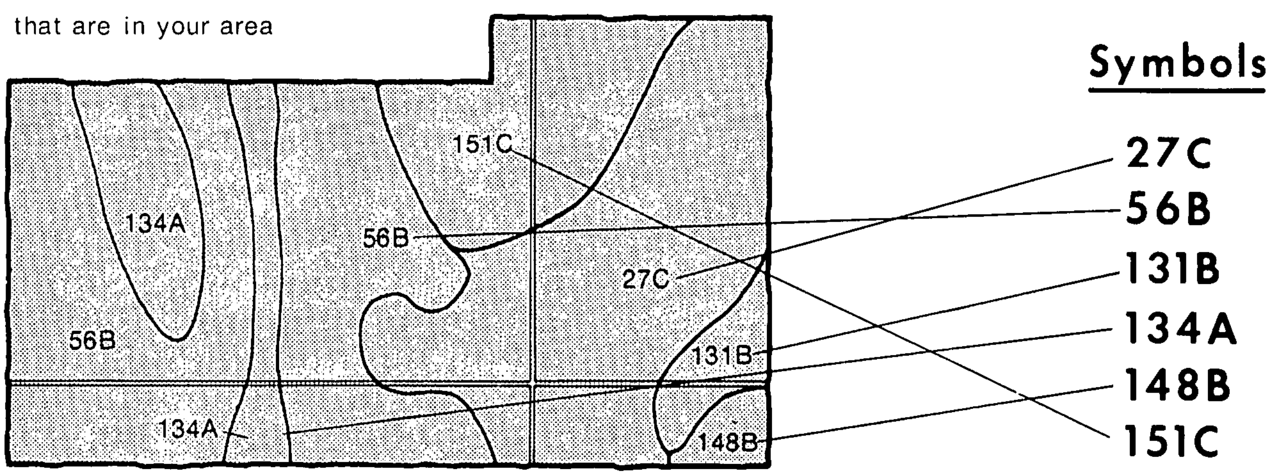
2. Note the number of the map sheet and turn to that sheet.

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



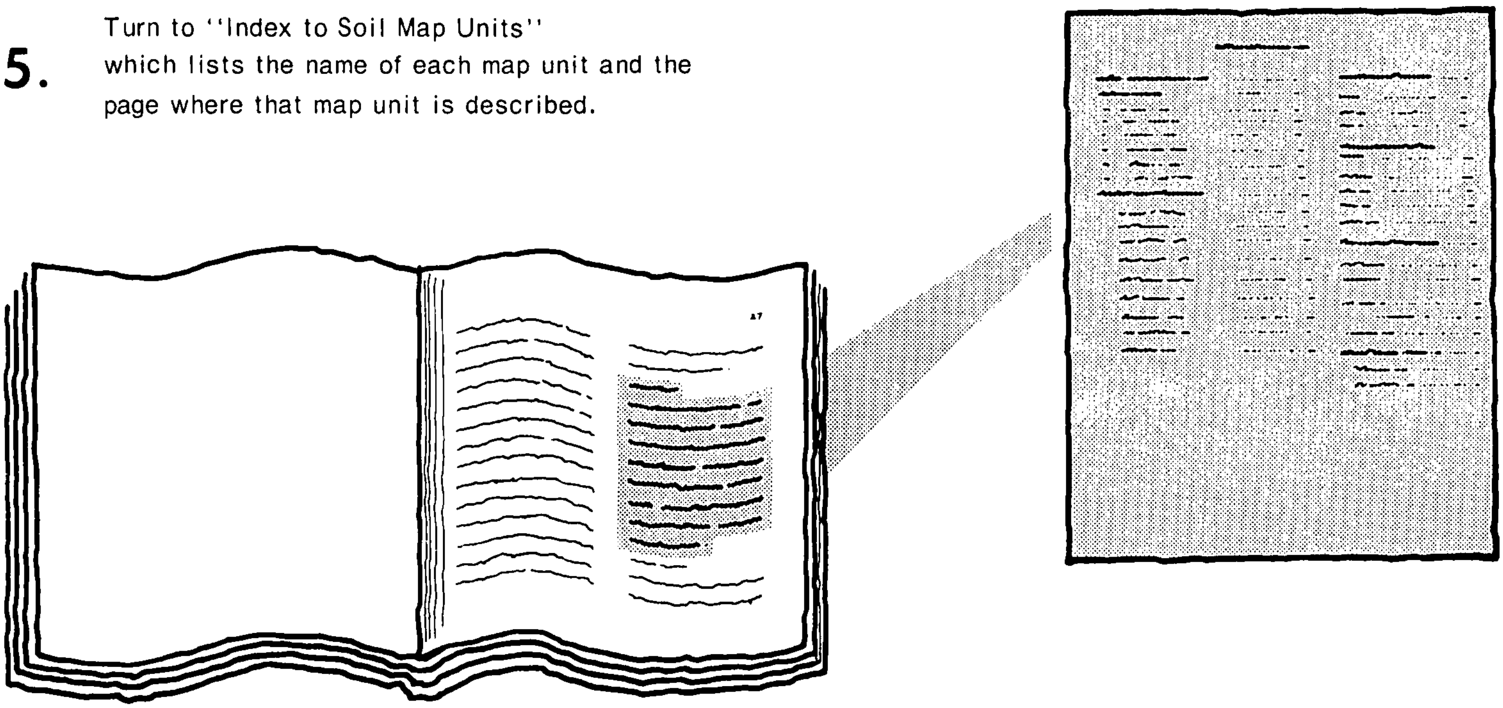


4. List the map unit symbols that are in your area

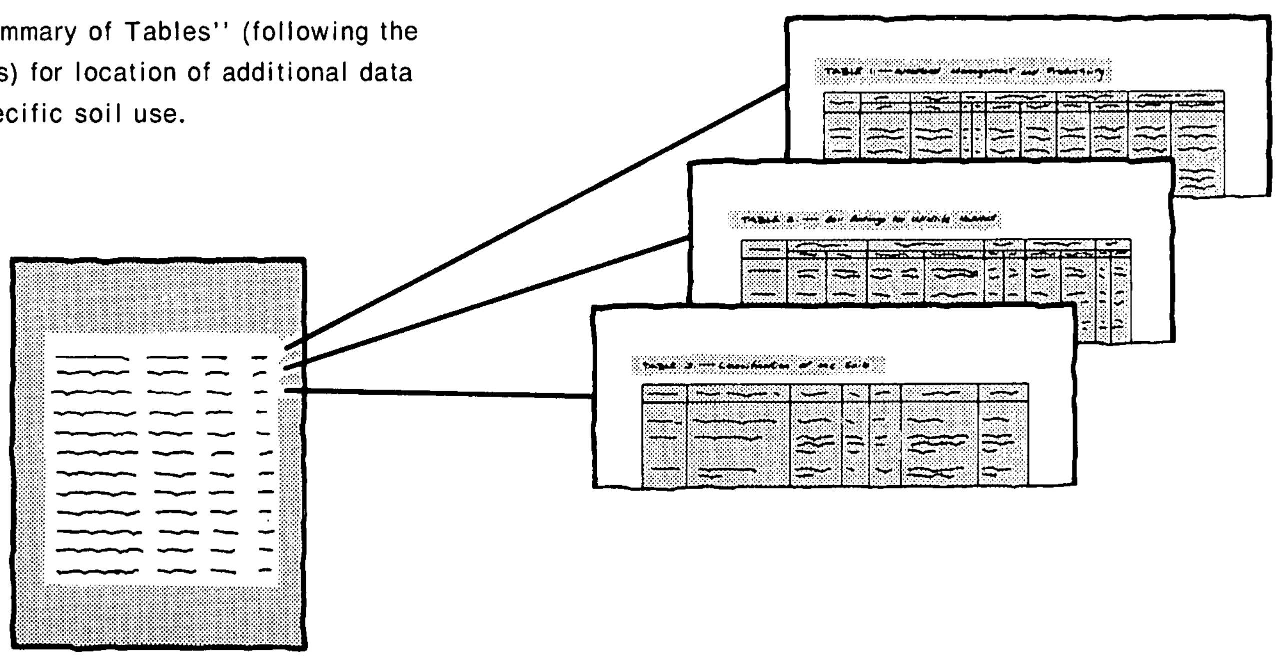


THIS SOIL SURVEY

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 1967-79. 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 Monroe County Soil Conservation District. Financial assistance was made available by the Monroe County Board of Commissioners.

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: An area of Selfridge-Pewamo complex, 0 to 3 percent slopes. The land use is changing from cropland to building sites. The Selfridge soil is light colored, and the Pewamo soil is dark colored. A limestone quarry is in the background in an area of Randolph clay loam, 0 to 3 percent slopes.

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Issued November 1981

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foreword

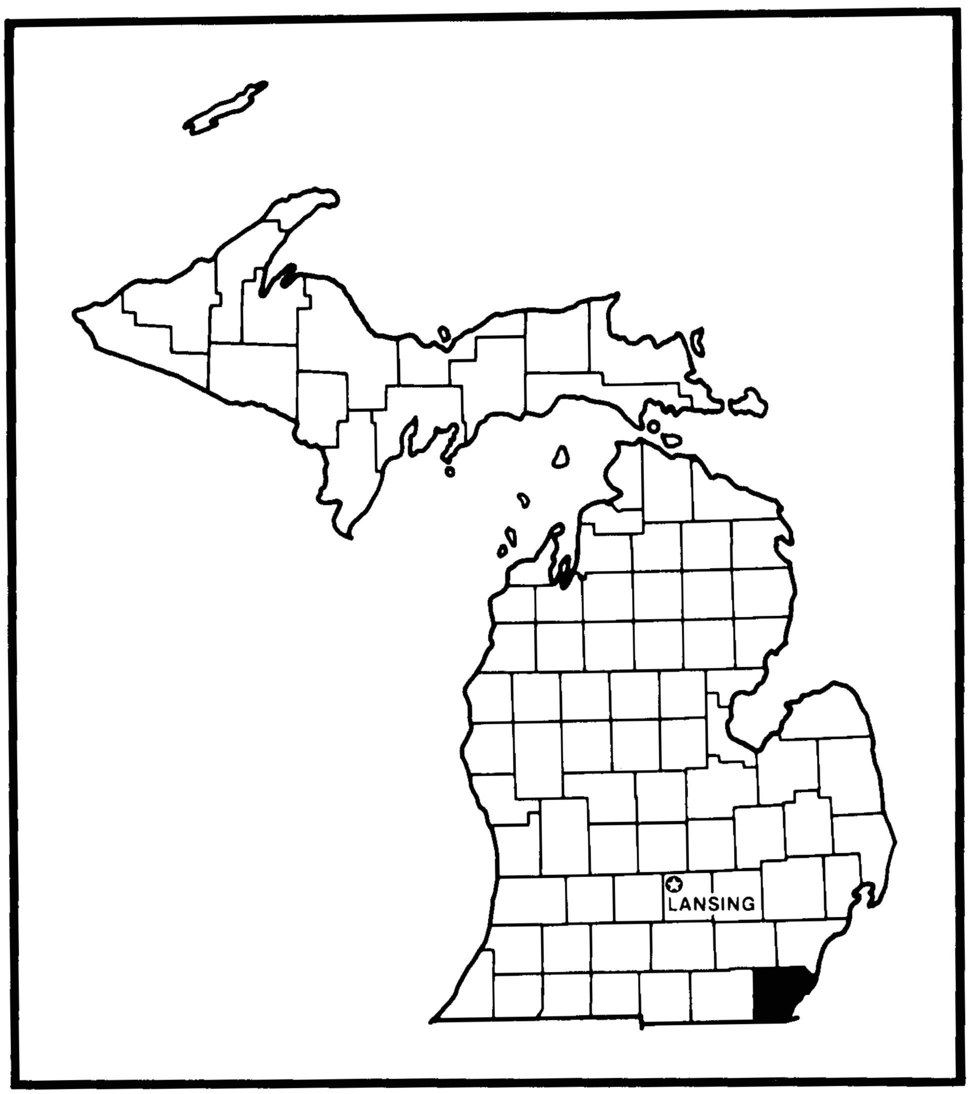
This soil survey contains information that can be used in land-planning programs in Monroe County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact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

soil survey of
Monroe County, Michigan

By William L. Bowman, Soil Conservation Service

Fieldwork by William L. Bowman, Donald F. Gibbs, Richard Larson, and Alvin Parker, Soil Conservation Service;
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United States Department of Agriculture, Soil Conservation Service
in cooperation with Michigan Agricultural Experiment Station

MONROE COUNTY is in the southeastern part of the lower peninsula of Michigan. The county is bordered on the north by Washtenaw and Wayne Counties, on the east by Lake Erie, on the south by the State of Ohio, and on the west by Lenawee County.

The county from east to west is 32 miles at its longest point and 17 miles at its shortest. It is 24 miles from north to south and has a land area about 356,544 acres. In 1978 the population was 118,479, according to the U.S. Census. Monroe, the county seat, is in the east-central part of the county.

general nature of the survey area

This section gives general information about climate, history and development, transportation, and lakes and streams of the survey area.

climate

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

Table 1 gives data on temperature and precipitation for the survey area as recorded at Monroe 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 27.6 degrees F, and the average daily minimum temperature is 20.2 degrees. The lowest temperature on record, which occurred at Monroe on Feb. 5, 1918, is -21 degrees. In summer the average temperature is 71.6 degrees, and the average daily maximum temperature is 81.9 degrees. The highest recorded temperature, which occurred at Monroe on July 24, 1934, is 106 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 31 inches. Of this, 17.91 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 14.7 inches. The heaviest 1-day rainfall during the period of record was 4.08 inches at Monroe on Sept. 9, 1917. Thunderstorms occur on about 42 days each year, and most occur in June and July.

Average seasonal snowfall is 32.9 inches. The greatest snow depth at any one time during the period of record was 20.0 inches on Dec. 3, 1974. On an average of 34 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 at the nearby Detroit Metropolitan Airport in midafternoon is about 60 percent. Humidity is higher at night and near the Lake Erie shore. The average at dawn is about 82 percent. The sun shines 67 percent of the time possible in summer and 38 percent in winter. The prevailing wind is from the southwest. The average windspeed is highest, 11.8 miles per hour, in March, and in January, February, and April it is more than 11.6 miles per hour.

history and development

Monroe County was established in July 1817 (*6*). Prior to 1600, the Ottawa and Pottawatomie Indians occupied villages in what is now Monroe County. They lived nomadic lives and made many paths and trails throughout the county.

About 1783 the French established a settlement along the River Raisin. Settlements in Monroe County and elsewhere in southeastern Michigan grew in size after the Erie Canal opened in 1825.

The settlement of the bloodless Michigan-Ohio War of 1835-36 ended the controversy over the county's southern boundary. In return for giving Michigan the Upper Peninsula, the U.S. Government gave Ohio what is now the city of Toledo.

transportation

The city of Monroe is the only Michigan port city on Lake Erie. Two major airports are in the county. Both accommodate small private planes and charter flights.

Several heavily travelled rail lines traverse the county. Two interstate highways, three U.S. highways, and two state highways link Monroe County to all points within the state.

lakes and streams

There are many miles of frontage on Lake Erie in Monroe County. The lake is important for commercial navigation and for recreation. In the northeastern part of the county, the Saline River runs south to meet the River Raisin, which flows principally east through the central part of the county. The River Raisin, which flows into Lake Erie, and its tributaries are important to drainage of agricultural land.

The largest inland bodies of water in the county are contained in old quarries. The only large natural lake is Lake Ottawa. Many small ponds, which provide important wildlife habitat, formed from borrow pits near highway overpasses and interchanges and in areas where sand has been commercially mined.

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; the kinds of native plants or crops; and the kinds of rock. 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 and 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, called soil associations, that have a distinctive pattern of soils, relief, and drainage. Each soil association on the general soil map is a unique natural landscape. Typically, a soil association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up a soil association 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 soil association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

soil descriptions

1. Lenawee ponded, association

Nearly level, very poorly drained, silty soils; on lake plains

The soils in this association are nearly level. The areas are along Lake Erie and adjacent to large rivers and streams.

This association makes up about 2 percent of the county.

Lenawee soils are level and very poorly drained. Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is mottled and about 23 inches thick. The upper part is grayish brown, firm and very firm silty clay loam; the lower part is brown, very firm silty clay. The substratum to a depth of 60 inches is multicolored silt loam.

The soils of minor extent in this association are sand deposits in areas of beach. These soils are in higher areas that pond less frequently.

The soils in this association are used mainly as wildlife habitat. Ponding is the main limitation.

2. Hoytville-Nappanee association

Nearly level, very poorly drained and somewhat poorly drained, silty and loamy soils; on ground moraines, lake plains, and till plains

This association makes up about 9 percent of the county. It is about 74 percent Hoytville soils, 10 percent Nappanee soils, and 16 percent soils of minor extent.

Hoytville soils are in natural drainageways and in broad, flat areas. Nappanee soils are on slight ridges and knolls.

Hoytville soils are nearly level and very poorly drained. Typically, the surface layer is very dark gray silty clay loam about 9 inches thick. The subsoil is gray, mottled, very firm clay about 31 inches thick. The substratum to a depth of 60 inches is gray, mottled clay.

Nappanee soils are nearly level and somewhat poorly drained. Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is mottled and is grayish brown, very firm clay about 16 inches thick. The substratum to a depth of 60 inches is gray, mottled silty clay loam.

The soils of minor extent in this association are the somewhat poorly drained Blount and Metamora soils. They occupy positions on the landscape similar to those of the Nappanee soils.

In many areas the soils in this association are used for cultivated crops, and in some areas they are used for pasture. Most of the acreage has been cleared and drained. Some areas have not been drained and are ponded. Excess water is the main limitation to use of these soils for crops.

The soils in this association, if drained, have good suitability for cultivated crops. They have poor suitability for sanitary facilities and building site development. Wetness is a severe limitation.

3. Oakville-Tedrow-Granby association

Nearly level and gently sloping, well drained to poorly drained, sandy soils; on glacial outwash plains and lake plains

This association makes up about 22 percent of the county. It is about 25 percent Oakville soils, 24 percent Tedrow soils, 20 percent Granby soils, and 31 percent soils of minor extent (fig. 1).

Oakville soils in most areas are higher in elevation than Tedrow and Granby soils. They are on sandy ridges and knolls. Tedrow soils are generally in slightly lower broad areas, and Granby soils are in low-lying flat areas.

Oakville soils are nearly level to gently sloping and are well drained or moderately well drained. Typically, the surface layer is very dark grayish brown fine sand about 7 inches thick. The subsoil is dark yellowish brown,

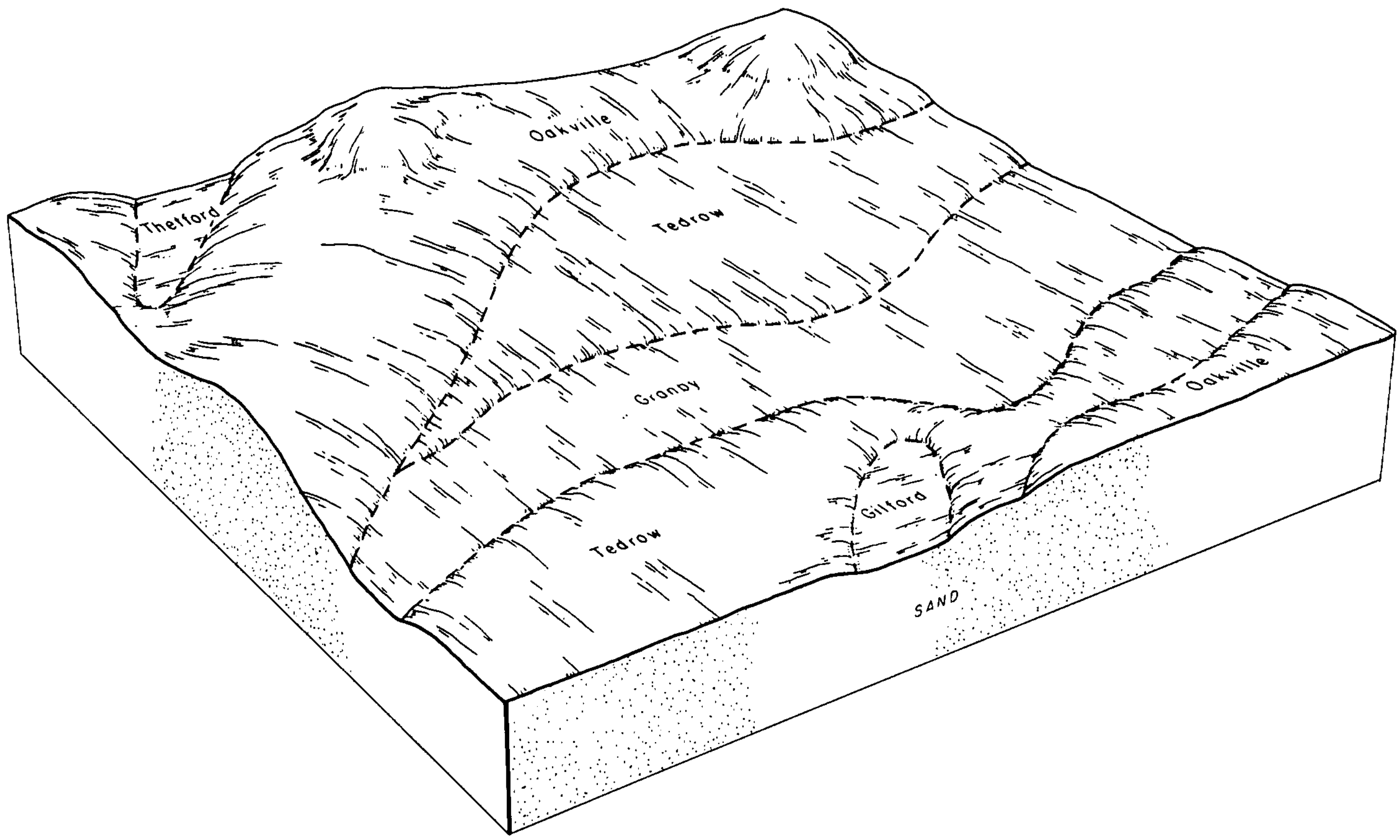

Figure 1.—Pattern of soils and underlying material in Oakville-Tedrow-Granby association.

yellowish brown, and brown, loose fine sand about 20 inches thick. The substratum to a depth of 60 inches is light yellowish brown, mottled fine sand.

Tedrow soils are nearly level and are somewhat poorly drained. Typically, the surface layer is very dark grayish brown loamy sand about 8 inches thick. The subsoil is yellowish brown and pale brown, mottled fine sand 46 inches thick. The substratum to a depth of 60 inches is brown fine sand.

Granby soils are nearly level and poorly drained. Typically, the surface layer is black loamy fine sand about 10 inches thick. The subsurface layer is very dark gray sand about 2 inches thick. The subsoil is mottled and is dark gray and dark grayish brown, loose sand and fine sand about 18 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled sand.

The soils of minor extent in this association are the well drained Spinks soils, the somewhat poorly drained Thetford and Kibbie soils, the poorly drained Colwood soils, and very poorly drained Gilford soils. Spinks soils are in positions on the landscape similar to those of Oakville soils. Thetford and Kibbie soils are in positions similar to those of the Tedrow soils. Colwood and Gilford soils are in low-lying areas.

The moderately well drained soils in this association are generally used as woodland. The rest are used mainly as farmland. Ponding is a limitation on the poorly drained soils. Droughtiness and wetness are the main limitations for cultivated crops.

The soils in this association have fair to poor suitability for cultivated crops. The well drained and moderately well drained soils have the best suitability of any soils in the county for building site development and for use as septic tank absorption fields. The other soils in this association have severe limitations for sanitary facilities and building site development because of wetness.

4. Fulton-Toledo association

Nearly level, somewhat poorly drained and very poorly drained, silty soils; on lake plains

This association makes up about 7 percent of the county. It is about 61 percent Fulton soils, 33 percent Toledo soils, and 6 percent soils of minor extent. Fulton soils in most places are slightly higher in elevation than Toledo soils.

Fulton soils are nearly level and somewhat poorly drained. Typically, the surface layer is dark grayish brown, silty clay loam about 7 inches thick. The subsoil is firm and mottled and is about 17 inches thick. The upper part is yellowish brown silty clay; the lower part is brown clay and silty clay. The substratum to a depth of 60 inches is brown, mottled silty clay.

Toledo soils are nearly level and are very poorly drained. Typically, the surface layer is very dark grayish brown, silty clay loam about 6 inches thick. The subsoil is mottled and is firm silty clay about 30 inches thick. The upper part is dark gray, the middle part is light gray, and the lower part is gray. The substratum to a depth of 60 inches is light gray, stratified clay, silty clay, and silty clay loam.

The soils of minor extent in this association are the somewhat poorly drained Blount and Del Rey soils and the poorly drained Corunna and Lenawee soils. Blount and Del Rey soils are in positions on the landscape similar to those of Fulton soils, and Lenawee and Corunna soils are in low-lying areas and natural drainageways.

In most areas the soils in this association are farmed. The rest are used as woodland or are idle. The management concerns are excess water and the restricted permeability.

The soils in this association are fairly suited to cultivated crops. They are poorly suited to sanitary facilities and building site development because of wetness. Wetness is a severe limitation that is very difficult to overcome. Ponding is common on the poorly drained soils.

5. Lenawee-Del Rey association

Nearly level, poorly and somewhat poorly drained, silty soils; on lake plains

This association makes up about 9 percent of the county. It is about 65 percent Lenawee soils, 33 percent Del Rey soils, and 2 percent soils of minor extent. Del Rey soils in most places are slightly higher in elevation than Lenawee soils.

Lenawee soils are level and poorly drained. The surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is mottled and is about 23 inches thick. The upper part is grayish brown, firm and very firm silty clay loam; the lower part is brown, very firm silty clay. The substratum to a depth of 60 inches is multicolored silt loam.

Del Rey soils are nearly level and somewhat poorly drained. Typically, the surface is very dark grayish brown silt loam about 9 inches thick. The subsoil is mottled and is about 15 inches thick. The upper part is dark yellowish brown, firm silty clay loam; the lower part is brown, friable silty clay loam. The substratum to a depth of 60 inches is brown, mottled silty clay loam with thin strata of very fine sand, silty loam, and silty clay.

Of minor extent in this association are the somewhat poorly drained Kibbie and Selfridge soils and the poorly drained Colwood soils. Kibbie and Selfridge soils are in positions on the landscape similar to those of Del Rey soils. Colwood soils are in natural drainageways and in low-lying areas.

In most areas the soils in this association are used for cultivated crops. Most of the acreage is cleared and drained. Wetness is the main limitation to use of these soils for farming. Ponding is common in the lowest areas.

The soils in this association, if adequately drained, have good suitability for cultivated crops. They have poor suitability for sanitary facilities and building site development. Wetness is a severe limitation.

6. Pewamo-Selfridge-Blount association

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

This association makes up about 51 percent of the county. It is about 30 percent Pewamo soils, 17 percent Selfridge soils, 10 percent Blount soils, and 43 percent soils of minor extent (fig. 2).

Selfridge and Blount soils are on slight ridges and knolls. Pewamo soils are in natural drainageways and in low, flat areas.

Pewamo soils are nearly level and poorly drained. Typically, the surface layer is black clay loam about 9 inches thick. The subsurface layer is very dark gray clay loam about 3 inches thick. The subsoil is mottled and is dark gray, very firm clay loam about 23 inches thick. The substratum to a depth of 60 inches is gray, mottled clay loam.

Selfridge soils are nearly level and somewhat poorly drained. Typically, the surface layer is very dark grayish brown loamy sand about 8 inches thick. The subsurface layer is brown sand about 7 inches thick. The subsoil is mottled and is about 17 inches thick. The upper part is yellowish brown, loose sand; the middle part is dark brown, friable sandy loam; and the lower part is reddish brown, friable clay loam. The substratum to a depth of 60 inches is reddish gray, mottled clay loam.

Blount soils are nearly level and somewhat poorly drained. Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is mottled and is about 14 inches thick. The upper part is dark grayish brown, firm silty clay loam; the lower part is dark yellowish brown and brown, very firm clay. The substratum to a depth of 60 inches is grayish brown, mottled silty clay loam.

The soils of minor extent in the association are somewhat poorly drained Metamora soils and the poorly drained Corunna and Belleville soils. Metamora soils are in positions on the landscape similar to those of the Blount and Selfridge soils. The Corunna and Belleville soils are in positions on the landscape similar to those of Pewamo soils.

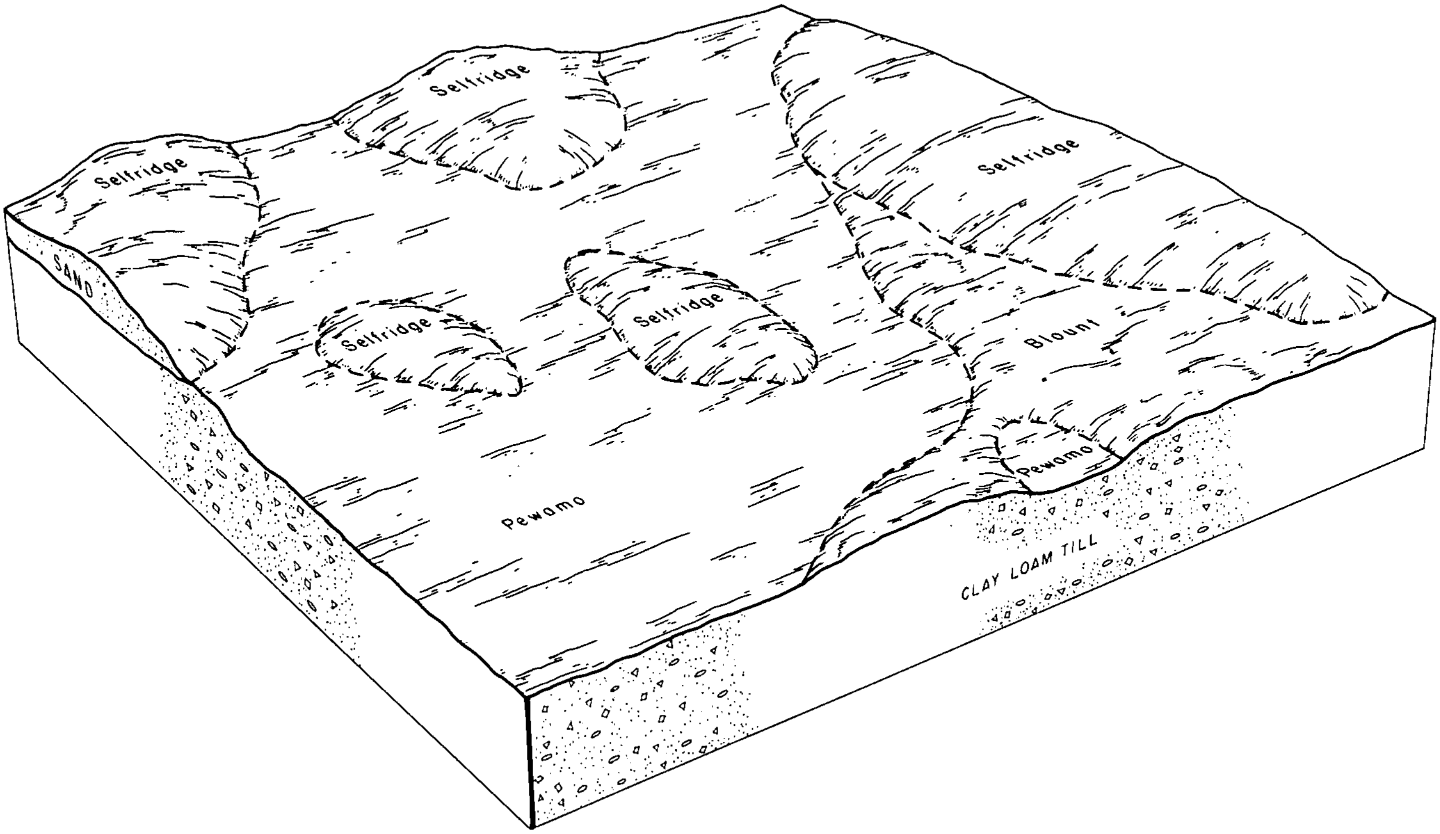

Figure 2.—Pattern of soils and underlying material in Pewamo-Selfridge-Blount association.

Figure 3.—Soil blowing in an area of Oakville-Tedrow-Granby association.

In most areas the soils in this association are used for cultivated crops, but in some areas they are used for pasture. In most areas the soils are artificially drained. Ponding occurs in some undrained areas. Wetness is the main limitation to the use of these soils for farming.

The soils in this association, if adequately drained, have good suitability for cultivated crops. They have poor suitability for sanitary facilities and building site development. Wetness is a severe limitation.

broad land use considerations

Each year, a considerable amount of land is developed for residential use throughout the survey area. The general soil map is helpful in selecting general locations for residential development, but it cannot be used to select sites for specific residential or other urban structures. The data in this survey about specific soils can be helpful in planning future land use patterns.

In extensive areas the soils have severe limitations for residential and other urban development. The soils in all the soil associations, except the Oakville-Tedrow-Granby association, have a seasonal high water table, which is a severe limitation for urban development. Most of the soils in the Oakville-Tedrow-Granby association have moderate and severe limitations for building site development. The soils in this association, although poorly suited to development, are the least costly to develop for urban use. The moderately well drained Oakville soils and the moderately well drained and well drained sandy soils have low shrink-swell potential or low frost heave potential. Wetness is a minor concern and is not very costly to overcome in these soils.

In some areas the soils have good suitability for farming but poor potential for nonfarm uses. Such soils are in associations 2, 4, 5, and 6, and the dominant soils are Hoytville, Nappanee, Fulton, Toledo, Lenawee, Del Rey, Pewamo, Selfridge, and Blount soils. If these soils are used for nonfarm uses, wetness is a limitation unless the soils are drained.

Soil blowing is a problem on the soils in association 3 on the general map (fig. 3). The soils in this association have a sandy surface layer.

All the soils in this county, except those in association 1, have fair suitability for use as woodland. Commercially valuable trees are scarce on many soils. Wetness causes slow growth, low survival, and poor regeneration of seedlings.

All the soils are poorly suited to most kinds of recreation development. The main limitation is wetness.

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, Oakville fine sand, 0 to 6 percent slopes is one of several phases in the Oakville series.

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

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. Blount-Pewamo-Metamora complex, 0 to 3 percent slopes is an example.

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. Dumps 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

10—Lenawee silty clay loam, ponded. This is a nearly level, very poorly drained soil adjacent to Lake Erie. It is ponded most of the year. The areas are elongated or irregular in shape and range from 10 to over 700 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is mottled and is about 23 inches thick. The upper part is grayish brown, firm and very firm silty clay loam; the lower part is brown, very firm silty clay. The substratum to a depth of 60 inches is multicolored silty loam.

Included with this soil in mapping are areas of lake beach sands that are generally covered with brush and trees, mainly willows. These areas make up about 5 percent of the map unit.

Permeability is moderately slow, and the available water capacity is high. The water table is near or above the surface from September to June (fig. 4).

In most areas this soil is used as wildlife habitat. The wildlife habitat is a nesting area for ducks and redwing black birds. Some areas are being filled for use as industrial building sites. Because of ponding, this soil is generally not suited to use as cropland, pasture, and woodland or to recreation, sanitary facilities, and building site development. It has good suitability for wetland wildlife.

The capability subclass is VIIIw. The Michigan soil management group is 1.5c.

11B—Oakville fine sand, 0 to 6 percent slopes. This is a nearly level and gently sloping, moderately well drained soil on small ridges and knolls. The areas are irregular in shape and range from 3 to 200 acres in size.

Figure 4.—An area of Lenawee silty clay loam, ponded. These soils are well suited to wetland wildlife.

Typically, the surface layer is very dark grayish brown fine sand about 7 inches thick. The subsoil is dark yellowish brown, yellowish brown, and brown, loose fine sand about 20 inches thick. The substratum to a depth of 60 inches is light yellowish brown, mottled fine sand. In some places the subsoil has gray mottles. In some places there are loamy bands either above or below a depth of 40 inches.

Included with this soil in mapping are some small areas of somewhat poorly drained Thetford and poorly drained Granby soils. Thetford soils are on slight knolls and ridges. Granby soils are in low areas and in natural drainageways. Thetford and Granby soils make up about 5 percent of the map unit.

Permeability is rapid, and the available water capacity is low. Surface runoff is very slow. The high water table is at a depth of 3 to 6 feet from November to April.

In most areas this soil is used as woodland. It has poor suitability for recreation development and for use as cropland, septic tank absorption fields, and sewage lagoons. It has good suitability for use as pasture and woodland and fair suitability for building site development.

If this soil is used as cropland, the major concerns are controlling soil blowing, conserving soil moisture, and maintaining the organic matter content. Field windbreaks, wind stripcropping, vegetative barriers, buffer strips, and cover crops help control soil blowing, as does tillage that does not invert the soil and leaves all or part of the crop residue on the surface. Crop residue, livestock manure, and green manure crops help increase the organic matter content and the available water capacity of the soil. Irrigation helps increase crop yields.

If this soil is used as pasture, droughtiness during dry periods and soil blowing are major limitations. Overgrazing can reduce plant cover, creating conditions favorable to soil blowing. Rotation or strip grazing, along with field windbreaks, helps control soil blowing.

If this soil is used as woodland, seedling mortality is a concern. Harvesting methods that leave some mature trees for shade and protection of the soils may be necessary. Special planting stock and overstocking may also be necessary to reduce seedling mortality.

If this soil is used for recreation development, the soft, loose surface layer is a major concern. Covering paths and trails with wood chips and bark improves their trafficability. Adding loamy material to the surface and seeding drought resistant grasses and legumes will make playground and picnic areas more serviceable and attractive.

In most places this soil is suited to building site development and is generally not suited to use as sewage lagoons. It has limitations for use as septic tank absorption fields because of a poor filtering capacity and a high water table. The caving of cutbanks in shallow excavations is a concern. Caving can be controlled by constructing retaining walls.

The capability subclass is IVs. The Michigan soil management group is 5.3a.

12B—Spinks loamy sand, 0 to 6 percent slopes. This is a nearly level and gently sloping, well drained soil on knolls and ridges. The areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is dark grayish brown loamy sand about 9 inches thick. The subsurface layer is brownish yellow sand about 19 inches thick. Below that, to a depth of 49 inches, is light yellowish brown, loose sand with thin strata of very friable loamy sand. In some places there is less than 6 inches of bands. The substratum to a depth of 60 inches is grayish brown sand.

Included with this soil in mapping are small areas of somewhat poorly drained Tedrow and Thetford soils in slight depressions. They make up about 15 percent of the unit.

Permeability is moderately rapid, and the available water capacity is low. Surface runoff is slow.

In most areas this soil is farmed. It has fair suitability for use as cropland and for recreation development. It has good suitability for use as pasture, woodland, septic tank absorption fields, and building sites. It has poor suitability for use as sewage lagoons.

If this soil is used as cropland, the major concerns are reducing droughtiness, maintaining the organic matter content, and controlling soil blowing. Field windbreaks, buffer strips, wind stripcropping, vegetative barriers, and cover crops help control soil blowing, as does conservation tillage that does not invert the soil and that leaves all or part of the residue on the surface. Crop residue and green manure crops help improve the organic matter content and reduce droughtiness. Irrigation helps increase crop yields.

If this soil is used as pasture, the major concerns are droughtiness and soil blowing. Overgrazing can reduce plant cover, creating conditions that result in soil blowing. Rotational or strip grazing helps maintain plant cover and helps reduce susceptibility to soil blowing.

If this soil is used as woodland, the major concern is seedling mortality. In some areas it may be necessary to use special site preparation such as furrowing. The loss of planted or natural tree seedlings can be high because of dry weather conditions.

This soil is suited to building site development and to use as septic tank absorption fields. It is not suitable for use as sewage lagoons. The caving of cutbanks in shallow excavations is a concern. Retaining walls can control the cave-ins.

The capability subclass is IIIs. The Michigan soil management group is 4a.

13A—Blount loam, 0 to 3 percent slopes. This is a nearly level, somewhat poorly drained soil on upland flats. The areas of this unit are irregular in shape and range from 3 to 230 acres in size.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is mottled and is about 14 inches thick. The upper part is dark grayish brown, firm silty clay loam; the lower part is dark yellowish brown and brown, very firm clay. The substratum to a depth of 60 inches is grayish brown, mottled, silty clay loam. In some places the subsoil has less clay. In some places the carbonates are at a depth of 15 to 19 inches. Also, in some small places the subsoil is more gray. In some places the substratum is compacted clay loam.

Included with this soil in mapping are some small areas of Metamora and Selfridge soils. Metamora and Selfridge soils occupy positions similar to those of Blount soils on the landscape. These soils have a coarser textured subsoil. They make up about 15 percent of the unit.

Permeability is slow or moderately slow, and the available water capacity is high. Surface runoff is slow. The water table is at a depth of 1 to 3 feet from January to May.

In most areas this soil is farmed. It has good suitability for use as cropland, pasture, woodland, and sewage lagoons. It has poor suitability for recreation development and building site development and for use as septic tank absorption fields.

If this soil is used as cropland, the major concerns are removing excess water during wet periods and maintaining good tilth. Combined surface and subsurface tile drainage help control wetness. Good tilth can be maintained by restricting field operations during wet periods and by using conservation tillage that does not invert the soil and that leaves all or part of the crop residue on the surface.

If this soil is used as pasture, the major concern is excess water. Grazing after heavy rains usually results in surface compaction, excessive runoff, and poor tilth. Rotation or strip grazing and timely deferred grazing help maintain good tilth in pasture.

If this soil is used for recreation development, the major concerns are permeability and wetness. This soil dries out slowly in early spring and after heavy rains. Surface or subsurface drains help control wetness.

This soil is suited to use as sewage lagoons. It has limitations for use as septic tank absorption fields and building sites. The major concerns are a seasonal high water table, permeability, and shrinking and swelling. This soil is poorly suited to use as septic tank filter fields because of moderately slow permeability and wetness. Conventional septic tank absorption fields generally are not practical on this soil. Buildings may be constructed without basements. Buildings should be placed on raised, well compacted fill material. Surface and subsurface drainage help lower the water table.

The capability subclass is IIw. The Michigan soil management group is 1.5b.

14A—Del Rey silt loam, 0 to 3 percent slopes. This is a nearly level, somewhat poorly drained soil in broad areas on lake plains. The areas are irregular in shape and range from 4 to 400 acres or more in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is mottled and is about 15 inches thick. The upper part is dark yellowish brown and yellowish brown, firm silty clay loam; the lower part is brown, friable silty clay loam. The substratum to a depth of 60 inches is brown, mottled, silty clay loam with thin strata of very fine sand, silt loam, and silty clay. In some places carbonates are at a depth of less than 20 inches. In some places the substratum is clay loam material. In some places the subsoil is more gray.

Permeability is slow, and the available water capacity is high. The surface runoff is slow. The seasonal high water table is at a depth of 1 to 3 feet from January to May.

In most areas this soil is farmed. It has good suitability for use as cropland, pasture, and woodland. It has poor suitability for most recreation uses and for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland the major concerns are removing excess water and maintaining tilth. Combined surface and subsurface tile drainage helps control wetness. Shallow surface ditches effectively remove surface water in low areas after rains. Erosion control structures may be needed where the surface ditches and natural drainageways enter outlets. Working this soil when too wet results in a cloddy, compacted soil. Cover crops, crop residue, and regular addition of other organic matter helps maintain good soil tilth, as does conservation tillage that does not invert the soil and that leaves crop residue on the surface.

If this soil is used as pasture, the major concern is excess water. Grazing this soil after heavy rains usually causes surface compaction, excessive runoff, and poor tilth. Rotational or strip grazing and timely deferred grazing on pasture help maintain good soil conditions.

If this soil is used for recreation development, the major concerns are wetness and permeability. Artificial drainage or filling with suitable material helps reduce wetness and permeability.

This soil is suited to use as sewage lagoons. It is limited for use as septic tank absorption fields because of a high water table and slow permeability. Conventional septic tank absorption fields generally are not practical on this soil. These soils are limited for use as building sites because of a high water table. Buildings can be constructed without basements. Buildings should be placed on raised, well-compacted fill material. Surface drainage and subsurface tile drainage help lower the water table and remove excess water.

The capability subclass is IIw. The Michigan soil management group is 1.5b.

15A—Fulton silty clay loam, 0 to 3 percent slopes. This is a nearly level, somewhat poorly drained soil on slight rises and knolls. The areas are irregular in shape and range from 3 to 120 acres in size.

Typically, the surface layer is dark grayish brown, silty clay loam about 7 inches thick. The subsoil is mottled, firm, and about 17 inches thick. The upper part is yellowish brown, silty clay; the lower part is brown clay and silty clay. The substratum to a depth of 60 inches is brown, mottled silty clay. In some places the subsoil has more clay, and in other places it has less clay. In some places the substratum is clay loam material.

The permeability is slow, and the available water capacity is moderate. Surface runoff is slow. The seasonal high water table is at a depth of 1 foot to 2 1/2 feet from December to May.

In most areas this soil is farmed. It has fair suitability for use as cropland and pasture. It has poor suitability for most recreation development and building site development and for use as woodland and septic tank absorption fields. It has good suitability for use as sewage lagoons.

If this soil is used as cropland, the major concerns are removing excess water and maintaining good tilth. Surface and subsurface tile drainage is needed for optimum crop production. Tile lines may become filled with fine sand and silt unless the lines are blinded with suitable material. Good tilth can be maintained by restricting field operations during wet periods and by using conservation tillage that does not invert the soil and that leaves crop residue on the surface.

If this soil is used as pasture, the major concern is excess water. Grazing after heavy rains usually results in surface compaction, excess runoff, and poor tilth. Rotation or strip grazing and timely deferment of grazing help maintain good tilth.

If this soil is used for recreation development, the major concerns are wetness and permeability. This soil, when wet, is very slippery to foot traffic. Artificial drainage helps reduce wetness. Limiting the use of recreation areas during wet periods helps to control the problems of surface compaction and slow permeability.

This soil has limitations for use as septic tank absorption fields and for building site development. It is suited to use as sewage lagoons. It is limited for use as septic tank absorption fields because of a high water table and slow permeability. Conventional septic tank absorption fields generally are not practical on this soil. This soil has limitations for building sites because of a high water table and shrinking and swelling. Buildings without basements can be constructed, but surface and subsurface tile drainage should be installed to lower the water table and remove excess water.

The capability subclass is IIIw. The Michigan soil management group is 1b.

16A—Tedrow loamy sand, 0 to 3 percent slopes. This is a nearly level, somewhat poorly drained soil on slight knolls. The areas of this soil are irregular in shape and range from 3 to 300 acres in size.

Typically, the surface layer is very dark grayish brown loamy sand about 8 inches thick. The subsoil is yellowish brown and pale brown, mottled fine sand about 46 inches thick. The substratum to a depth of 60 inches is brown fine sand. In some places the subsoil has loamy strata. In some places there are no grayish mottles in the upper part of the subsoil.

Permeability is rapid, and the available water capacity is low. Surface runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet in winter and spring.

In most areas this soil is farmed. It has fair suitability for use as cropland and pasture. It has fair suitability for use as woodland. It has poor suitability for recreation development and for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concerns are excess water, soil blowing, and droughtiness. Tile drainage helps control wetness. Field windbreaks, wind stripcropping, vegetative barriers, buffer strips, and cover crops help control soil blowing, as does conservation tillage that does not invert the soil and that leaves crop residue on the surface. Crop residue, manure, and green manure crops increase the available water capacity of the soil. Irrigation helps increase crop yields.

If this soil is used as pasture, the major concerns are excess water and soil blowing. Grazing during wet periods tends to cause poor tilth. If overgrazed, this soil is susceptible to soil blowing. Rotation and strip grazing and field windbreaks help reduce soil blowing.

If this soil is used as woodland, the major concern is seedling mortality. The loss of planted or natural tree seedlings, because of dry weather conditions, can be high. It may be necessary to use special harvest methods that leave some mature trees for shade and protection of the soils.

If this soil is used for recreation development, the major concern is wetness. Subsurface or open ditch drains may be needed to reduce wetness.

This soil has limitations for use as septic tank absorption fields, sewage lagoons, and building sites because of a high water table and poor filtering capacity. Conventional septic tank absorption fields generally are not practical on this soil. Dwellings without basements can be constructed. Artificial drainage should be installed to lower the high water table.

The capability subclass is IIIs. The Michigan soil management group is 5b.

17A—Metamora-Corunna sandy loams, 0 to 3 percent slopes. This map unit consists of a nearly level, somewhat poorly drained Metamora soil and a poorly drained Corunna soil. The Metamora soil is on upland flats. The Corunna soil is in depressions and in natural drainageways. It is subject to frequent ponding. These soils are in areas so small or so intricately mixed that it was not practical to map them separately (fig. 5). The mapped areas are irregular in shape and range from 3 to 1,200 acres or more in size. This map unit is made up of about 45 percent Metamora soil, 30 percent Corunna soil, and 25 percent other soils.

Typically, the Metamora soil has a surface layer of black sandy loam about 7 inches thick. The subsurface

Figure 5.—An area of Metamora-Corunna sandy loams, 0 to 3 percent slopes. The Metamora soil is light colored, and the Corunna soil is dark colored.

layer is brown sandy loam about 3 inches thick. The mottled, friable subsoil is about 11 inches thick. The upper part is grayish brown sandy loam; the lower part is light brownish gray sandy loam. The substratum to a depth of 60 inches is brown, mottled silty clay loam. In some places the substratum is within 20 inches of the surface.

Typically, the Corunna soil has a surface layer of very dark gray sandy loam about 11 inches thick. The subsoil is mottled and is about 23 inches thick. The upper part is grayish brown and light brownish gray, friable sandy loam; the middle part is yellowish brown, loose loamy fine sand; the lower part is grayish brown, friable sandy loam. The substratum to a depth of 60 inches is dark grayish brown, mottled clay loam.

Included with these soils in mapping are some small areas of somewhat poorly drained Selfridge soils. Selfridge soils have a surface layer of sand 20 to 40 inches thick over loamy material. They are on low knolls and ridges. They make up about 10 to 15 percent of the unit. Also included are very poorly drained Brookston soils and poorly drained Belleville soils. They are in positions similar to those of Corunna soils. Belleville soils have more sand in the subsoil than Corunna soils, and Brookston soils have more clay. Belleville and Brookston soils make up about 5 to 10 percent of the unit.

Permeability is moderately rapid in the subsoil of the Metamora soil and moderately slow in the underlying material. The available water capacity is high, and surface runoff is slow. The seasonal water table is at a depth of 1/2 foot to 1 1/2 feet in winter and spring.

Permeability of the Corunna soil is moderate or moderately rapid in the subsoil and moderately slow in the underlying material. The available water capacity is moderate, and surface runoff is very slow or ponded. The water table is near or above the surface in winter and spring.

In most areas these soils are farmed. They have good suitability for use as cropland, pasture, and woodland. They have poor suitability for recreational development and for use as septic tank absorption fields, sewage lagoons, and building sites.

If these soils are used as cropland, wetness during wet periods and droughtiness during dry periods are major concerns. In some low areas of the Corunna soils, ponding may delay tillage in spring. Tile drainage helps control wetness. Adding manure to the soil and green manure crops help increase the available water capacity, as does conservation tillage that does not invert the soil and that leaves all or part of the crop residue on the surface. Irrigation helps to increase crop yields.

If these soils are used as pasture, wetness and soil blowing are major concerns. Grazing during wet periods can cause surface compaction and poor tilth. Overgrazing during the droughty midsummer can leave the soil susceptible to soil blowing.

If these soils are used for recreation development, wetness and ponding are major concerns. The low areas of Corunna soils are ponded after heavy rains. Subsurface or open ditch drains help to overcome wetness and ponding. Low-lying areas can be filled with suitable material to help overcome wetness and ponding.

These soils have severe limitations for use as septic tank absorption fields, sewage lagoons, and building sites. The major concerns are a high water table, ponding, and moderately slow permeability. Conventional septic tank absorption fields generally are not practical on these soils. The Metamora soil is suitable for buildings without basements if the buildings are constructed on raised, well-compacted fill material and if surface drains and subsurface tile drains are installed to lower the water table.

The capability subclass is IIw. The Michigan soil management groups are 3/2b and 3/2c.

18—Granby loamy fine sand. This is a nearly level, poorly drained soil in low areas and drainageways. It is subject to frequent ponding. The areas are irregular in shape and range from 3 to 300 acres in size.

Typically, the surface layer is black loamy fine sand about 10 inches thick. The subsurface layer is very dark gray fine sand about 2 inches thick. The subsoil is dark gray and dark grayish brown, mottled, loose, sand and fine sand about 18 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled sand. In some places the surface layer is muck. In some places the subsoil has more clay. In some small places the subsoil is not grayish.

Included with this soil in mapping are small areas of poorly drained Belleville soils. Belleville soils are in positions similar to those of Granby soils on the landscape and make up about 5 percent of the unit.

Permeability is rapid. Surface runoff is very slow or ponded. The available water capacity is low. The water table is near or above the surface in winter and spring.

In most areas this soil is farmed. It has fair suitability for use as cropland and good suitability for use as pasture. It has poor suitability for recreation development and for use as woodland, septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concerns are excess water during wet periods, soil blowing, and droughtiness during dry periods. This soil ponds in early spring and after heavy rains. Drainage is needed to lower the water table, reduce ponding, and produce optimum crop yields. Open ditches are difficult to maintain because of cutbank cave-ins. Tile lines may become filled with fine sand unless they are protected with blinding material. Wind stripcropping, vegetative barriers, cover crops, and field windbreaks help control soil blowing, as does conservation tillage that does not invert the soil and that leaves crop residue on the surface. Crop residue, green manure crops, and manure increase the available water capacity of the soil. Irrigation helps increase crop yields.

If this soil is used as pasture, the major concerns are excess water and ponding. Grazing should be restricted during wet periods.

If this soil is used as woodland, the major concerns are equipment limitations because of excess water, seedling mortality, and windthrow hazard. The use of planting or logging equipment is limited during wet periods. The concern of excess water can be overcome if woodland operations are carried out when the soils are relatively dry or frozen. Using special site preparation, such as furrowing before planting, helps overcome seedling mortality. High winds may blow down trees. Windthrow may be limited by using harvesting methods that will not leave trees standing alone or widely spaced.

If this soil is used for recreation development, the major concerns are wetness, the soft, loose surface layer, and ponding. Installing subsurface or open ditch drains and filling low areas with suitable material help control wetness and ponding.

This soil has severe limitations for building site development. It is generally not suited to use as sewage lagoons because of a high water table. It has severe limitations for use as septic tank absorption fields because of poor filtering capacity and high water table. Conventional septic tank absorption fields are not practical in this soil. The caving of cutbanks in shallow excavations is a concern. Constructing retaining walls can control cave-ins.

The capability subclass is IIIw. The Michigan soil management group is 5c.

19A—Selfridge loamy sand, 0 to 3 percent slopes. This is a nearly level, somewhat poorly drained soil on knolls and ridges. The areas of this unit range from 3 to 300 acres in size.

Typically, the surface layer is very dark grayish brown loamy sand about 8 inches thick. The subsurface layer is brown sand about 7 inches thick. The subsoil is mottled and is about 17 inches thick. The upper part is yellowish brown, loose sand; the next part is dark brown, friable sandy loam; and the lower part is reddish brown, friable clay loam. The substratum to a depth of 60 inches is reddish gray, mottled clay loam.

Included with this soil in mapping are small areas of moderately well drained Oakville soils that have a loamy substratum and poorly drained Belleville and Corunna soils. Oakville soils are on knolls and ridges and make up about 5 percent of the unit. Belleville and Corunna soils are in slight depressions and drainageways and make up about 10 percent of the unit.

Permeability is rapid in the upper, sandy part and moderately slow in the loamy underlying layer. The available water capacity is moderate. Surface runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet in winter and spring.

In most areas this soil is farmed. It has fair suitability for cultivated crops and for use as woodland and good suitability for use as pasture. It has poor suitability for recreation development, and for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concerns are excess water, droughtiness, and soil blowing. Subsurface tile drainage is needed to remove excess water. Irrigation is needed for optimum crop production. Wind stripcropping and conservation tillage that does not invert the soil and that leaves crop residue on the surface help reduce soil blowing and increase available water capacity.

If this soil is used as pasture, the major concerns are wetness and soil blowing. Grazing during prolonged dry periods can reduce plant cover and leave the soil susceptible to blowing. Rotation grazing and restricted grazing during dry periods help reduce soil blowing.

If this soil is used as woodland, the major concern is seedling mortality. It may be necessary to use special planting stock, overstocking, or containerized stock for better seedling survival.

If this soil is used for recreation, the major concerns are wetness and the soft, loose surface layer. Surface and subsurface drainage help lower the water table.

This soil has severe limitations for use as septic tank absorption fields, sewage lagoons, and for building sites because of a high water table. Conventional septic tank absorption fields generally are not practical on this soil. The soil is suitable for buildings without basements if the buildings are constructed on raised, well-compacted fill material and surface drains and subsurface drains are installed to lower the water table.

The capability subclass is IIIw. The Michigan soil management group is 4/2b.

20A—Selfridge-Pewamo complex, 0 to 3 percent slopes. This map unit consists of a nearly level, somewhat poorly drained Selfridge soil and a poorly drained Pewamo soil. The Selfridge soil is on slight knolls. Pewamo soil is in depressions or in natural drainageways. It is subject to frequent ponding. These soils are in areas so small or so intricately mixed that it was not practical to map them separately. The mapped areas are irregular in shape and range from 3 to 700 acres in size. This map unit is made up of about 40 percent Selfridge soil, 35 percent Pewamo soil, and 25 percent other soils.

Typically, the Selfridge soil has a surface layer of very dark grayish brown loamy sand about 8 inches thick. The subsurface layer is mottled, brown, loose sand about 7 inches thick. The subsoil is mottled and is about 17 inches thick. The upper part is yellowish brown, loose sand; the middle part is dark brown, friable sandy loam; and the lower part is reddish brown, friable clay loam. The substratum to a depth of 60 inches is reddish gray, mottled clay loam. In some places the sand is at a depth of 10 to 19 inches.

Typically, the Pewamo soil has a surface layer of black clay loam about 9 inches thick. The subsurface layer is very dark gray clay loam about 3 inches thick. The subsoil is dark gray, mottled, very firm clay loam about 23 inches thick. The substratum to a depth of 60 inches is gray, mottled clay loam. In some places the subsoil is less clayey. In some places the subsoil is not so gray.

Included with these soils in mapping are some small areas of somewhat poorly drained Metamora soils that are in positions similar to those of the Selfridge soil. Metamora soils have more clay in the subsoil than the Selfridge soils. They make up about 6 percent of the unit.

Permeability is rapid in the upper sandy layers of the Selfridge soil and moderately slow in the loamy underlying layers. The available water capacity is moderate. Surface runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet in winter and spring.

Permeability of the Pewamo soil is moderately slow, and the available water capacity is high. Surface runoff is very slow or ponded. The water table is near or above the surface in winter and spring.

In most areas these soils are farmed. They have good suitability for use as cropland, pasture, and woodland. They have poor suitability for recreation development and for use as septic tank absorption fields, sewage lagoons, and building sites.

If these soils are used as cropland, the major limitations are wetness and the textural differences between the soils. In midsummer, the soils may be droughty (fig. 6). Surface and subsurface tile drainage is needed for optimum crop production. Care should be taken not to overdrain sandy areas. In low-lying areas, wetness can delay tillage in spring. Tillage that does not invert the soil and that leaves all or part of the crop residue on the surface and wind stripcropping help prevent soil blowing in sandy areas.

If these soils are used as pasture, the major concerns are the wetness of the Selfridge and Pewamo soils and soil blowing on the Selfridge soil. Grazing should be restricted during wet periods. Overgrazing in the sandy areas may leave the soils bare and susceptible to soil blowing. Rotation grazing is needed to protect sandy areas from soil blowing.

If these soils are used for recreation development, wetness and ponding are major limitations. These soils

Figure 6.—An area of Selfridge-Pewamo complex, 0 to 3 percent slopes. The light areas are Selfridge soils, and the dark areas are Pewamo soils.

are ponded in low-lying areas after heavy rains. Subsurface or open ditch drains help reduce wetness and ponding. Low-lying areas can be filled with suitable material to help overcome wetness and ponding.

These soils have severe limitations for use as septic tank absorption fields, sewage lagoons, and building sites. The major concern is a high water table. Conventional septic tank absorption fields generally are not practical on these soils. The Selfridge soil is suitable for buildings without basements if the buildings are constructed on raised, well-compacted fill material and if surface drains and subsurface tile drains are installed to lower the water table.

The capability subclass is IIIw. The Michigan soil management groups are 4/2b and 1.5c.

21—Lenawee silty clay loam. This is a nearly level, poorly drained soil in flat areas and drainageways. This soil is subject to frequent ponding. The areas of this unit are irregular in shape and range from 3 to 900 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is mottled and is about 23 inches thick. The upper part is grayish brown, firm and very firm silty clay loam; the lower part is brown, very firm silty clay. The substratum to a depth of 60 inches is multicolored silt loam. In some places the upper part of the subsoil is less gray.

Included with this soil in mapping are some small areas of poorly drained Corunna soils. Corunna soils have more sand in the subsoil, are in positions similar to those of Lenawee soils on the landscape, and make up about 6 percent of the unit.

Permeability is moderately slow. Surface runoff is very slow or ponded. The available water capacity is high. The water table is near or above the surface in winter and spring.

In most areas this soil is farmed. It has good suitability for use as cropland and pasture. It has poor suitability for recreation development and for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concern is removing excess water. Field operations are hindered when the soil ponds in early spring and after heavy rains. Surface drainage and subsurface tile drainage are needed for optimum crop production. Tile lines may become clogged with fine soil material unless they are protected with a suitable material.

If this soil is used as pasture, the major concerns are excess water and ponding. Grazing during wet periods can cause surface compaction and poor tilth. Rotation or strip grazing and timely deferred grazing help maintain good tilth.

If this soil is used for recreation development, the major concerns are wetness and ponding. Using artificial drainage, limiting the use of areas during wet periods, and covering areas with suitable fill material help control wetness and ponding.

This soil is generally not suited to use as septic tank absorption fields, sewage lagoons, and building sites because of a high water table and ponding.

The capability subclass is IIw. The Michigan soil management group is 1.5c.

22—Pewamo clay loam. This is a nearly level, poorly drained soil in low areas and depressions. It is subject to frequent ponding. The areas range from 2 to 500 acres in size.

Typically, the surface layer is black clay loam about 9 inches thick. The subsurface layer is very dark gray clay loam about 3 inches thick. The subsoil is mottled dark gray, very firm clay loam about 23 inches thick. The substratum to a depth of 60 inches is gray, mottled clay loam. In some places the subsoil has less clay. In some places the subsoil is less gray. Also in some places the subsoil has more clay.

Included with this soil in mapping are some small areas of somewhat poorly drained Metamora and Selfridge soils. Metamora soils have less clay in the subsoil and are on upland flats and slight knolls. Selfridge soils have 20 to 40 inches of sand over loamy material and are on slight knolls and ridges. These soils make up 8 to 12 percent of the unit.

Permeability is moderately slow, and the available water capacity is high. Surface runoff is very slow or ponded. The water table is near or above the surface in winter and spring.

In most areas this soil is farmed. It has good suitability for use as cropland, pasture, and woodland. It has poor suitability for recreation development and for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concern is excess water. The soil ponds in early spring and after heavy rains. Tillage during wet periods can cause surface compaction. Surface and subsurface tile drainage can reduce soil wetness (fig. 7).

If this soil is used as pasture, the major concerns are excess water and ponding. Grazing this soil when wet can cause poor tilth and surface compaction. Pasture plants that tolerate wetness should be used.

If this soil is used for recreation development, the major concern is wetness and ponding. Subsurface drains and open ditches can help reduce wetness and ponding. Filling material helps raise the surface level above the perched water table.

This soil has severe limitations for use as building sites, septic tank absorption fields, and sewage lagoons. The major concerns are a high water table and ponding. The soil is suitable for buildings without basements if the buildings are constructed on raised, well compacted till material and if surface drains and subsurface tile drains are installed to lower the water table. Conventional septic tank absorption fields are not practical on this soil.

The capability subclass is IIw. The Michigan soil management group is 1.5c.

Figure 7.—An area of recently tiled Pewamo clay loam planted to tomatoes.

23A—Metamora sandy loam, 0 to 3 percent slopes. This is a nearly level, somewhat poorly drained soil on slight knolls and ridges. The areas of this unit are irregular in shape and range from 3 to 300 acres in size.

Typically, the surface layer is black sandy loam about 7 inches thick. The subsurface layer is brown sandy loam about 3 inches thick. The subsoil is mottled, friable sandy loam about 11 inches thick. The upper part is grayish brown, and the lower part is light brownish gray. The substratum to a depth of 60 inches is brown, mottled silty clay loam. In some places the substratum is at a depth of 16 to 20 inches. In some places the substratum has a gravel layer. In places the subsoil has more clay, and in some places it has less clay.

Included with this soil in mapping are some small areas of somewhat poorly drained Blount and Selfridge soils. Blount soils have more clay in the subsoil and are on slight knolls. Selfridge soils have 20 to 40 inches of sand in the subsoil and are in positions similar to those of Metamora soils. Also included are some small areas of poorly drained Corunna and Pewamo soils. They are in low areas and in natural drainageways. These soils make up about 15 percent of the unit.

Permeability is moderately rapid in the subsoil and moderately slow in the underlying material. The available water capacity is high, and surface runoff is slow. The seasonal high water table is at a depth of one-half foot to 1 1/2 feet in winter and spring.

In most areas this soil is farmed. It has good suitability for use as cropland, pasture, and woodland. It has poor suitability for recreation development and for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concerns are soil wetness and soil blowing (fig. 8). Drainage systems help reduce wetness and lower the water table. Field windbreaks, buffer strips, and cover crops help control soil blowing, as does conservation tillage that does not invert the soil and that leaves all or part of the crop residue on the surface. This is one of the best soils for crops in the county.

If this soil is used as pasture, the major concerns are excess water and soil blowing. Overgrazing in midsummer when the soil is droughty leaves the soil susceptible to soil blowing. Rotation grazing during wet and dry periods helps keep the soil in good condition and reduces soil blowing.

If this soil is used for recreation development, the major concern is wetness. Surface drainage and subsurface drainage help reduce wetness.

This soil has limitations for use as septic tank absorption fields, building sites, and sewage lagoons. Conventional septic tank absorption fields generally are not practical on this soil. This soil is generally not suitable for buildings with basements. It is suited for buildings without basements if the buildings are constructed on raised, well-compacted fill material and if surface and subsurface tile drains are installed to lower the water table.

The capability subclass is IIw. The Michigan soil management group is 3/2.

24—Corunna sandy loam. This is a nearly level, poorly drained soil in depressions and drainageways. This soil is subject to frequent ponding. The areas are elongated or irregular in shape and range from 3 to 300 acres or more in size.

Typically, the surface layer is very dark gray sandy loam about 11 inches thick. The subsoil is mottled and is about 23 inches thick. The upper part is grayish brown and light brownish gray, friable sandy loam; the middle part is yellowish brown, loose loamy fine sand; the lower part is grayish brown, friable sandy loam. The substratum to a depth of 60 inches is dark grayish brown, mottled clay loam. In some places the subsoil has more clay.

Included with this soil in mapping are some small areas of somewhat poorly drained Metamora and Selfridge soils and poorly drained Belleville soils. Metamora and Selfridge soils are on slight knolls. Metamora soils have more clay in the subsoil, and Selfridge soils have more sand in the subsoil than Corunna soils do. Belleville soils are in positions similar to those of the Corunna soils on the landscape, and they have more sand in the subsoil. These soils make up 10 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the subsoil, and moderately slow in the underlying material. The available water capacity is moderate. Surface runoff is very slow or ponded. The water table is near or above the surface in winter and spring.

In most areas this soil is farmed. It has good suitability for use as cropland and pasture. It has fair suitability for use as woodland. It has poor suitability for recreation development and for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concerns are excess water and ponding. Early field operations are hindered if this soil ponds early in spring and after heavy rains. Tilling the soil when it is wet can result in poor tilth. Surface and subsurface tile drainage is needed to remove excess water and lower the water table. This is one of the best soils for crops in the county.

If this soil is used as pasture, the major concerns are excess water and ponding. Grazing during wet periods can cause surface compaction and poor tilth. Rotation grazing and restricted use of pasture during wet periods help reduce surface compaction and improve tilth.

If this soil is used for recreation development, the

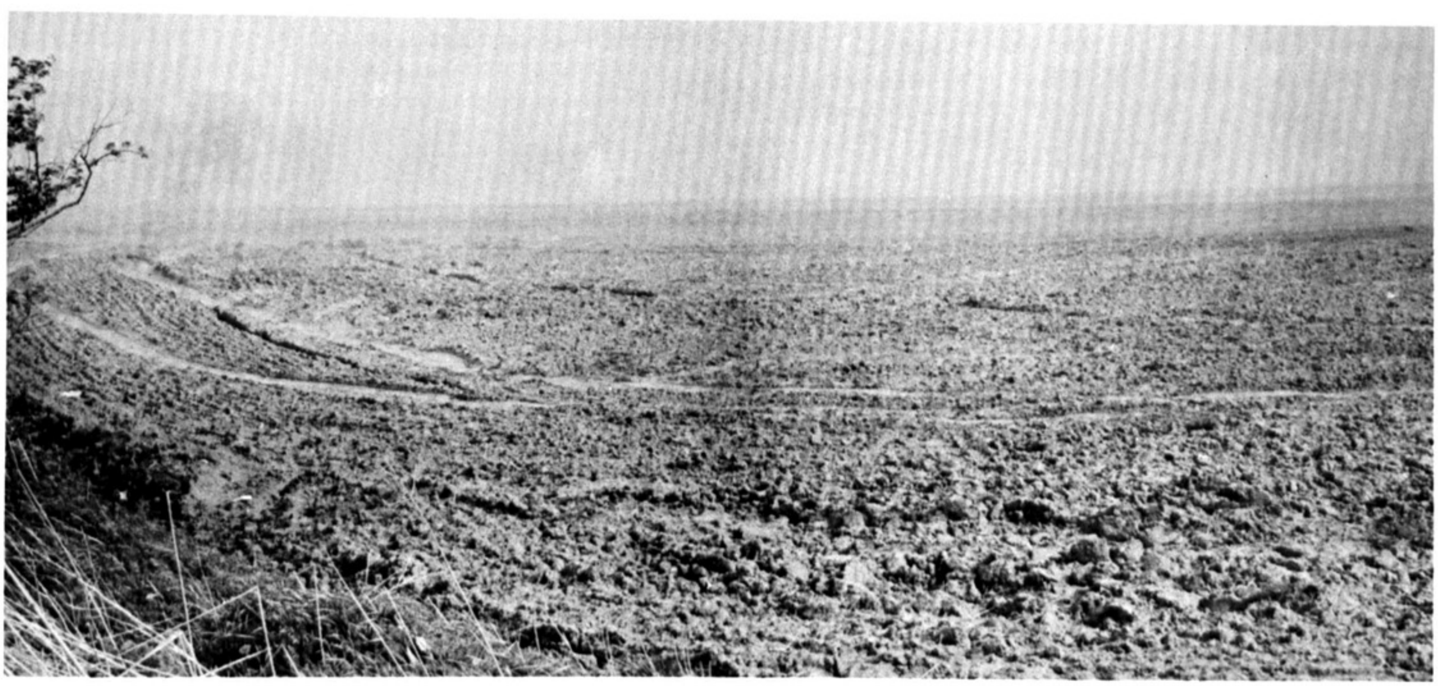

Figure 8.—Soil blowing on Metamora sandy loam, 0 to 3 percent slopes.

major concerns are wetness and ponding. Surface drainage and subsurface tile drainage and filling low areas with suitable material help reduce ponding and wetness.

This soil is limited for use as septic tank absorption fields, building sites, and sewage lagoons because of a high water table. Conventional septic tank absorption fields are not practical on this soil. This soil is not suited to buildings with basements. Dwellings without basements may be constructed if they are placed on raised, well-compacted fill material. Subsurface drains are needed to help lower the water table.

The capability subclass is IIw. The Michigan soil management group is 3/2c.

25A—Randolph clay loam, 0 to 3 percent slopes. This is a moderately deep, nearly level, somewhat poorly drained soil on upland flats. The areas of this unit range from 2 to 150 acres.

Typically, the surface layer is very dark clay loam about 7 inches thick. The subsoil is brown, mottled, and about 13 inches thick. The upper part is friable clay loam, and the lower part is firm silty clay loam. The substratum is yellowish brown channery clay loam to limestone. In some places limestone is at a depth of 40 inches. In some places the subsoil has more than 50 percent clay. In some places the subsoil is gray. In some places the subsoil is not mottled.

Included with this soil in mapping are some small areas of somewhat poorly drained Pewamo soils. Selfridge soils are on slight knolls and low ridges and have a sandy subsoil. Pewamo soils are in natural drainageways and low areas and do not have bedrock within a depth of 50 inches. These soils make up 5 to 10 percent of the unit.

Permeability is moderately slow, and the available water capacity is low. Surface runoff is slow. Moderately deep bedrock may restrict root development. The seasonal high water table is at a depth of 1 foot to 2 1/2 feet in winter and spring.

In most areas this soil is farmed. It has fair suitability for use as cropland and for recreation development and good suitability for use as pasture and woodland. It has poor suitability for use as septic tank absorption fields, sewage lagoons, and for building sites.

If this soil is used as cropland, the major concerns are a high water table, depth to bedrock, and maintaining good tilth. Artificial drainage is needed for optimum crop production. Tiling may be difficult to install because the depth to bedrock varies. Good tilth can be maintained by restricting tillage during wet periods and by conservation tillage that does not invert the soil and that leaves crop residue on the surface.

If this soil is used as pasture, the major concern is excess water. Grazing this soil when wet can cause soil compaction and poor tilth. Rotation or strip grazing and timely deferred grazing when the soil is wet help keep the soil in good condition.

If this soil is used for recreation development, the major concern is wetness. Water erosion is also a concern for paths and trails. Subsurface drains or open ditches help reduce wetness. Covering paths and trails with woodchips and bark helps control erosion.

This soil has severe limitations for use as septic tank absorption fields, sewage lagoons, and building sites. This soil is generally not suited to use as conventional septic tank absorption fields because of a high water table, moderately slow permeability, and depth to rock. Dwellings without basements may be constructed if they are placed on raised, well-compacted fill material. This soil is a good source of limestone (fig. 9).

The capability subclass is IIIw. The Michigan soil management group is 2R.

26B—Milton clay loam, 2 to 6 percent slopes. This is a moderately deep, gently sloping, well drained soil on knolls. The areas of this soil are irregular in shape and range from 8 to 70 acres or more in size.

Typically, the surface layer is dark grayish brown clay loam about 9 inches thick. The subsoil is dark yellowish brown and yellowish brown, firm clay loam about 15 inches thick. The substratum is dark brown loam over limestone. In some places depth to bedrock is less than 20 inches. In other places it is more than 40 inches. In some places the upper part of the subsoil is mottled.

Included with this soil in mapping are some small areas of well drained sandy soils over clayey soils. They are on slightly higher knolls and make up about 5 percent of this unit.

Permeability is moderate or moderately slow. The available water capacity is low. Surface runoff is medium. Bedrock may restrict root development.

In most areas this soil is farmed. It has fair suitability for use as cropland and for most recreation uses. It has good suitability for use as pasture and woodland. It has poor suitability for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concerns are depth to bedrock and water erosion. The presence of stones and limestone flags can make cultivating difficult in some places. Depth to bedrock may hamper the growth of crops with deep rooting systems. Cover crops help control erosion, as does conservation tillage that does not invert the soil and that leaves crop residue on the surface.

The use of this soil for pasture effectively controls erosion. Grazing after the heavy rains usually causes surface compaction, excess runoff, and poor tilth. Controlled stocking and rotation or strip grazing help keep the pasture and soil in good condition.

If this soil is used for recreation development, the major concerns are permeability for camp areas, picnic areas, and playgrounds and water erosion for paths and trails. Limiting the use of areas after heavy rains to allow water to drain off, may be necessary in areas used for

Figure 9.—Mining limestone in an area of Randolph clay loam, 0 to 3 percent slopes.

camps, picnics, and playgrounds. During heavy rains, exposed soils in paths and trails can erode.

This soil has limitations for use as septic tank absorption fields because of depth to bedrock and moderately slow permeability and for use as sewage lagoons and building sites because of depth to bedrock. Conventional septic tank absorption fields generally are not practical on this soil. This soil is suitable for dwellings without basements if the layers subject to shrinking and swelling are replaced with suitable material and if the buildings are constructed on raised, well-compacted fill material. This soil is a good source of limestone.

The capability subclass is IIe. The Michigan soil management group is 2Ra.

27—Beaches. This map unit consists of nearly level and gently sloping, fresh sand deposits. This unit is along the shores of Lake Erie. It is modified by wave action unless protected by pilings, breakwaters, and other manmade structures. The areas of this unit are elongated in shape and range in size from 9 to 80 acres.

This unit consists of sands more than 5 feet deep. A few stones and pebbles are in some areas.

The areas are used for recreation, cottages, and home sites.

This unit is too variable to rate for specific uses. Wave action, soil blowing, and varying depths of ground water are the major concerns.

28A—Kibbie very fine sandy loam, 0 to 3 percent slopes. This is a nearly level, somewhat poorly drained soil on slight knolls and in broad upland areas. It is irregular in shape and ranges from 4 to 300 acres or more in size.

Typically, the surface layer is very dark grayish brown very fine sandy loam about 9 inches thick. The subsurface layer is grayish brown, very fine sandy loam about 2 inches thick. The brown, mottled subsoil is 11 inches thick. The upper part is firm clay loam; the next part is friable loam; and the lower part is friable silt loam. The substratum to a depth of 60 inches is gray, stratified silt loam and very fine sand. In some places the substratum is at a depth of less than 20 inches. Also in some places the lower solum is stratified. In some places a loamy substratum is below a depth of 40 inches. The subsoil has less clay in some places. In some places the upper part of the subsoil is more gray.

Included with this soil in mapping are some small areas of somewhat poorly drained Selfridge soils. The areas are on small, slightly higher knolls and make up about 5 percent of the unit.

Permeability is moderate. The available water capacity is high. Surface runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet in winter and spring.

In most areas this soil is used for farming. It has good suitability for use as cropland, pasture, and woodland. It has fair suitability for recreation development. It has poor suitability for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concerns are excess water, soil blowing, and erosion. This soil dries out slowly in spring and after heavy rains. Surface drainage and subsurface tile drainage can lower the water table and remove excess water. However, silt and very fine sand in the substratum tend to plug tile lines during wet periods. Tile should be covered with blindings. Wind stripcropping, vegetative barriers, cover crops, and windbreaks help reduce soil blowing and erosion, as does conservation tillage that does not invert the soil and that leaves crop residue on the surface.

This soil is suited to pasture. If this soil is used for pasture, the major concerns are excess water and maintaining soil tilth. Grazing this soil when wet can cause poor tilth and soil compaction. Rotation grazing and timely deferment of grazing during wet periods can help maintain good soil tilth.

If this soil is used for recreation development, the major concern is wetness. Artificial drainage can help reduce wetness.

This soil has limitations for use as septic tank absorption fields, sewage lagoons, and building sites because of a high water table. Conventional septic tank absorption fields generally are not practical on this soil.. Dwellings may be constructed, provided they are placed on raised, well-compacted fill material. Subsurface drains can help lower the water table.

The capability subclass is IIw. The Michigan soil management group is 2.5b-s.

29—Colwood loam. This is a nearly level, poorly drained soil in depressions, natural drainageways, and broad flats. This soil is subject to frequent ponding. The areas are irregular in shape and range from 3 to 120 acres or more.

Typically, the surface and subsurface layers are very dark gray or gray loam about 12 inches thick. The subsoil is gray, friable, mottled clay loam and silt loam about 33 inches thick. The substratum to a depth of 60 inches is gray. In some places the subsoil has a layer of gravelly clay loam. In some places the substratum is not stratified. Also, in some places more clay is in the subsoil.

Included with this soil in mapping are some small areas of somewhat poorly drained Metamora soils on small knolls. Metamora soils make up about 5 percent of the unit.

Permeability is moderate. The available water capacity is high. Surface runoff is very slow or ponded. The water table is near or above the surface in winter and spring.

In most areas this soil is farmed. It has good suitability for use as cropland and pasture. It has poor suitability for recreation development and for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concern is excess water. This soil tends to pond in early spring and after heavy rains. Surface drainage and subsurface tile drainage are needed to reduce wetness. Subsurface tile lines should be protected with suitable material to prevent their filling with fine sands, silts, and clays. Cover crops can help keep the soil in good condition, as does conservation tillage that does not invert the soil and that leaves crop residue on the surface.

If this soil is used as pasture, the major concerns are excess water, soil tilth, and ponding. Grazing when the soil is wet can cause surface compaction and poor tilth. Good tilth may be maintained if grazing during wet periods is limited or avoided.

If this soil is used for recreation development, the major concerns are wetness and ponding. Surface drainage and subsurface tile drainage will help reduce wetness. Filling low areas with suitable material helps overcome ponding.

This soil has severe limitations for use as septic tank absorption fields, sewage lagoons, and building sites because of the high water table. This soil ponds in early spring and after heavy rains. Building site development and conventional septic tank absorption fields are not practical on this soil.

The capability subclass is IIw. The Michigan soil management group is 2.5c-s.

30—Sloan loam. This is a nearly level, very poorly drained soil on flood plains. It is subject to frequent flooding. The areas are elongated in shape and range from 3 to 200 acres in size.

Typically, the surface layer is black loam about 12 inches thick. The subsoil is dark gray and gray, friable, mottled silt loam about 14 inches thick. The substratum to a depth of 60 inches is light gray, mottled silt loam.

Included with this soil in mapping are some small areas of moderately steep soils, somewhat poorly drained Ceresco soils, and poorly drained alluvial soils with less clay in the subsoil. The moderately steep soils are along the edges of the unit bordering uplands and make up about 5 percent of the unit. The Ceresco soils have less clay in the subsoil and are in areas slightly higher than those of Sloan soils. The coarse textured, poorly drained alluvial soils are in positions similar to those of Sloan soils on the landscape. These two soils make up about 5 to 10 percent of the unit.

Permeability is moderate or moderately slow. The available water capacity is high. Surface runoff is very slow or ponded. The water table is near or at the surface in winter and spring.

In most areas this soil is wooded. It has poor suitability for use as cropland, pasture, woodland, septic tank absorption fields, and sewage lagoons and for building site development and recreation development.

If this soil is used as cropland, the major concerns are flooding and a high water table. This soil is difficult to drain because the water table is often near the water level in adjacent streams. It is flooded after heavy rains and in spring.

If this soil is used as pasture, the major concern is flooding. Grazing this soil can result in water pollution unless the livestock's access to streams and rivers is restricted (fig. 10).

If this soil is used as woodland, the major concerns are flooding and wetness. The high water table can be overcome if woodland operations are carried out when the soils are relatively dry or frozen. Windthrow is a hazard unless harvesting methods are used that will not leave trees standing alone or widely spaced.

If this soil is used for recreation development, the major concerns are flooding and wetness. This soil is not suited to use as campgrounds or playgrounds because of frequent flooding. Artificial drainage is difficult because of a lack of suitable outlets. Limiting use to drier periods or filling the areas with suitable material helps reduce wetness if this soil is used as picnic areas and as paths and trails.

Building site development, sewage lagoons, and septic tank absorption fields are not practical on this soil because of flooding.

The capability subclass is Vw. The Michigan soil management group is L-2c.

31—Aquents, nearly level. This map unit consists of poorly drained soils that have had 8 to 24 inches of soil material removed. It also consists of low, wet areas that have been filled with nonsoil material and then covered with soil material. The nonsoil material, consisting mainly of bits of concrete, brick, and wood, does not support plant growth. The areas are irregular in shape and range from 5 to 500 acres or more in size.

These soils are extremely variable, and on-site investigation is necessary to determine their use. Generally, a water table is at a depth of one-half foot to 2 feet during wet periods.

In most areas these soils are idle and do not have plant cover. In some areas these soils are used for building site development. The filled areas generally are unstable and not suitable for use as foundations for buildings.

This unit is not assigned to interpretive groupings.

32—Dumps. This map unit consists of areas filled with municipal and industrial waste. The areas range in size from 3 to more than 300 acres.

Included in mapping are small areas of Aquents. These soils make up less than 10 percent of the unit.

Figure 10.—Pasture on Sloan loam.

The properties of this unit are extremely variable, and on-site investigation is necessary to determine its proper use.

This unit is not assigned to interpretive groupings.

33—Pits-Aquents complex. This map unit consists of open excavations and pits, the bottoms of which are nearly level aquent soils. The areas are rectangular or irregular in shape and range in size from 3 to more than 10 acres.

The soil is generally calcareous in reaction and has a high water table. Included in the mapped areas are some small shallow ponds.

Soil properties are variable. On-site investigation is necessary.

Most areas are idle land and do not have plant cover. Some areas are active borrow pits.

This unit is not assigned to interpretive groupings.

36—Belleville loamy sand. This is a nearly level, poorly drained soil in depressional areas and drainageways. This soil is subject to frequent ponding. The areas are irregular in shape and range in size from 4 to 230 acres.

Typically, the surface layer is black loamy sand about 10 inches thick. The subsoil is mottled sand, very friable, and about 18 inches thick. The upper part is grayish brown, and the lower part is light brownish gray. The substratum to a depth of 60 inches is light olive sand 10 inches thick and gray silty clay loam 22 inches thick. In some places the substratum is stratified silt and very fine sand. In some places the loamy material is at a depth of more than 40 inches. In some places the subsoil has no grayish colors in the upper part.

Included with this soil in mapping are some small areas of poorly drained Corunna and Granby soils. These soils are in positions similar to those of the Belleville soils on the landscape. Corunna soils have more clay in the subsoil. Granby soils do not have a loamy substratum. These soils make up about 5 percent of the unit.

Permeability is rapid in the sandy layers and moderately slow in the underlying layers. The available water capacity is moderate. Surface runoff is very slow or ponded. The high water table is near or above the surface in winter and spring.

In most areas this soil is farmed. It has fair suitability for use as cropland and pasture. It has poor suitability for use as woodland, septic tank absorption fields, and sewage lagoons and for building site development and recreation development.

If this soil is used as cropland, the major concerns are removing excess water and soil blowing. This soil ponds in early spring and after heavy rains, hindering early field operations. Tillage when the soil is wet can cause poor tilth. Surface drainage and subsurface tile drainage are needed to remove excess water. Cover crops and field windbreaks help control soil blowing, as does conservation tillage that does not invert the soil and that leaves crop residue on the surface.

If this soil is used for recreation development, the major concerns are wetness and ponding. Ponding occurs during wet periods and after heavy rains. Subsurface drains or open ditches help reduce wetness. Filling areas with suitable material helps overcome ponding.

This soil has severe limitations for building site development. It is generally not suited to use as sewage lagoons because of a high water table. The soil has severe limitations for use as septic tank absorption fields. Conventional septic tank absorption fields are not practical on this soil. The caving of cutbanks is a concern in shallow excavations. Retaining walls can control cutbank cave-ins.

The capability subclass is IIIw. The Michigan soil management group is 4/2c.

37B—Ottokee Variant fine sand, 0 to 6 percent slopes. This is a moderately deep, nearly level and gently sloping, moderately well drained soil on knolls or convex ridgetops. The areas are irregular in shape and range in size from 5 to 100 acres or more.

Typically, the surface layer is very dark grayish brown fine sand about 9 inches thick. The subsurface layer is yellowish brown and light yellowish brown fine sand about 15 inches thick. The subsoil is dark yellowish brown, loamy sand about 2 inches thick. The substratum is dark yellowish brown loam about 28 inches thick. In some places the solum has more than 15 percent flagstones.

Included with this soil in mapping are some small areas of moderately well drained Oakville soils and somewhat poorly drained sandy soils over limestone. The Oakville soils are on low ridges and have no bedrock within a depth of 60 inches. The somewhat poorly drained sandy soils are in depressional areas. These soils make up about 5 to 10 percent of the map unit.

Permeability is rapid. The available water capacity is very low. Surface runoff is very slow. The seasonal high water table is at a depth of 2 to 3 feet in winter and spring. Limestone bedrock may restrict root growth.

In most areas this soil is idle. It has poor suitability for use as cropland, septic tank absorption fields, and sewage lagoons, and for building site development and recreation development. If this soil is used for woodland, the major concern is seedling mortality.

If this soil is used as cropland, the major concerns are maintaining organic matter content, soil blowing, and droughtiness. Organic matter can be maintained by adding crop residue, manure, and green manure to the soil. Cover crops, wind stripcropping, vegetative barriers, and field windbreaks reduce soil blowing as does conservation tillage that does not invert the soil and that leaves crop residue on the surface.

If this soil is used for pasture, the major concern is droughtiness. Growth is reduced in dry periods unless pasture plants are deep rooted and drought resistant.

If this soil is used for recreation development, the major concern is the soft, loose surface layer. Adding a layer of loamy material to the surface and seeding with drought resistant grasses and legumes helps overcome this concern. These measures make the soil more serviceable and attractive. Establishing a plant cover can be difficult because of the droughty soil.

This soil is generally not suited for use as conventional septic tank absorption fields and sewage lagoons because of depth to bedrock, a high water table, and poor filtering capacity.

The capability subclass is IVs. The Michigan soil management group is 5/Ra.

38—Adrian muck. This is a nearly level, very poorly drained soil in depressional areas. This soil is subject to frequent ponding. The areas are irregular in shape and range in size from 3 to 50 acres.

Typically, the surface layer is black muck about 10 inches thick. The layer below that is black, friable muck about 24 inches thick. The substratum to a depth of 60 inches is grayish brown loamy sand. In some places the muck is 12 to 15 inches thick, and in some places it is more than 51 inches thick. In some places the substratum is sandy loam.

Included with this soil in mapping are some small areas of very poorly drained soils that have 3 to 11 inches of muck over sandy and loamy material and small areas of soils that have at least 16 inches of muck over marl. These soils are in similar positions on the landscape as this Adrian soil and make up 10 to 15 percent of the map unit.

Permeability is moderately slow to moderately rapid in the organic material and rapid in the underlying layers. The available water capacity is high. Surface runoff is very slow or ponded. The water table is near or above the surface in winter and spring.

In most areas this soil is idle or is wooded. In some places this soil is mined for use as a soil conditioner. It has poor suitability for use as cropland, pasture, and woodland and for recreation development, septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, wetness is a major concern. The soil needs to be drained. Drainage outlets, however, are difficult to locate.

If this soil is used as pasture, wetness and ponding are the major concerns. Most areas remain undrained.

If this soil is used as woodland, ponding and soil stability are the major concerns. Trees are subject to windthrow. In most places, ordinary crawler tractors or rubber-tired skidders cannot be used for harvesting. Special equipment is needed.

This soil is poorly suited to recreation use because of ponding.

Building sites, septic tank absorption fields, and sewage lagoons are not practical on this soil because of frequent ponding.

The capability subclass is Vw. The Michigan soil management group is M/4c.

40A—Thetford loamy sand, 0 to 3 percent slopes. This is a nearly level, somewhat poorly drained soil on slight knolls. The areas are irregular in shape and range in size from 3 to 600 acres or more.

Typically, the surface layer is very dark grayish brown loamy sand about 9 inches thick. The subsoil is mottled and about 37 inches thick. The upper part is yellowish brown, loose sand; the next part is pale brown, loose sand with thin strata of light yellowish brown, friable loamy sand; the next part is pale brown, very friable loamy fine sand; and the lower part is brown, loose sand. The substratum to a depth of 60 inches is grayish brown sand. In some places the subsoil is more gray. In some places the subsoil does not have sandy bands. In places sandy bands are at a depth of more than 40 inches.

Included with this soil in mapping are some small areas of well drained Spinks soils. Spinks soils occupy slight knolls and make up about 5 percent of the unit.

Permeability is moderately rapid, and the available water capacity is low. Surface runoff is slow or very slow. The seasonal high water table is at a depth of 1 to 2 feet in winter and spring.

In most areas this soil is farmed. It has fair suitability for use as cropland and woodland. It has good suitability for use as pasture. It has poor suitability for most recreation uses and building site development and for use as septic tank absorption fields and sewage lagoons.

If this soil is used as cropland, the major concerns are excess water, droughtiness, and soil blowing. Surface drainage and subsurface tile drainage help control wetness. Field windbreaks, buffer strips, vegetative barriers, wind stripcropping, and cover crops help control soil blowing, as does conservation tillage that does not invert the soil and that leaves crop residue on the surface. Crop residue, manure, and green manure crops increase the available water holding capacity of the soil. Irrigation helps increase crop yields.

If this soil is used as pasture, the major concerns are excess water and soil blowing. Grazing during dry periods can reduce the plant cover and leave the soil susceptible to soil blowing. Rotation grazing and restricting grazing during dry periods help reduce soil blowing.

If this soil is used as woodland, the major concern is seedling mortality. The loss of planted or natural tree seedlings because of dry weather can be high. It may be desirable to use special harvesting methods that leave some mature trees to provide shade and protection.

If this soil is used for recreation development, the major concern is wetness. Subsurface or open ditch drains can help reduce wetness.

The soil has limitations for septic tank absorption fields, building site development, and sewage lagoons because of a high water table. Conventional septic tank absorption fields generally are not practical on this soil. Dwellings without basements may be constructed on raised, well-compacted fill material if artificial drainage is installed to lower the high water table.

The capability subclass is IIIw. The Michigan soil managment group is 4b.

41B—Metea sand, 2 to 6 percent slopes. This is a gently sloping, well drained soil on ridges and knolls. The areas are irregular in shape and range in size from 3 to 60 acres.

Typically, the surface layer is dark grayish brown sand about 8 inches thick. The subsurface layer is yellowish brown and strong brown loose sand about 26 inches thick. The subsoil is yellowish brown, mottled, friable sandy loam about 3 inches thick. The substratum to a depth of 60 inches is brown, mottled clay loam. In some places the substratum is at a depth of 40 inches or more.

Included with this soil in mapping are some small areas of somewhat poorly drained Selfridge soils. These soils are on slight knolls and ridges and make up about 15 percent of the unit.

Permeability is very rapid in the subsoil and moderately slow in the underlying material. The available water capacity is medium. Surface runoff is very slow.

In most areas this soil is farmed. It has fair suitability for use as cropland. It has good suitability for use as pasture and woodland and poor suitability for recreation development. It has fair suitability for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concerns are droughtiness, maintaining organic matter, and soil blowing. Field windbreaks, buffer strips, and cover crops help control soil blowing, as does conservation tillage that does not invert the soil and that leaves crop residue on the surface. Crop residue and green manure crops help improve organic matter content and reduce droughtiness. Irrigation can help reduce droughtiness and increase crop yields.

If this soil is used as pasture, the major concerns are droughtiness and soil blowing. Growth is reduced in dry periods. Overgrazing during dry periods can cause loss of plant cover and create conditions ideal for soil blowing. Rotational or strip grazing in pasture helps reduce soil blowing.

If this soil is used as woodland, the major concern is seedling mortality. There can be great loss of planted or natural tree seedlings because of dry weather conditions. It may be necessary to use special harvesting methods that leave some mature trees to provide shade and protection.

If this soil is used for recreation development, the major concern is the soft, loose surface layer. Adding a layer of loamy material to the surface and seeding with drought resistant grasses and legumes help make playgrounds and picnic areas more serviceable and attractive. Covering paths and trails with wood chips and bark helps improve their trafficability.

The moderately slow permeability is a limitation for use of the soil as septic tank absorption fields. The soil has severe limitations for shallow excavations because of cutbank cave-ins. Using retaining walls and avoiding steep wall grades help prevent cutbank cave-ins.

The capability subclass is IIIe. The Michigan soil management group is 4/2a.

42—Hoytville silty clay loam. This is a nearly level, very poorly drained soil in low areas and depressions. It is subject to frequent ponding. The areas are irregular in shape and range in size from 3 to 600 acres.

Typically, the surface layer is very dark gray silty clay loam about 9 inches thick. The subsoil is gray, mottled, very firm clay about 31 inches thick. The substratum to a depth of 60 inches is gray, mottled clay. In some places the subsoil has less clay. In some places the subsoil is less gray. In some places the substratum is stratified with thin strata of silt loam.

Included with this soil in mapping are some small areas of somewhat poorly drained Metamora soils on slight knolls. These soils make up about 5 percent of the unit.

Permeability is moderately slow in the subsoil and slow in the underlying material. Surface runoff is very slow or ponded. The available water capacity is moderate. The water table is near or above the surface in winter and spring.

In most areas this soil is farmed. It has good suitability for use as cropland, pasture, and woodland. It has poor suitability for recreation development and building site development and for use as septic tank absorption fields.

If this soil is used as cropland, the major concerns are removing excess water and maintaining good tilth. This soil ponds early in spring and after heavy rains. Tillage operations during wet periods can cause soil compaction. Surface and subsurface tile drainage help reduce wetness.

If this soil is used as pasture, the major concerns are excess water and ponding. Grazing during wet periods usually results in soil compaction. Rotational grazing and timely deferment of grazing during wet periods help keep the soil in good condition.

If this soil is used for recreational development, the major concerns are wetness and ponding. This soil may be used for recreation only in dry periods of the year because of ponding. Surface and subsurface drainage help reduce the wetness and ponding. Filling areas with a suitable material also helps reduce ponding.

This soil is suitable for use as sewage lagoons. It is generally not suited to use as septic tank absorption fields and building sites. The high water table and slow permeability are severe limitations for use as septic tank absorption fields, and a high water table and shrinking and swelling are severe limitations for building site development.

The capability subclass is IIw. The Michigan soil management group is 1c.

43A—Nappanee loam, 0 to 3 percent slopes. This is a nearly level, somewhat poorly drained soil on upland flats. The areas are irregular in shape and range in size from 3 to 400 acres.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is grayish brown, mottled, very firm clay about 16 inches thick. The substratum to a depth of 60 inches is gray, mottled silty clay loam. In some places limestone is at a depth of 50 inches or more. In some places the subsoil has less clay. The subsoil is more gray in some places.

Included with this soil in mapping are small areas of somewhat poorly drained Metamora soils. Metamora soils have more sand in the subsoil, are on slight knolls and ridges, and make up about 5 percent of the unit.

Permeability is slow, and the available water capacity is moderate. Surface runoff is slow or very slow. The seasonal high water table is at a depth of 1 to 2 feet in winter and spring.

In most areas this soil is farmed. It has fair suitability for use as cropland and woodland. It has good suitability for use as pasture and sewage lagoons and poor suitability for recreation development and for use as septic tank absorption fields and building sites.

If this soil is used as cropland, the major concerns are removing excess water and maintaining good tilth. Surface and subsurface tile drainage are needed for optimum crop production. Restricting tillage during wet periods and leaving crop residue on the surface can maintain good tilth.

If this soil is used as pasture, the major concerns are excess water and soil tilth. Grazing during wet periods can cause soil compaction. Rotation grazing and timely deferment of grazing during wet periods can help maintain good tilth.

If this soil is used for recreation development, the major concern is wetness. Subsurface drains or open ditches will help reduce soil wetness.

This soil is suited to use as sewage lagoons. It has limitations for septic tank absorption fields because of a high water table and very slow permeability and for building site development because of a high water table. Conventional septic tank absorption fields are not practical on this soil. Buildings without basements may be constructed on raised, well-compacted fill material. Surface and subsurface drainage help lower the water table.

The capability subclass is IIIw. The Michigan soil management group is 1b.

44A—Wasepi sandy loam, loamy substratum, 0 to 3 percent slopes. This is a nearly level, somewhat poorly drained soil on slight knolls and ridges. The areas of this unit are irregular in shape and range in size from 3 to 150 acres.

Typically, the surface layer is very dark gray sandy loam about 7 inches thick. The subsoil is yellowish brown, mottled, friable sandy loam about 14 inches thick. The substratum extends to a depth of 60 inches. The upper part is light olive brown fine sand 3 inches thick. The middle part is grayish brown sand and gravelly sand 26 inches thick. The lower part is dark gray, silty clay loam 14 inches thick. In some places the loamy substratum is below a depth of 60 inches.

Included with this soil in mapping are some small areas of somewhat poorly drained Metamora, Tedrow, and Thetford soils. Metamora soils have more clay in the subsoil and are on slight knolls. Tedrow and Thetford soils have a sandy substratum and are on slopes similar to Wasepi soils that have a loamy substratum. Also included in mapping are some small areas of somewhat poorly drained sandy over loamy soils that are on slight ridges. These soils make up about 15 percent of the unit.

Permeability is moderately rapid in the subsoil and moderately slow in the substratum. The available water capacity is low, and surface runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet in winter and spring.

In most areas this soil is farmed. It has fair suitability for use as cropland, pasture, and woodland. It generally has a fair suitability for recreation uses. It has poor suitability for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concerns are removing excess water during wet periods, droughtiness during dry periods, and soil blowing. Tile drainage helps remove excess water and allows field operations earlier in spring. During dry periods, the soil is droughty and susceptible to soil blowing. Conservation tillage that does not invert the soil and that leaves crop residue on the surface, as well as cover crops, helps retain soil moisture and control soil blowing.

If this soil is used as pasture, the major concern is excess water during wet periods. Overgrazing during dry periods can reduce plant cover and leave the soil susceptible to soil blowing. Rotation grazing during wet and dry periods helps maintain soil tilth and plant cover.

If this soil is used for recreation development, the major concern is wetness. Subsurface drains or open ditch drains help reduce wetness.

This soil has limitations for septic tank absorption fields because of a high water table and poor filtering capacity. It has limitations for building site development and sewage lagoons because of a high water table. Conventional septic tank absorption fields generally are not practical on this soil. Dwellings without basements may be constructed if they are placed on raised, well-compacted fill material and if artificial drainage is installed to lower the high water table.

The capability subclass is IIIw. The Michigan soil management group is 5a.

45A—Channahon loam, 0 to 3 percent slopes. This is a nearly level, well drained soil in flat areas. The areas are irregular in shape and range in size from 3 to 100 acres.

Typically, the surface is black loam about 8 inches thick. The subsoil is dark yellowish brown, friable loam about 7 inches thick. The underlying material is grayish brown limestone. In some places the loam material extends below a depth of 20 inches.

Included with this soil in mapping are small areas of well drained Milton and somewhat poorly drained Randolph soils. These soils have fewer coarse fragments than the Channahon soils. Milton soils are in positions on the landscape similar to those of Channahon loam. Randolph soils are in slight depressions. These soils make up about 10 to 15 percent of the unit.

Permeability is moderate, and the available water capacity is very low. Surface runoff is very slow. The limestone bedrock restricts root development.

In most areas this soil is idle. It has poor suitability for use as cropland. It has fair suitability for use as pasture and woodland and poor suitability for recreation development and building site development and for use as septic tank absorption fields and sewage lagoons.

If this soil is used as cropland, the major concerns are depth to bedrock and flagstones on the surface and in the subsoil. Limestone fragments hinder the use of farm machinery in planting and plowing.

The concerns are only minor if this soil is used as pasture. Proper stocking and rotational grazing or strip grazing help to keep pasture and soil in good condition.

If this soil is used as woodland, the major concerns are windthrow hazard and seedling mortality. Shallow depth to bedrock restricts the root zone. Care in thinning or no thinning at all helps overcome the windthrow hazard.

If this soil is used for camp areas, picnic areas, or playgrounds, the major concern is depth to bedrock. This soil is droughty during midsummer. Drought resistant grasses and legumes help make picnic areas, playgrounds, and camp areas more serviceable and attractive.

This soil is generally not suited to dwellings with basements and to use as conventional septic tank absorption fields and sewage lagoons because of depth to bedrock.

The capability subclass is IIIs. The Michigan soil management group is Ra.

46—Ceresco fine sandy loam. This is a nearly level, somewhat poorly drained soil on flood plains of rivers and streams. It is subject to occasional flooding. The areas are elongated or irregular in shape and range in size from 3 to 200 acres or more.

Typically, the surface layer is very dark grayish brown fine sandy loam about 9 inches thick. The subsurface layer is dark brown fine sandy loam about 9 inches thick. The subsoil is dark brown, friable, mottled fine sandy loam about 16 inches thick. The substratum to a depth of 60 inches is grayish brown, mottled fine sandy loam. In some small places the subsoil is grayish. In some places the subsoil is more grayish and has more clay.

Included with this soil in mapping are small areas of moderately steep soils that are river or creek banks, and somewhat poorly drained, sandy soils on ridges. These soil inclusions make up about 10 to 15 percent of the unit.

Permeability is moderate or moderately rapid, and the available water capacity is moderate. Surface runoff is very slow. The seasonal high water table is at a depth of 1 to 2 feet in winter and spring.

In most areas this soil is used for building site development and farming. It has fair suitability for use as cropland. It has good suitability for use as pasture and woodland and poor suitability for recreation development and building site development and for use as septic tank absorption fields and sewage lagoons.

If this soil is used as cropland, the major concerns are flooding and removing excess water. Surface drainage, enabling crops to be planted after floodwaters recede, helps overcome flooding. Tile drainage helps remove excess water.

If this soil is used as pasture, the major concerns are occasional flooding and excess water. Grazing should be restricted in wet periods.

If this soil is used for picnic areas, playgrounds, and paths and trails, the major concerns are wetness and flooding. Flooding and wetness are concerns for camp areas. In some areas this soil is not suitable for camps. Subsurface drains or open ditch drains help reduce wetness for use as picnic areas, playgrounds, and paths and trails (fig. 11).

Building site development, septic tank absorption fields, and sewage lagoons are not practical on this soil because of flooding.

The capability subclass is IIIw. The Michigan soil management group is L-2c.

47—Millsdale clay loam. This is a moderately deep, nearly level, very poorly drained soil in slightly depressed areas. This soil is subject to frequent ponding. The areas are irregular in shape and range in size from 2 to 100 acres.

Typically, the surface layer is very dark gray clay loam about 11 inches thick. The subsoil is 22 inches thick. It is dark gray, mottled, firm clay loam over limestone. In some places bedrock is at a depth of 10 to 20 inches and in some places it is at a depth of more than 40 inches. In some places the subsoil is not as gray.

Figure 11.—A park in an area of Ceresco fine sandy loam.

Included with this soil in mapping are some small areas of poorly drained clayey soils with a flaggy surface layer. The poorly drained flaggy soil makes up about 5 percent of the unit.

Permeability is moderately slow. The available water capacity is low, and surface runoff is very slow or ponded. The limestone bedrock may restrict root development. The water table is near or above the surface in winter and spring.

In most areas this soil is farmed. It has fair suitability for use as cropland. It has good suitability for use as pasture and poor suitability for use as woodland, septic tank absorption fields, and sewage lagoons and for building site development and recreation development.

If this soil is used as cropland, the major concerns are removing excess water, ponding, and depth to bedrock. The soil remains wet until late in spring and after heavy rains. Subsurface tile drainage is generally difficult to install because of varying depths to bedrock, but the surface drains can help reduce soil wetness.

If this soil is used as pasture, the major concerns are excess wetness and ponding. Grazing this soil when wet can cause soil compaction and poor tilth. It may be necessary to use pasture plants that tolerate wetness.

If this soil is used for recreation development, the major concerns are ponding and depth to bedrock. This soil ponds in early spring and after heavy rains. Installing open ditch drains or filling areas with a suitable material are methods of controlling ponding.

Building site development, septic tank absorption fields, and sewage lagoons are not practical on this soil because of the depth to bedrock and a high water table.

The capability subclass is IIIw. The Michigan soil management group is 2/Rc.

48—Toledo silty clay loam. This is a nearly level, very poorly drained soil in low areas and natural drainageways. It is subject to frequent ponding. The areas are irregular in shape and range in size from 2 to 1,000 acres or more.

Typically, the surface layer is very dark grayish brown silty clay loam about 6 inches thick. The subsoil is firm, mottled silty clay about 30 inches thick. The upper part is dark gray, the middle part is light gray, and the lower part is gray. The substratum to a depth of 60 inches is light gray, stratified, mottled clay, silty clay, and silty clay loam. In some places the substratum is clay. The subsoil in some places has less clay, and in some places it is yellowish brown and brown.

Permeability is slow. The available water capacity is moderate, and surface runoff is very slow or ponded. The high water table is near or above the surface in winter and spring.

In most areas this soil is farmed. It has fair suitability for use as cropland and good suitability for use as pasture and sewage lagoons. It has fair suitability for use as woodland and poor suitability for recreation development and building site development and for use as septic tank absorption fields.

If this soil is used as cropland, the major concerns are removing excess water and maintaining good tilth. This soil dries out slowly in spring and after heavy rains. Tillage operations during wet periods can cause soil compaction. Surface drainage and subsurface tile drainage can help reduce soil wetness. Limiting tillage operations during wet periods can maintain good tilth, as does using conservation tillage that does not invert the soil and that leaves crop residue on the surface.

If this soil is used as pasture, the major concerns are excess water and ponding. Grazing this soil when wet can cause poor tilth and soil compaction.

If this soil is used for recreation development, the major concerns are wetness and ponding. Installing surface drainage and subsurface tile drainage and filling low areas with suitable material can help control wetness and ponding.

This soil is suitable for use as sewage lagoons. It is generally not suited to use as septic tank absorption fields and building sites because of a high water table.

The capability subclass is IIIw. The Michigan soil management group is 1c.

49B—Oakville fine sand, loamy substratum, 0 to 6 percent slopes. This is a nearly level and gently sloping, moderately well drained soil on slight knolls. The areas are irregular in shape and range in size from 4 to 250 acres or more.

Typically, the surface layer is dark grayish brown fine sand about 9 inches thick. The subsoil is yellowish brown, brownish yellow, and light yellowish brown, loose fine sand about 43 inches thick. The substratum to a depth of 60 inches is yellowish brown, mottled clay loam. In some places the loamy substratum is at a depth of more than 60 inches, and in other places it is at a depth of between 30 and 40 inches.

Included with this soil in mapping are some small areas of somewhat poorly drained Thetford and Tedrow soils. These soils are in slight depressional areas and make up from 10 to 15 percent of the map unit.

Permeability is rapid in the subsoil and moderately slow in the substratum. The available water capacity is low, and surface runoff is very slow. The seasonal high water table is at a depth of 3 to 6 feet in winter and spring.

In most areas this soil is wooded or is idle. It is poorly suited to use as cropland and for recreation uses. It is well suited to use as pasture and woodland and for building site development. It is poorly suited to use as septic tank absorption fields and sewage lagoons.

If this soil is used as cropland, the major concerns are droughtiness, soil blowing, and maintaining the organic matter content. Leaving crop residue on the surface, adding manure, and raising green manure crops help maintain the organic matter content. Irrigating can relieve droughty conditions. Buffer strips, cover crops, and field windbreaks can control soil blowing, as does conservation tillage that does not invert the soil and that leaves crop residue on the surface.

If this soil is used as pasture, the major concerns are droughtiness and soil blowing. Overgrazing can reduce plant cover and make the soil susceptible to soil blowing. Rotation grazing can help maintain plant cover. It may be necessary to use deep-rooted plants that are drought resistant.

If this soil is used as woodland, the major concern is droughtiness. The loss of planted or natural seedlings, because of dry weather conditions, can be high. Special site preparation, such as furrowing before planting, helps overcome seedling mortality.

If this soil is used for recreation development, the major concern is the soft, loose surface layer. Establishing grass cover is difficult. Adding a layer of loamy material to the surface and seeding with drought resistant grasses and legumes make playgrounds and picnic areas more serviceable and attractive.

This soil is suited to building site development and is generally not suited to use as sewage lagoons. It is limited for use as sites for septic tank absorption fields because of poor filtering capacity and high water table. Caving of cutbanks in shallow excavations is a concern. Constructing retaining walls can control cutbank cave-ins.

The capability subclass is IIIs. The Michigan soil management group is 5/2a.

50B—Ottokee fine sand, 0 to 6 percent slopes. This is a nearly level and gently sloping, moderately well drained soil on small ridges and knolls. The areas are irregular in shape and range in size from 3 to 200 acres.

Typically, the surface layer is dark brown fine sand about 9 inches thick. The subsurface layer is reddish yellow and yellowish brown, very friable fine sand about 24 inches thick. The subsoil extends to a depth of 60 inches. The upper part is yellowish brown, mottled, loose fine sand about 8 inches thick. The middle part is dark brown, mottled, massive loamy fine sand with yellowish brown fine sand strata about 5 inches thick. The lower part is light yellowish brown, mottled fine sand with thin layers of dark brown sandy loam about 14 inches thick. In some places the subsoil does not have loamy bands. Also, in some places the subsoil does not have gray mottles.

Included with this soil in mapping are some small areas of poorly drained Granby soils. Granby soils are in low areas and natural drainageways and make up about 5 percent of the unit.

Permeability is rapid. The available water capacity is low, and surface runoff is moderate. The seasonal high water table is at a depth of 2 to 3 1/2 feet in winter and spring.

In most areas this soil is wooded. It has poor suitability for use as cropland. It has good suitability for use as pasture, fair suitability for use as woodland and recreation development, and poor suitability for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concerns are maintaining organic matter content, soil blowing, and droughtiness. Leaving crop residue on the surface, adding manure, and raising green manure crops can maintain the organic matter content. Field windbreaks, buffer strips, cover crops, and conservation tillage that does not invert the soil and that leaves crop residue on the surface help conserve moisture and prevent soil blowing. Irrigation is needed for optimum crop production.

If this soil is used for pasture, the major concerns are droughtiness and soil blowing. Overgrazing can reduce plant cover, making the soils susceptible to soil blowing. Rotation or strip grazing can help maintain plant cover. It may be necessary to plant deep-rooted plants that are drought resistant.

If this soil is used as woodland, the major concern is high seedling mortality. Using special planting stock and overstocking help overcome seedling mortality.

If this soil is used for recreation development, the major concern is the soft, loose surface layer. Adding a layer of loamy material to the surface and seeding with drought resistant grasses and legumes make playgrounds and picnic areas more serviceable and attractive. Covering paths and trails with wood chips and bark improves their trafficability.

The soil is suited to building site development, and it is generally not suited to use as sewage lagoons. It is limited to use as a site for septic tank absorption fields because of poor filtering capacity and high water table. Caving of cutbanks in shallow excavations is a concern. Retaining walls can control cutbank cave-ins.

The capability subclass is IIIs. The Michigan soil management group is 4a.

51—Pits, quarries. This map unit consists of excavations from which limestone has been removed. The exposed rock does not support plants. The excavations that are deeper than the water table are flooded seasonally every year. The areas range from 40 to more than 60 acres is size.

In most areas the mining for limestone continues. Suitability is poor for use as cropland, pasture, and woodland. The areas are too variable to be rated for other uses. Onsite investigation is necessary for specific uses.

This area is not assigned to an interpretive grouping.

52—Warners silt loam. This is a nearly level, very poorly drained soil in depressions and low-lying areas. It is subject to frequent ponding. The areas are irregular in shape and range in size from 3 to 100 acres.

Typically, the surface layer is black silt loam about 12 inches thick. Below that, there is very pale brown, very friable marl about 15 inches thick. The part below that is black, very friable muck about 2 inches thick. The next part is very pale brown, massive marl about 13 inches thick. The next part is very dark gray, massive muck about 15 inches thick. The next part is light gray loamy sand to a depth of about 60 inches. In some places the surface layer is muck, and in some places it is marl.

The permeability is moderate or moderately slow, and the available water capacity is low. Surface runoff is very slow or ponded. The strong alkaline conditions in the subsoil limit root development. The high water table is near or above the surface in winter and spring.

In most areas this soil is idle. It has poor suitability for use as cropland, pasture, woodland, septic tank absorption fields, and sewage lagoons and for building site development and recreation development.

This soil is generally not suited to use as cropland because of the lack of drainage outlets and because of its high alkalinity.

If this soil is used as pasture, the major concerns are alkalinity, ponding, and excess water. In most areas the soils remain undrained for lack of outlets.

This soil is poorly suited to recreation uses because of ponding and too much organic matter. It is generally not practical to use this soil for most recreation uses.

This soil is generally not suited to use as septic tank absorption fields, sewage lagoons, and building sites because of frequent ponding and the high water table.

The capability subclass is Vw. The Michigan soil management group is M/mc.

55—Gilford sandy loam. This is a nearly level, very poorly drained soil in depressional areas, broad low-lying areas, and drainageways. It is subject to frequent ponding. The areas are elongated in shape and range in size from 5 to 200 acres or more.

Typically, the surface layer is very dark gray, sandy loam about 11 inches thick. The subsoil is grayish brown, friable, mottled sandy loam about 17 inches thick. The substratum to a depth of 60 inches is light brownish gray, grayish brown, and gray sand. In some places it is stratified silt loam and very fine sand. In some places silty clay loam is below a depth of 50 inches.

Included with this soil in mapping are some small areas of poorly drained Granby soils. Granby soils have more sand in the subsoil, are in positions on the landscape similar to those of Gilford soils, and make up about 12 percent of the unit.

Permeability is moderately rapid in the subsoil and rapid in the substratum. The available water capacity is low, and surface runoff is very slow or ponded. The water table is near or above the surface in winter and spring.

In most areas this soil is cropland. It has fair suitability for use as cropland, pasture, and woodland. It has poor suitability for recreation development and building site development and for use as septic tank absorption fields and sewage lagoons.

If this soil is used as cropland, the major concern is removing excess water. This soil ponds after heavy rains and is ponded late in spring. Surface and subsurface tile drainage help reduce wetness.

If this soil is used as pasture, the major concerns are excess water and ponding. It may be necessary to restrict grazing during wet periods.

If this soil is used as woodland, the major concern is excess water. Timing woodland operations to seasons of the year when the soils are relatively dry or frozen helps overcome the concern of excess water for equipment operations. Special site preparation, such as furrowing before planting, helps reduce seedling mortality. Harvest methods that will not leave trees standing alone or widely spaced help control windthrow hazard.

If this soil is used for recreation development, the major concern is ponding. This soil ponds after heavy rains and is ponded in late spring. Surface and subsurface drainage help reduce ponding. In some areas some filling may be needed.

The soil is generally not suited to use as septic tank absorption fields and sewage lagoons and for building site development because of ponding and high water table.

The capability subclass is IIw. The Michigan soil management group is 4c.

56A—Urban land-Blount complex, 0 to 3 percent slopes. This map unit consists of Urban land and a nearly level, somewhat poorly drained Blount soil on upland flats. The areas are so intricately mixed or so small that it was not practical to map them separately. The mapped areas range from 10 to 200 acres in size. This map unit is made up of 50 to 65 percent Urban land and 35 to 40 percent Blount soils.

Urban land consists of areas that are covered by streets, parking lots, buildings, and other structures that obscure or alter the soils and make identification unfeasible.

Typically, the Blount soil has a surface layer of dark grayish brown loam about 8 inches thick. The subsoil is mottled and is about 14 inches thick. The upper part is dark yellowish brown, firm silty clay loam, and the lower part is dark yellowish brown and brown, very firm clay. The substratum to a depth of 60 inches is grayish brown, silty clay loam. Some of the low areas have been filled and other small areas have been cut, built up, or smoothed.

Included with this unit in mapping are small areas of Metamora and Pewamo soils. The somewhat poorly drained Metamora soils are in higher convex areas, and the poorly drained Pewamo soils are in depressional areas or drainageways. These soils make up about 10 to 14 percent of the unit.

Permeability in the Blount soil is slow or moderately slow. The available water capacity is high, and surface runoff is slow. In most areas this soil is artificially drained by sewer systems, gutters, drainage tiles, and, to a lesser extent, surface ditches. Blount soils that are not drained have a seasonal high water table at a depth of 1 to 3 feet during wet periods.

The Blount soil is used as open spaces, lawns, gardens, and building sites. It has fair suitability for use as parks, lawns, and gardens. It has poor suitability for use as septic tank absorption fields and building sites.

The Blount soil is suited to use as lawns and gardens. Excess water is the main concern. Several methods of artificial drainage can be successfully used on this soil, but on-site investigation is needed to determine the best method for a particular area. It may be necessary to select perennial plants that have a fairly high tolerance of wetness. Soil erosion generally is not a major problem unless the soil is disturbed and left bare for a considerable period of time.

The Blount soil has severe limitations for building site development. Areas used for this purpose must be artificially drained. It may be necessary to construct dwellings and small buildings without basements. Sanitary facilities should be connected to commercial sewer or treatment facilities. The upper layer of the Blount soil will need to be replaced or covered with a suitable base material if this soil is used for local roads and streets. The poorly drained Pewamo soils in this unit are not suitable for parks and playgrounds. Play areas and walkways may need artificial drainage. Onsite investigation is essential to properly evaluate and plan the development of specific sites.

This map unit is not assigned to an interpretive group.

57—Urban land-Lenawee complex. This map unit consists of Urban land and a nearly level, poorly drained Lenawee soil in flat areas and drainageways. The Lenawee soil is subject to frequent ponding. The areas are so intricately mixed or so small in size that it was not practical to map them separately. Areas of this complex range in size from 20 to 230 acres. The areas are 60 to 70 percent Urban land and 15 to 30 percent Lenawee soil.

The Urban land part is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils and make identification unfeasible.

Typically, the Lenawee soil has a surface layer of very dark grayish brown silty clay loam about 10 inches thick. The subsoil is mottled and is about 23 inches thick. The upper part is grayish brown silty clay loam, and the lower part is brown silty clay. The substratum to a depth of about 60 inches is multicolored silt loam. In some places the soil has been altered. In some low areas it has been filled, and in other small areas it has been cut, built up, or smoothed.

Included with this unit in mapping are some small areas of the somewhat poorly drained Del Rey and Fulton soils. These soils are in slightly raised positions on the landscape. These soils make up about 10 to 15 percent of the unit.

Permeability is moderately slow in the Lenawee soil. The available water capacity is high, and surface runoff is very slow or ponded. In most areas this soil is artificially drained by sewer systems, gutters, drain tiles, and, to some extent, surface ditches. Where the soil is not drained the water table is near or above the surface in winter and spring.

The Lenawee soil is used for parks, open spaces, building sites, lawns, and gardens. It has fair suitability for lawns and gardens and for trees and shrubs. It has poor suitability for use as recreation areas, septic tank absorption fields, and building sites.

The Lenawee soil is suited to grasses, trees, and shrubs if excess water is removed. Several methods of artificial drainage can be used on this soil, but the best method for a particular area will need to be determined by on-site evaluation. It may be necessary to select perennial plants that have a fairly high tolerance for wetness.

The Lenawee soil has severe limitations for building site development and recreation development. The areas used for these purposes must be artificially drained and protected from ponding. If local roads and streets are constructed, the upper layer will need to be replaced with a suitable base material.

The better drained Del Rey and Fulton soils in this map unit are more suitable than the Lenawee soils for parks and playgrounds. Onsite investigation is essential to properly evaluate and plan the development of specific sites.

This map unit is not assigned to an interpretive group.

58B—Urban land-Oakville complex, 0 to 6 percent slopes. This map unit consists of Urban land and a nearly level and gently sloping, well drained Oakville soil on small ridges and knolls. The areas are so intricately mixed or so small in size that it was not practical to map them separately. Areas of this map unit range in size from 3 to 139 acres. This map unit is made up of 50 to 60 percent Urban land and 20 to 30 percent Oakville soil.

The Urban land part is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils and make identification unfeasible.

Typically, the Oakville soil has a surface layer of very dark grayish brown fine sand about 7 inches thick. The subsoil is dark yellowish brown, yellowish brown, and brown, loose, fine sand about 20 inches thick. The substratum to a depth of 60 inches is light yellowish brown, mottled, fine sand. In some places the soil has been leveled or excavated.

Included with this unit in mapping are small areas of Tedrow and Selfridge soils. The somewhat poorly drained Tedrow and Selfridge soils are in low areas and some drainageways. These soils make up about 10 to 15 percent of the unit.

Permeability is rapid in the Oakville soil. The available water capacity is low, and surface runoff is slow.

The Oakville soil is used as gardens, borrow areas, and building sites, or it it idle. It has fair suitability for recreation uses and for use as septic tank absorption fields and building sites.

The Oakville soil is poorly suited to use as gardens. The major concerns are droughtiness and soil blowing. It may be necessary to select perennial plants that have a fairly high tolerance for droughtiness. Management practices, such as using vegetative cover and planting windbreaks, can reduce wind erosion.

The Oakville soil has slight limitations for building site development and septic tank absorption fields and moderate or severe limitations for recreation development. The areas used for recreation should be protected from soil blowing. Sanitary facilities should be connected to commercial sewers or treatment facilities.

The Selfridge and Tedrow soils in this unit are not suitable for parks and playgrounds because of wetness. Onsite investigation is essential to properly evaluate and plan the development of specific sites.

This unit is not assigned to an interpretive group.

59A—Urban land-Selfridge-Pewamo complex, 0 to 3 percent slopes. This map unit consists of Urban land and a nearly level, somewhat poorly drained Selfridge soil on upland flats and a poorly drained Pewamo soil in shallow depressions or drainageways. The individual areas are so intricately associated or so small in size that it was not practical to map them separately. The Pewamo soil ponds frequently. The mapped areas range in size from 30 to 440 acres. This map unit is made up of 25 to 40 percent Urban land and 60 to 75 percent Selfridge and Pewamo soils.

The Urban land is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils to the extent that identification is not feasible.

Typically, the Selfridge soil has a surface layer of very dark grayish brown, loamy sand about 8 inches thick. The subsurface layer is brown sand about 7 inches thick. The subsoil is mottled and is about 17 inches thick. The upper part is yellowish brown, loose sand; the middle part is dark brown, friable sandy loam; and the lower part is reddish brown, friable clay loam. The substratum to a depth of 60 inches is reddish gray, mottled, clay loam.

Typically, the Pewamo soil has a surface layer of black clay loam about 9 inches thick. The subsurface layer is very dark gray clay loam about 3 inches thick. The subsoil is dark gray, mottled, very firm, clay loam about 23 inches thick. The substratum to a depth of 60 inches is gray clay loam. In some places the soil has been altered. Some low areas have been filled, and other small areas have been cut, built up, or smoothed.

Most areas of this map unit are artificially drained through sewer systems, gutters, drainage tiles, and, to a lesser extent, surface ditches. Selfridge soil that is not drained has a seasonal high water table at a depth of 1 to 2 feet, and Pewamo soil that is not drained has a water table near or above the surface in winter and spring. Permeability is moderate in the subsoil of the Selfridge soil and slow or moderately slow in the substratum. Permeability is moderately slow in the Pewamo soil.

The Selfridge and Pewamo soils are used for open spaces, for lawns and gardens, and as building sites. The Selfridge soil is suited to grasses, flowers, vegetables, trees, and shrubs. During the wet season, drainage may be a concern. Several methods of artificial drainage can be successfully used on this soil. The best method for a particular area needs to be determined by onsite investigation. It may be necessary to select perennial plants that have a fairly high tolerance of droughtiness during dry periods. Soil erosion can be a concern if the soil is left bare.

The Pewamo soil is suited to grasses, flowers, vegetables, trees, and shrubs if excess water is removed. Several methods of artificial drainage can be used on this soil. The best method depends on the area and the findings of an onsite investigation. It may be necessary to select plants that have a high tolerance of wetness.

The Selfridge and Pewamo soils in this map unit have severe limitations for building site development, sanitary facilities, and recreation uses. If used for these purposes the soils must be artificially drained. Dwellings and small buildings without basements can be constructed. Sanitary facilities should be connected to commercial sewers and treatment facilities. Onsite investigation is essential to properly evaluate and plan the development of specific sites.

This map unit is not assigned to an interpretive group.

60A—Conover loam, 0 to 3 percent slopes. This is a nearly level, somewhat poorly drained soil on upland flats and small knolls. Areas are irregular in shape and range in size from 3 to 120 acres.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. The subsurface layer is brown loam about 7 inches thick. The subsoil is yellowish brown, mottled, firm clay loam about 20 inches thick. The substratum to a depth of 60 inches is dark grayish brown loam. In some places carbonates are at a depth of 13 to 19 inches. In some places the subsoil has more clay or is gleyed. In some places the solum has more sand.

Included with this soil in mapping are some small areas of somewhat poorly drained Selfridge soils and poorly drained Pewamo soils. Selfridge soils have a sandy subsoil in the upper part and are on slopes in positions similar to those of the Conover soil. Pewamo soils have more clay in the subsoil. They are in drainageways and small depressions. These included soils make up about 7 to 10 percent of the unit.

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

In most areas this soil is farmed. It has good suitability for use as cropland, pasture, and woodland. It has poor suitability for recreation development and for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concerns of management are removing excess water and maintaining good tilth. Surface drainage and subsurface tile drainage can lower the water table and reduce wetness. Erosion control structures may be needed at the outlet of surface ditches and natural drainageways. Green manure crops and crop residue returned to the soil help maintain good soil tilth, as does conservation tillage that does not invert the soil and that leaves crop residue on the surface.

If this soil is used as pasture, the major concern is excess water. Grazing when the soil is wet generally results in soil compaction, excess runoff, and poor tilth. Proper stocking rates, rotational grazing, and timely deferment of grazing help maintain good tilth.

If this soil is used for recreation development, the major concern is wetness. Subsurface drains or open ditches can help to reduce wetness.

This soil has limitations for use as septic tank absorption sites and sewage lagoons and for building sites because of a high water table. Conventional septic tank absorption fields generally are not practical on this soil. Dwellings without basements may be constructed if artificial drainage is installed to lower the high water table.

The capability subclass is IIw. The Michigan soil management group is 1.5b.

61—Brookston loam. This is a nearly level, very poorly drained soil in broad low areas and depressions. It is subject to frequent ponding. Areas range in size from 30 to 500 acres or more.

Typically, the surface layer is very dark gray loam about 11 inches thick. The gray, mottled, firm subsoil is about 19 inches thick. The upper part is clay loam, and the lower part is sandy clay loam. The substratum to a depth of 60 inches is light gray, mottled loam. In some places the subsoil has more clay. In some places the subsoil has less clay.

Included with this soil in mapping are some small areas of poorly drained Corunna soils and poorly drained soils with a gravelly substratum. Corunna soils have more sand in the subsoil. They are in positions on the landscape similar to those of Brookston soils and make up about 5 to 10 percent of the unit.

Permeability is moderate, and the available water capacity is high. Surface runoff is very slow or ponded. The water table is near or above the surface in winter and spring.

In most areas this soil is farmed. It has good suitability for use as cropland, pasture, and woodland. It has poor suitability for recreation development and for use as septic tank absorption fields, sewage lagoons, and building sites.

If this soil is used as cropland, the major concern is removing excess water. Surface drainage and subsurface tile drainage can help lower the water table and reduce ponding.

If this soil is used as pasture, the major concerns are wetness and ponding. Grazing during wet periods may cause soil compaction. Rotation grazing or limiting grazing to drier periods can reduce soil compaction.

If this soil is used as woodland, the major concern is excess water. Harvesting can be done during dry periods.

If this soil is used for recreation development, the major concerns are wetness and ponding. Subsurface drains or open ditches can help to reduce the wetness and ponding.

This soil is generally not suited to use as septic tank absorption fields, sewage lagoons, and building sites because of ponding and a high water table.

The capability subclass is IIw. The Michigan soil management group is 2.5c.

62A—Blount-Pewamo-Metamora complex, 0 to 3 percent slopes. This map unit consists of a nearly level, somewhat poorly drained Blount soil in flat upland areas, a Metamora soil on slight knolls, and a poorly drained Pewamo soil. The Pewamo soil is in depressions and drainageways and is subject to frequent ponding. These soils are in areas so intricately mixed or so small in size that it was not practical to separate them in mapping. The mapped areas are irregular in shape and range in size from 200 to 1,300 acres or more. This map unit is made up of 25 to 40 percent Pewamo soils, 20 to 50 percent Blount soils, and 19 to 31 percent Metamora soils.

Typically, the Blount soil has a surface layer of dark grayish brown loam about 8 inches thick. The subsoil is mottled and is about 14 inches thick. The upper part is dark yellowish brown and brown, very firm silty clay loam, and the lower part is dark yellowish brown and brown, very firm clay. The substratum to a depth of 60 inches is grayish brown silty clay loam. In some places carbonates are at a depth of 13 to 19 inches. Also, in some places the subsoil has less clay, and the substratum is loam. The surface layer is sandy loam in places.

Typically, the Pewamo soil has a surface layer of black clay loam about 9 inches thick. The subsurface layer is very dark gray clay loam about 3 inches thick. The subsoil is dark gray, mottled, very firm clay loam about 23 inches thick. The substratum to a depth of 60 inches is gray, mottled clay loam. In some places the subsoil has less clay.

Typically, the Metamora soil has a surface layer of black sandy loam about 7 inches thick. The subsurface layer is brown sandy loam about 8 inches thick. The mottled, friable subsoil is about 11 inches thick. The upper part is grayish brown sandy loam, and the lower part is light brownish gray sandy loam. The substratum to a depth of 60 inches is brown, mottled silty clay loam. In some places the substratum is at a depth of 14 to 19 inches.

Included with these soils in mapping are small areas of a somewhat poorly drained Selfridge soil that has more sand in the subsoil than Metamora or Blount soils and is in similar positions on the landscape. This included soil makes up about 5 to 10 percent of the map unit.

Permeability in the Blount soil is slow or moderately slow. The available water capacity is high. Surface runoff is medium or slow. The seasonal high water table is at a depth of 1 to 3 feet in winter and spring.

Permeability in the Pewamo soil is moderately slow. The available water capacity is high. Surface runoff is very slow or ponded. The water table is near or above the surface in winter and spring.

Permeability in the Metamora soil is moderately rapid in the subsoil and moderately slow in the substratum. The available water capacity is high. Surface runoff is slow. The seasonal high water table is at a depth of 1/2 foot to 1 1/2 feet in winter and spring.

In most areas these soils are farmed. They have good suitability for use as cropland, pasture, and woodland and poor suitability for recreation development and for use as septic tank absorption fields, sewage lagoons, and building sites.

If these soils are used as cropland, the major concerns are removing excess water and maintaining good soil tilth. In low areas these soils pond after heavy rains. Surface drainage and subsurface tile drainage help control wetness. Restricting tillage operations during wet periods and using conservation tillage that does not invert the soil and that leaves crop residue on the surface can maintain good tilth.

If these soils are used as pasture, the major concern is excess water. Grazing should be restricted during wet periods to reduce soil compaction.

If these soils are used for recreation development, the major concerns are ponding and wetness. Surface and subsurface drains can help to reduce wetness and ponding.

These soils have severe limitations for use as building sites and septic tank absorption fields. Dwellings without basements can be constructed in areas of Blount and Pewamo soils. These areas should be artificially drained.

The capability subclass is IIw. The Michigan soil management groups are 1.5c, 3/2, and 1.5b.

63—Urban land. This map unit consists of nearly level areas covered by streets, parking lots, buildings, and other structures that obscure or alter the soils to the point that identification is not feasible. Areas are irregular in shape and range in size from 15 to 150 acres.

Included with this unit in mapping are small areas of poorly drained Lenawee and Pewamo soils and of somewhat poorly drained Blount and Fulton soils. Individually, these soils make up as much as 15 percent of a mapped area. Together, they make up less than 20 percent of this unit.

The present use of Urban land precludes use for most other purposes. Most areas are drained by storm sewers, gutters, and, to a lesser extent, ditches.

The suitability for most engineering and recreation uses varies greatly. Onsite investigation is necessary to determine the hazards and limitations for specific uses.

This map unit is not assigned to an interpretive group.

prime farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in Monroe County are listed.

Prime farmland provides much of the nation's food and fiber. It is one of several kinds of important farmland defined by the U.S. Department of Agriculture. The acreage of high quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have soil properties that are favorable for the economic production of sustained high yields of crops. The soils need to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long.

Prime farmland soils may presently be used as cropland, pasture, or woodland, or they may be in other land uses. They are either used for producing food or fiber or are available for these uses. Urban and built-up land or water areas cannot be considered prime farmland.

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent.

Soils that have limitations—a high water table, subject to flooding, or droughtiness—may qualify as prime farmland soils if the limitations are overcome by such measures as drainage, flood control, or irrigation. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information on the criteria for prime farmland soils can be obtained at the local office of the Soil Conservation Service.

prime farmland in Monroe County

A recent trend in land use in some parts of the county has resulted in the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, or difficult to cultivate and less productive than prime farmland.

The following map units, or soils, make up prime farmland in Monroe County. Limitations or restrictions, if any, are shown in parentheses after the name of the map unit. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each map unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed soil map units." The list does not constitute a recommendation for a particular land use.

13A—Blount loam, 0 to 3 percent slopes (where drained)
14A—Del Rey silt loam, 0 to 3 percent slopes (where drained)
15A—Fulton silty clay loam, 0 to 3 percent slopes (where drained)
17A—Metamora-Corunna sandy loams, 0 to 3 percent slopes (where drained)
19A—Selfridge loamy sand, 0 to 3 percent slopes (where drained)
20A—Selfridge-Pewamo complex, 0 to 3 percent slopes (where drained)
21—Lenawee silty clay loam (where drained)
22—Pewamo clay loam (where drained)
23A—Metamora sandy loam, 0 to 3 percent slopes (where drained)
24—Corunna sandy loam (where drained)
25A—Randolph clay loam, 0 to 3 percent slopes (where drained)
26B—Milton clay loam, 2 to 6 percent slopes
28A—Kibbie very fine sandy loam, 0 to 3 percent slopes (where drained)
29—Colwood loam (where drained)
30—Sloan loam (where protected from flooding and drained)
41B—Metea sand, 2 to 6 percent slopes
42—Hoytville silty clay loam (where drained)
43A—Nappanee loam, 0 to 3 percent slopes (where drained)
46—Ceresco fine sandy loam (where protected from flooding and drained)
47—Millsdale clay loam (where drained)
48—Toledo silty clay loam (where drained)

55—Gilford sandy loam (where drained)
60A—Conover loam, 0 to 3 percent slopes (where drained)

61—Brookston loam (where drained)
62A—Blount-Pewamo-Metamora complex, 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 rangeland and 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.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Dwight L. Quisenberry, agronomist, Soil Conservation Service, helped prepare 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.

Monroe County has a total land area of 356,544 acres. About 57 percent, or 204,731 acres, is in farms. In 1974 this farmland consisted of 192,666 acres of harvested cropland, 4,405 acres of cropland used only for pasture, and 7,660 acres of land in other uses. Abandoned farmland, woodland, wetland, and urban areas made up the rest of the county's land area. Of the total farmland in Monroe County, about 93 percent was used as cropland. Soybeans made up 46 percent, corn 27 percent, wheat, the main closegrown crop, 17 percent, and other crops 10 percent.

Soil drainage is the major management need on about 90 percent of the acreage used for crops and pasture in Monroe County. Draining cropland improves the air-water relationship in the root zone. Spring planting, weed control, and harvesting operations are hampered if drainage is inadequate. Tile drains and surface drainageways can be used to remove excess water. Some soils, for example, the very poorly drained Sloan soils, are subject to frequent flooding. These soils are so wet that crop production generally is not possible unless the soils are artificially drained and protected.

Unless they are artificially drained, the poorly drained and somewhat poorly drained soils, for example, Belleville, Blount, Colwood, Corunna, Del Rey, Fulton, Granby, Lenawee, Metamora, and Pewamo soils, are so wet that crops are damaged in most years.

The design of surface and subsurface drainage systems varies with the soil. A combination of tile drains and ditches is needed in most areas of poorly drained soils that are used intensively for row crops. Drains have to be more closely spaced in soils that are slowly permeable than in the more permeable soils. Adequate outlets for a tile drainage system are difficult to find in many areas of Belleville, Colwood, Corunna, Gilford, Granby, and Pewamo soils. Dikes and pumps could be used in some places. Good soil structure improves soil drainage. Information on drainage design for each kind of soil is available in local offices of the Soil Conservation Service.

Soil blowing is a major hazard on about one-fourth of the cropland in Monroe County. Soil blowing can damage the soils and injure or destroy crops. It is a major hazard on the sandy Belleville, Granby, Metea, Oakville, Ottokee, Selfridge, Spinks, Tedrow, Thetford, and Wasepi soils. It can also be a hazard on loamy soils if winds are strong and the soils are dry and bare of vegetation. Vegetative cover, surface residue, a rough surface through tillage, buffer strips of grain, vegetative barriers, wind stripcropping, and field windbreaks help reduce soil blowing.

Water erosion is a hazard on about 20 percent of the cropland, where the slope is more than 2 percent. Metea, Milton, and Ottokee soils, for example, have slopes of 0 to 6 percent and are subject to erosion. In places, Blount, Conover, Del Rey, Fulton, Kibbie, and Metamora soils, for example, have slopes of more than 2 percent.

Erosion reduces productivity 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 subsoil of clay loam, such as Blount soils. Erosion also reduces productivity on soils that tend to be droughty, such as Metamora and Selfridge soils. Erosion contributes to the sediment pollution of streams and affects water quality for municipal use, recreation, and fish and wildlife.

In some fields where there are spots of clay loam, preparing a good seedbed and tilling are difficult because the original friable soil on the surface has been eroded away. Such spots are common in areas of Corunna, Metamora, and Selfridge soils.

Erosion control practices help protect the soil surface, reduce runoff, and increase water infiltration. A cropping system that keeps a vegetative cover on the soil can hold the loss of soil to an amount that will not reduce the productive capacity of the soils. On livestock farms, legume and grass crops in the cropping system reduce erosion on sloping land and improve soil structure and tilth. Legumes also provide nitrogen for the next crop.

Water erosion is a major hazard along streams and open ditches in Monroe County. Runoff from fields, roadways, and construction sites forms gullies and carries sediment into streams and ditches. Sediment clogs streams and ditches and reduces water quality. It is expensive to remove. The banks of the streams and ditches cave in and erode during periods of peak flow. Measures that can reduce erosion and improve water quality include vegetative cover, mulching, grassed waterways, diversions, grade stabilization structures, channel linings, and sediment basins.

Soil tilth is an important factor in germinating seeds and in infiltrating water into the soil. Soils that have good tilth are granular and porous.

In Monroe County, maintaining tilth is a problem on some soils. In most years the dark colored Pewamo soils stay wet until late in spring. If these soils are wet when plowed or when tillage or harvesting equipment is used, they tend to be very cloddy when dry and their subsoil becomes compacted. Good seedbeds are difficult to prepare.

Field crops commonly grown in Monroe County include soybeans, corn, and some close growing crops. Wheat is the most common close growing crop, but rye and oats are grown as well. If artificially drained, loamy soils that are poorly drained and somewhat poorly drained are especially well suited to these crops.

Special crops grown commercially in Monroe County are small fruits, tree fruits, and nursery stock. Vegetables are grown mainly in the southern half of the county. Potatoes are well adapted to the sandy soils throughout the county. A small acreage of scattered land is used for potatoes, peppers, sweet corn, cabbage, cantaloupes, tomatoes, onions, and cauliflower.

Sandy soils that are moderately well drained and somewhat poorly drained and that warm up early in spring, for example, Metea, Selfridge, Tedrow, and Thetford soils, are especially well suited to vegetables and small fruits. Irrigation and artificial drainage can be used to obtain optimum yields. Crops can generally be planted and harvested earlier on these soils than on other soils in Monroe County.

The latest information and suggestions for growing special crops (*4*) can be obtaind from local offices of the Cooperative Extension Service and the Soil Conservation Service.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 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 rangeland, 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 few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main 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); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass (*5*) is shown in table 6. The capability classification and Michigan soil management group of each map unit is given in the section "Detailed soil map units."

The soil management groups in the soil complexes are listed in the same order as the soils in the complex. The soils are grouped according to the need for lime and fertilizer, artificial drainage, and other practices.

woodland management and productivity

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.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service, the Cooperative Extension Service, or from a commercial nursery.

recreation

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 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. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

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

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, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggartick, thistle, ragweed, wild carrot, daisy, chicory, and milkweed.

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, ash, poplar, cherry, maple, apple, hawthorn, dogwood, hickory, blackberry, raspberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are gray dogwood, silky dogwood, autumn-olive, crabapple, honeysuckle, American cranberry, and fragrant sumac.

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, eastern redcedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, potholes, waterfowl feeding areas, wet meadow ponds, and flood plains.

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, woodchuck, red fox, and mourning dove.

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, squirrels, raccoon, deer, and owls.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, wading 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, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the 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 bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and 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, depth to bedrock or to a cemented pan, 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 bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 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, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to 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, depth to bedrock or to a cemented pan, 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, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, and soil reaction affect trench 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 bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 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. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, and bedrock.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, 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 and 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 fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, 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 1.7 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 16, 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, by runoff from adjacent slopes, or by tides. 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 an average of once or less 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, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*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 coarse-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 muck soils on lake plains. These soils formed in organic material less than 51 inches thick over sandy material. The permeability is moderately slow to moderately rapid in the organic material and rapid in the underlying layer. Slope is 0 to 1 percent.

Adrian soils are commonly adjacent on the landscape to Granby and Tedrow soils. Granby and Tedrow soils are coarse textured mineral soils. Granby soils are in natural drainageways and low areas. Tedrow soils are somewhat poorly drained and are on slight knolls.

Typical pedon of Adrian muck, 40 feet north and 396 feet east of the southwest corner of sec. 35, T. 5 S., R. 6 E.

Oa1—0 to 10 inches; black (N 2/0) sapric material, black (N 2/0) when dry; moderate medium granular structure; 10 percent fiber, less than 5 percent rubbed; very friable; neutral; abrupt wavy boundary.
Oa2—10 to 24 inches; black (10YR 2/1) sapric material, black (N 2/0) rubbed; 15 percent fiber, less than 5 percent rubbed; moderate thin platy structure; friable; neutral; gradual wavy boundary.
Oa3—24 to 30 inches; black (5YR 2/1) sapric material, rubbed and broken face; 13 percent fiber, less than 5 percent rubbed; weak thick platy structure; friable; neutral; gradual wavy boundary.
Oa4—30 to 34 inches; black (5YR 2/1) sapric material; rubbed and broken face; moderate medium subangular blocky structure; friable; neutral; abrupt smooth boundary.
IICg—34 to 60 inches; grayish brown (2.5Y 5/2) loamy sand; single grain; loose; mildly alkaline.

The organic layers are 16 to 50 inches deep over sandy material. The reaction ranges from slightly acid to mildly alkaline. Woody fragments range from 0 to 10 percent in some pedons. The substratum contains 0 to 25 percent pebbles. It is effervescent in some pedons.

Belleville series

The Belleville series consist of poorly drained soils on lake plains and in glacial outwash areas. The permeability is rapid in the sandy horizons and moderately slow in underlying layers. These soils formed in sandy, glacial fluvial material over loamy lacustrine or till material. Slope is 0 to 2 percent.

Belleville soils are similar to Granby soils and are commonly adjacent to Corunna and Selfridge soils on the landscape. Granby soils have a coarser textured substratum. Corunna soils have finer textures in the solum, and Selfridge soils are better drained.

Typical pedon of Belleville loamy sand, 2,000 feet east and 600 feet south of northwest corner of sec. 24, T. 8 S., R. 7 E.

Ap—0 to 10 inches; black (10YR 2/1) loamy sand, very dark gray (10YR 3/1) dry; very weak medium granular structure; very friable; slightly acid; abrupt wavy boundary.
B21g—10 to 18 inches; grayish brown (2.5Y 5/2) sand; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; very friable; slightly acid; clear wavy boundary.
B22g—18 to 28 inches; light brownish gray (2.5Y 6/2) sand; common medium distinct yellowish brown (10YR 5/8) and common fine faint gray (10YR 5/1) mottles; weak fine subangular blocky structure; very friable; neutral; abrupt wavy boundary.
C1—28 to 38 inches; light olive brown (2.5Y 5/6) sand; common medium distinct yellowish brown (10YR 5/6) and (10YR 5/8) mottles; weak fine subangular blocky structure; very friable; slight effervescence; mildly alkaline; abrupt smooth boundary.
IIC2g—38 to 60 inches; gray (10YR 5/1) silty clay loam; many coarse distinct dark yellowish brown (10YR 4/4) mottles; massive; firm; slight effervescence; mildly alkaline.

The solum is 20 to 40 inches thick. Carbonates are at a depth of 20 to 40 inches. Reaction is slightly acid to mildly alkaline.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. It is dominantly loamy sand, but the range includes sand and loamy fine sand. An A12 horizon is present in some pedons.

The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is sand, loamy sand, or loamy fine sand. In some pedons there are thin strata of loamy sand.

The C1 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3. It is sand, loamy sand, or loamy fine sand. It is mildly or moderately alkaline.

The IIC horizon has hue of 10YR or 5Y, value of 4 or 5, and chroma of 1 or 2.

Blount series

The Blount series consists of somewhat poorly drained, slowly or moderately slowly permeable soils on water-reworked glacial till plains. These soils formed in loamy and clayey calcareous till. Slopes range from 0 to 3 percent.

Blount soils are similar to Nappanee and Randolph soils and are commonly adjacent on the landscape to Metamora and Pewamo soils. Nappanee soils have more clay in the subsoil. Randolph soils are underlain by limestone. Pewamo soils are poorly drained and are in slight depressions and drainageways. Metamora soils have more sand in the subsoil.

Typical pedon of Blount loam, 0 to 3 percent slopes, 1,330 feet south and 60 feet east of the northwest corner of sec. 2, T. 8 S., R. 8 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.
B21—8 to 12 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine faint grayish brown (10YR 5/2) and common fine faint yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; firm; thin discontinuous pale brown (10YR 6/3) clay films on the vertical faces of peds; 2 percent pebbles; neutral; clear wavy boundary.
B22t—12 to 16 inches; dark yellowish brown (10YR 4/4) clay; many fine faint grayish brown (10YR 5/2) and

yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very firm; many thin discontinuous grayish brown (10YR 5/2) clay films on the vertical faces of peds; 2 percent pebbles; neutral; clear wavy boundary.

B23t—16 to 22 inches; brown (10YR 5/3) clay; many fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate coarse angular blocky structure; very firm; thin discontinuous grayish brown (10YR 5/2) clay films on the vertical faces of peds; 2 percent pebbles; neutral; abrupt wavy boundary.

Cg—22 to 60 inches; grayish brown (10Yr 5/2) silty clay loam; many fine faint gray (10YR 5/1) and common medium distinct yellowish brown (10YR 5/4) mottles; massive; very firm; 2 percent pebbles; light gray (10YR 7/1) lime concretions; strong effervescence; moderately alkaline.

The solum ranges from 20 to 36 inches in thickness. Free carbonates are at a depth of 20 to 36 inches. Reaction in the solum ranges from medium acid to neutral in the upper part and neutral or mildly alkaline in the lower part.

The Ap horizon has chroma of 1 or 2. It is dominantly loam, but the range includes clay loam.

The B horizon has value of 4 or 5 and chroma of 1 to 4. It is clay, silty clay loam, or clay loam.

The C horizon has value of 4 or 5 and chroma of 2 or 3. It is clay loam or silty clay loam.

Brookston series

The Brookston series consists of very poorly drained, moderately permeable soils on lake plains and till plains. These soils formed in loamy glacial till. Slope is 0 to 2 percent.

Brookston soils are similar to Colwood and Pewamo soils and are commonly adjacent to Blount, Colwood, Corunna, Metamora, and Pewamo soils. Blount and Metamora soils are on slight rises. Colwood, Corunna, and Pewamo soils are in positions similar to those of Brookston soils. Blount soils are better drained and have more clay in the subsoil. Colwood soils have a stratified substratum. Corunna soils have a coarser textured subsoil. Pewamo soils have more clay in the subsoil. Metamora soils have a coarser textured subsoil.

Typical pedon of Brookston loam, 1,320 feet east, 50 feet north of southwest corner of sec. 3, T. 6 S., R. 6 E.

Ap—0 to 11 inches; very dark gray (10YR 3/1) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; 1 percent pebbles; neutral; abrupt smooth boundary.

B21tg—11 to 20 inches; gray (10YR 5/1) clay loam; common fine distinct yellowish brown (10YR 5/6) and (10YR 5/4) mottles; moderate coarse subangular blocky structure; firm; thin discontinuous gray (10YR 5/1) clay films on the vertical faces of peds; very dark gray (10YR 3/1) organic stains; 2 percent pebbles; neutral; gradual smooth boundary.

B22tg—20 to 30 inches; gray (10YR 5/1) sandy clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; firm; thin discontinuous gray (10YR 5/1) clay films on vertical faces of peds; 2 percent pebbles; mildly alkaline; clear wavy boundary.

C—30 to 60 inches; light gray (10YR 6/1) loam; massive; friable; dark yellowish brown (10YR 4/4) organic stains along old root channels; strong effervescence; moderately alkaline.

The solum ranges from 30 to 48 inches in thickness. Free carbonates are at a depth of 30 to 48 inches thick. Pebble content ranges from 1 to 5 percent in the pedon.

The Ap horizon has moist value of 2 or 3 and chroma of 1 or 2.

The matrix color of the B horizon has hue of 2.5Y or 10YR, value of 4 to 6, and chroma of 1 or 2. It is dominantly clay loam or sandy clay loam, but individual subhorizons may contain loam.

The C horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 1 or 2. It is loam, sandy clay loam, or clay loam.

Ceresco series

The Ceresco series consists of somewhat poorly drained, moderately or moderately rapidly permeable soils on incised flood plains of rivers and large streams. These soils formed in loamy alluvial material. Slope is 0 to 2 percent.

Ceresco soils are commonly adjacent to Sloan soils on the landscape. Sloan soils are poorly drained and have more clay in the subsoil.

Typical pedon of Ceresco fine sandy loam, 60 feet north of south field boundary and 60 feet east of Howard Drive on Government lot 635, T. 6 S., R. 8 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A12—9 to 18 inches; dark brown (10YR 3/3) fine sandy loam, grayish brown (10YR 5/2) dry; common fine faint dark brown (10YR 4/3) mottles; weak medium subangular blocky structure; friable; neutral; clear smooth boundary.

B2—18 to 34 inches; dark brown (7.5YR 4/4) fine sandy loam; common fine distinct light brownish gray (10YR 6/2) and brown (10YR 5/3) mottles; weak coarse subangular blocky structure; friable; neutral; clear smooth boundary.

Cg—34 to 60 inches; grayish brown (10YR 5/2) fine sandy loam; common fine faint pale brown (10YR 6/3) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; neutral.

The solum ranges from 24 to 30 inches in thickness. Reaction ranges from slightly acid to mildly alkaline in the upper part and from neutral to moderately alkaline in the lower part.

The Ap and A12 horizons have color value of 2 or 3 and chroma of 1 to 3. They are dominantly fine sandy loam, but the range includes sandy loam, loamy fine sand, or loam.

The B horizon has value of 4 or 5 and chroma of 2 to 4. It is fine sandy loam or loamy fine sand.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is fine sandy loam, sandy loam, or silt loam. Some pedons have thin strata of sand or loamy sand.

Channahon series

The Channahon series consists of shallow, well drained, moderately permeable soils on glacial till plains. These soils formed in loamy material over limestone. Slope ranges from 0 to 3 percent.

Channahon soils are commonly adjacent to Milton and Randolph soils on the landscape. Milton soils have bedrock at a depth below 20 inches and are in gently sloping areas. Randolph soils are finer textured and are on slopes similar to those of Channahon soils.

Typical pedon of Channahon loam, 0 to 3 percent slopes, 1,520 feet east and 350 feet north of the southwest corner of sec. 25, T. 3 S., R. 6 E.

Ap—0 to 8 inches; black (10YR 2/1) loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; friable; 15 percent limestone fragments; mildly alkaline; abrupt smooth boundary.

Bt—8 to 15 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; friable; thin discontinuous dark brown (10YR 3/3) clay films on the vertical faces of peds; 15 percent limestone fragments; mildly alkaline; abrupt smooth boundary.

IIR—15 to 60 inches; grayish brown (10YR 5/2) limestone bedrock.

The solum is less than 20 inches thick. Bedrock is at a depth of less than 20 inches. The solum is 0 to 20 percent flagstones.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. It is dominantly loam but the range includes silt loam.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam, silt loam, clay loam, or sandy clay loam.

Colwood series

The Colwood series consists of poorly drained, moderately permeable soils on lake plains and in delta areas. These soils formed in loamy and sandy glaciofluvial deposits. Slope is 0 to 2 percent.

Colwood soils are similar to Kibbie soils and are commonly adjacent to Lenawee and Tedrow soils on the landscape. Kibbie soils are somewhat poorly drained and are on slight knolls. Lenawee soils have more clay in the subsoil. Tedrow soils are somewhat poorly drained, have more sand in the subsoil, and are on slight knolls.

Typical pedon of Colwood loam, 445 feet south and 180 feet east of the center of sec. 3, T. 8 S., R. 8 E.

Ap—0 to 10 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A12g—10 to 12 inches; gray (10YR 5/1) loam, common fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; friable; neutral; abrupt wavy boundary.

B21g—12 to 18 inches; gray (10YR 5/1) clay loam, common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; neutral; clear wavy boundary.

B22g—18 to 24 inches; gray (10YR 5/1) clay loam; many fine distinct brown (10YR 5/3) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; neutral; clear wavy boundary.

IIB23g—24 to 45 inches; gray (10YR 5/1) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; mildly alkaline; clear wavy boundary.

IICg—45 to 60 inches; gray (10YR 6/1) stratified silt loam and very fine sand; many medium distinct yellowish brown (10YR 5/4, 10YR 5/6) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum ranges from 30 to 50 inches in thickness. The reaction of the solum is neutral or mildly alkaline.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. It is dominantly loam, but the range includes silt loam and fine sandy loam.

The Bg horizon has hue of 10YR or 2.5Y and value of 4 to 6. It is silt loam, clay loam, and fine sandy loam. Thin strata of silt, very fine sand, and silty clay are present in some pedons.

The C horizon has color value of 5 or 6 and chroma of 1 or 2.

Conover series

The Conover series consists of somewhat poorly drained, moderately or moderately slowly permeable soils on till plains and moraines. These soils formed in loamy glacial till. Slope ranges from 0 to 3 percent.

Conover soils are similar to Blount and Brookston soils and are commonly adjacent to Metamora and Pewamo soils on the landscape. Blount soils have more clay in the subsoil. Brookston soils are poorly drained and are in small depressions and drainageways. Metamora soils have more sand in the subsoil. Pewamo soils are poorly drained, have more clay in the subsoil, and are in small depressions and drainageways.

Typical pedon of Conover loam, 0 to 3 percent slopes, 660 feet east and 1,980 feet south of northwest corner of sec. 10, T. 6 S., R. 6 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; neutral; abrupt wavy boundary.

A2—7 to 14 inches; brown (10YR 5/3) loam; common fine faint yellowish brown (10YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; neutral; gradual wavy boundary.

B2t—14 to 34 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct grayish brown (10YR 5/2) and common medium faint yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on the faces of peds; neutral; gradual wavy boundary.

Cg—34 to 60 inches; dark grayish brown (10YR 4/2) loam; few fine faint yellowish brown (10YR 5/6) mottles; massive; firm; slight effervescence; mildly alkaline.

The solum ranges from 24 to 40 inches in thickness. Carbonates are at a depth of 24 to 40 inches. Reaction of the solum ranges from medium acid to neutral. Pebbles range from 0 to 10 percent, by volume, throughout the pedon.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. It is dominantly loam, but the range includes sandy loam. The A2 horizon has color value of 5 or 6 and chroma of 2 or 3. It is loam or sandy loam.

The B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. It is clay loam, silty clay loam, or loam.

The C horizon has value of 4 to 6 and chroma of 2 or 3.

Corunna series

The Corunna series consists of poorly drained soils on till plains and lacustrine lake plains. These soils formed in loamy and sandy waterlain loamy material. The permeability is moderate or moderately rapid in the subsoil and moderately slow in the underlying material. Slope is 0 to 2 percent.

Corunna soils are commonly adjacent to Belleville, Metamora, Pewamo, and Selfridge soils on the landscape. Belleville soils have a coarser textured subsoil. Metamora soils are somewhat poorly drained and are on slight knolls. Pewamo soils have more clay in the subsoil and are along natural drainageways and in depressions. Selfridge soils are somewhat poorly drained, are on slight knolls, and have more sand in the subsoil.

Typical pedon of Corunna sandy loam, 96 feet north and 496 feet east of the southwest corner of sec. 36, T. 5 S., R. 6 E.

Ap—0 to 11 inches; very dark gray (10YR 3/1) sandy loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

B21g—11 to 16 inches; grayish brown (2.5Y 5/2) sandy loam, common medium distinct dark yellowish brown (10YR 4/4) and few fine distinct dark brown (7.5YR 4/4) mottles; very dark grayish brown (10YR 3/2) coatings in worm casts and along root channels; weak fine and medium subangular blocky structure; friable; neutral; abrupt irregular boundary.

B22g—16 to 25 inches; light brownish gray (2.5Y 6/2) sandy loam; common medium distinct yellowish brown (10YR 5/8 and 5/6) mottles; grayish brown (10YR 5/2) coatings on primary structures and very dark grayish brown (10YR 3/2) coatings in worm channels and along root channels; weak coarse and very coarse subangular blocky structure parting to weak fine and medium subangular blocky; friable; neutral; abrupt wavy boundary.

B23g—25 to 31 inches; yellowish brown (2.5Y 5/2) loamy fine sand; common medium distinct yellowish brown (10YR 5/6) and common medium faint grayish brown (10YR 5/2) mottles; single grain; loose; mildly alkaline; abrupt wavy boundary.

B3g—31 to 34 inches; grayish brown (2.5Y 5/2) sandy loam; common medium faint dark brown (10YR 4/3) and few medium distinct yellowish brown (10YR 5/6) mottles; strata and nodules of clay loam, loam, and sandy loam comprise 10 to 15 percent of the horizon; massive; very friable; 2 percent pebbles; mildly alkaline; abrupt wavy boundary.

IICg—34 to 60 inches; dark grayish brown (10YR 4/2) clay loam, common medium distinct brown (10YR 5/3) mottles; massive; very firm; strong effervescence; mildly alkaline.

The solum is 20 to 40 inches thick. Carbonates are at a depth of 20 to 40 inches. Reaction is slightly acid to mildly alkaline in the solum. The content of pebbles ranges from 0 to 5 percent.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. It is dominantly sandy loam, but the range includes loam.

The B2g horizon has color value of 5 or 6 and chroma of 1 or 2. It is sandy loam, loam, fine sandy loam, or loamy fine sand.

The IICg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is clay loam or silty clay loam.

Del Rey series

The Del Rey series consists of somewhat poorly drained, slowly permeable soils on lake plains. These soils formed in loamy and clayey lacustrine deposits. Slope ranges from 0 to 3 percent.

Del Rey soils are similar to Fulton soils and are commonly adjacent to Blount, Kibbie, and Lenawee soils on the landscape. Fulton soils are finer in texture. Blount soils are not stratified, and Kibbie soils are coarser in texture. Both soils are on slopes similar to those of Del Rey soils. Lenawee soils are poorly drained and are in low-lying areas.

Typical pedon of Del Rey silt loam, 0 to 3 percent slopes, 200 feet south and 495 feet west of the center of sec. 16, T. 8 S., R. 8 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 6/2) when dry; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

B21t—9 to 13 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct gray (10YR 5/1) and common fine faint strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure; firm; Ap soil material in many root channels and worm casts; thin continuous brown (7.5YR 5/2) clay films on faces of peds; neutral; clear wavy boundary.

B22t—13 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct gray (10YR 5/1) and common fine faint strong brown (7.5YR 5/6) mottles; moderate coarse angular blocky structure parting to moderate fine subangular blocky; firm; thick continuous brown (7.5YR 5/2) clay films on the faces of peds; neutral; clear wavy boundary.

B3—20 to 24 inches; brown (10YR 5/3) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; mildly alkaline; abrupt wavy boundary.

C—24 to 60 inches; brown (10YR 5/3) silty clay loam; common fine distinct light gray (10YR 6/1) and yellowish brown (10YR 5/6) mottles; massive; friable; stratified with varves and pockets of very fine sand, silt loam, and silty clay; strong effervescence; moderately alkaline.

The solum ranges from 24 to 40 inches in thickness. The reaction of the solum ranges from slightly acid to mildly alkaline.

The Ap horizon has color value of 3 or 4 and chroma of 1 or 2. It is dominantly silt loam, but the range includes silty clay loam or loam.

The B2t horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 or 5; and chroma of 4 to 6. It is silty clay loam or silty clay.

The C horizon is silty clay loam or silt loam.

Fulton series

The Fulton series consists of somewhat poorly drained, slowly permeable soils on lake plains. These soils formed in clayey, calcareous lacustrine deposits. Slope ranges from 0 to 3 percent.

Fulton soils are similar to Del Rey and Blount soils and are commonly adjacent to Blount, Nappanee, and Toledo soils on the landscape. Del Rey soils have less clay in the subsoil. Blount and Nappanee soils are not stratified, and both soils are on slopes similar to Fulton soils. Toledo soils are poorly drained and are in low-lying areas.

Typical pedon of Fulton silty clay loam, 0 to 3 percent slopes, 678 feet south and 1,320 feet west of the center of sec. 12, T. 6 S., R. 9 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; weak very fine subangular blocky structure; firm; slightly acid; abrupt smooth boundary.

B21t—7 to 9 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct yellowish brown (10YR 5/8) and common fine faint gray (10YR 5/1) mottles; moderate medium angular blocky structure; firm; thin discontinuous grayish brown (10YR 5/2) clay films on the vertical faces of peds; neutral; abrupt wavy boundary.

B22t—9 to 18 inches; brown (10YR 5/3) clay; common fine distinct yellowish brown (10YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; moderate fine angular blocky structure; firm; thick continuous grayish brown (10YR 5/2) clay films on the faces of peds; neutral; abrupt wavy boundary.

B23t—18 to 24 inches; brown (7.5YR 5/2) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; thick continuous grayish brown (10YR 5/2) clay films on the faces of peds; mildly alkaline; clear wavy boundary.

C—24 to 60 inches; brown (7.5YR 5/2) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; massive; very firm; strong effervescence; moderately alkaline.

The solum ranges from 24 to 36 inches in thickness. The reaction of the solum is neutral or mildly alkaline.

The Ap horizon has color value of 4 or 5. It is dominantly silty clay loam, but the range includes silt loam.

The Bt horizon has hue of 7.5YR and 10YR, value of 4 or 5, and chroma of 1 to 4. It is silty clay or clay.

The C horizon has a hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is silty clay or clay.

Gilford series

The Gilford series consists of very poorly drained soils on outwash plains. The permeability is moderately rapid in the subsoil and rapid in the underlying material. These soils formed in loamy and sandy glacial outwash material. Slopes are 0 to 2 percent.

Gilford soils are similar to Granby soils and are adjacent to Ottokee and Thetford soils on the landscape. Granby soils have more sand in the subsoil. Ottokee soils are moderately well drained and are on high knolls and ridges. Thetford soils are somewhat poorly drained and are on slight knolls.

Typical pedon of Gilford sandy loam, 1,566 feet west and 560 feet south of the northeast corner of sec. 1, T. 5 S., R. 6 E.

Ap—0 to 11 inches; very dark gray (10YR 3/1) sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; 1 percent pebbles; neutral; abrupt smooth boundary.

B21g—11 to 17 inches; grayish brown (2.5Y 5/2) sandy loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; 1 percent pebbles; neutral; gradual wavy boundary.

B22g—17 to 28 inches; grayish brown (2.5Y 5/2) sandy loam; common coarse prominent light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; very friable; 1 percent pebbles; neutral; clear wavy boundary.

IIC1g—28 to 40 inches; light brownish gray (2.5Y 6/2) sand; single grain; loose; 7 percent pebbles; violent effervescence; moderately alkaline; clear wavy boundary.

IIC2g—40 to 49 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; 1 percent pebbles; violent effervescence; mildly alkaline; clear wavy boundary.

IIC3g—49 to 60 inches; gray (5Y 5/1) sand; single grain; loose; 3 percent pebbles; violent effervescence; moderately alkaline.

The solum ranges from 24 to 40 inches in thickness. It is slightly acid or neutral. Pebble content ranges from 1 to 5 percent.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. It is dominantly sandy loam, but the range includes fine sandy loam or loamy sand.

The Bg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. Layers of loamy sand and sandy clay loam range from 2 to 6 inches thick in some pedons.

The IICg horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 or 5; and chroma of 1 or 2. Strata of silt loam, silty clay loam, or clay loam ranges from 1 to 3 inches in some pedons. It is sand or gravelly sand.

Granby series

The Granby series consists of poorly drained, rapidly permeable soils on lake plains, on outwash plains, and in glacial drainageways. These soils formed in sandy material. Slope is 0 to 2 percent.

Granby soils are similar to Gilford and Tedrow soils and are commonly adjacent to Belleville and Oakville soils on the landscape. Gilford soils have more clay in the subsoil. Tedrow soils are somewhat poorly drained. Belleville soils have a loamy substratum and are in positions similar to those of Granby soils. Oakville soils are moderately well drained and are on high knolls and ridges.

Typical pedon of Granby loamy fine sand, 1,650 feet south and 495 feet east of the northwest corner of sec. 9, T. 8 S., R. 7 E.

Ap—0 to 10 inches; black (N 2/0) loamy fine sand, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

A12—10 to 12 inches; very dark gray (10YR 3/1) fine sand; single grain; loose; neutral; clear wavy boundary.

B21g—12 to 17 inches; dark gray (10YR 4/1) sand; many coarse faint dark grayish brown (10YR 4/2) and few fine faint dark yellowish brown (10YR 4/4) mottles; single grain; loose; few very dark gray (10YR 2/2) organic stains in root channels; slightly acid; gradual wavy boundary.

B22g—17 to 30 inches; dark grayish brown (10YR 4/2) fine sand; many coarse faint dark brown (10YR 4/1) and common coarse distinct yellowish brown (10YR 5/6) mottles; single grain; loose; few very dark brown (10YR 2/2) organic stains in root channels; neutral; gradual wavy boundary.

Cg—30 to 60 inches; grayish brown (10YR 5/2) sand; common medium distinct light gray (10YR 6/1) and few fine faint yellowish brown (10YR 5/4) mottles; single grain; loose; neutral.

The solum ranges from 24 to 40 inches in thickness. The mollic epipedon ranges from 11 to 16 inches in thickness. The reaction of the solum is slightly acid to mildly alkaline.

The Ap horizon has hue of 10YR or N, value of 2 or 3, and chroma of 0 to 2. It is dominantly loamy fine sand, but the range includes loamy sand and sand.

The Bg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is sand, fine sand, loamy sand, or loamy fine sand.

The Cg horizon has color value of 5 or 6 and chroma of 1 or 2. Thin lenses of sandy loam and sandy clay loam are in some pedons. The reaction is neutral or mildly alkaline.

Hoytville series

The Hoytville series consists of very poorly drained soils on ground moraines and lake plains. These soils formed in fine textured glacial till material. The permeability is moderately slow in the subsoil and slow in the underlying material. Slope is 0 to 2 percent.

Hoytville soils are similar to Pewamo and Toledo soils and are commonly adjacent to Metamora and Nappanee soils on the landscape. Pewamo soils have less clay in the subsoil. Toledo soils have a stratified substratum. Metamora soils have a coarse textured subsoil. Nappanee soils are somewhat poorly drained. Metamora and Nappanee soils are on slight knolls and ridges.

Typical pedon of Hoytville silty clay loam, 80 feet north and 1,200 feet west of the center of sec. 31, T. 8 S., R. 6 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium angular blocky structure parting to moderate fine angular blocky; firm; 3 percent pebbles; neutral; abrupt smooth boundary.

B21tg—9 to 20 inches; gray (10YR 5/1) clay; common fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate medium and coarse angular blocky structure; very firm; dark fingering of Ap horizon into the upper 4 inches along root channels; thick continuous dark gray (10YR 4/1) clay films on the vertical faces of peds; 3 percent pebbles; mildly alkaline; gradual wavy boundary.

B22tg—20 to 32 inches; gray (10YR 6/1) clay; many fine and medium yellowish brown (10YR 5/6) mottles; moderately coarse and very coarse angular blocky structure; very firm; thick discontinuous dark gray (10YR 4/1) clay films on the vertical faces of peds; 3 percent pebbles; mildly alkaline; clear wavy boundary.

B3tg—32 to 40 inches; gray (10YR 5/1) clay; many fine and medium distinct yellowish brown (10YR 5/6 and 5/4) mottles; moderate coarse angular blocky structure; very firm; 3 percent pebbles; thin discontinuous dark grayish brown (2.5Y 4/2) clay films on the vertical faces of peds; mildly alkaline; gradual wavy boundary.

Cg—40 to 60 inches; gray (10YR 5/1) clay; many fine and medium yellowish brown (10YR 5/6 and 5/4) mottles; massive; very firm; 3 percent pebbles; slight effervescence; mildly alkaline.

The solum ranges from 36 to 48 inches in thickness. Reaction is slightly acid to mildly alkaline in the solum. Pebbles range from 3 to 8 percent, by volume, throughout the pedon.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly silty clay loam, but the range includes clay loam.

The Bg horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2. It is clay or silty clay.

The Cg horizon is clay or silty clay.

Kibbie series

The Kibbie series consists of somewhat poorly drained moderately permeable soil on lake plains and deltas. These soils formed in loamy and sandy glaciofluvial deposits. Slope ranges from 0 to 3 percent.

Kibbie soils are similar to Colwood soils and are commonly adjacent to Colwood, Del Rey, Lenawee, and Selfridge soils on the landscape. Colwood soils are poorly drained and are in low-lying areas and drainageways. Del Rey soils have a fine textured subsoil and are on slopes similar to Kibbie soils. Lenawee soils are poorly drained and are in low-lying areas. Selfridge soils have a sandy subsoil and are in the same relative position as Kibbie soils.

Typical pedon of Kibbie very fine sandy loam, 0 to 3 percent slopes, 280 feet south and 260 feet east of the center of sec. 3, T. 8 S., R. 8 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) very fine sandy loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

A2—9 to 11 inches; grayish brown (10YR 5/2) very fine sandy loam, common fine faint dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; friable; neutral; abrupt wavy boundary.

B21t—11 to 14 inches; brown (10YR 5/4) clay loam, many fine distinct dark yellowish brown (10YR 4/4) and many fine distinct gray (10YR 5/1) mottles; moderate fine angular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on the vertical faces of peds; neutral; clear wavy boundary.

B22t—14 to 19 inches; brown (10YR 5/3) loam, many fine faint yellowish brown (10YR 5/6) and many fine faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; few thin discontinuous dark gray (10YR 4/1) clay films on the vertical faces of peds; neutral; clear wavy boundary.

B3—19 to 22 inches; brown (10YR 5/3) silt loam, common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; mildly alkaline; abrupt wavy boundary.

Cg—22 to 60 inches; light gray (10YR 6/1) stratified silt loam and very fine sand, common medium distinct grayish brown (10YR 5/2) mottles; massive; very friable; varved with strata of clay, clay loam, silty clay loam, and carbonate concretions; strong effervescence; mildly alkaline.

The solum ranges from 20 to 40 inches in thickness. Reaction of the solum ranges from slightly acid to neutral.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. It is dominantly very fine sandy loam, but the range includes fine sandy loam, sandy loam, or loamy fine sand.

The B horizon has color value of 4 to 6 and chroma of 3 or 4. It is loam, clay loam, or silt loam. Thin strata of fine sand or very fine sand are in some pedons.

The C horizon has color value of 5 or 6 and chroma of 1 to 4.

Lenawee series

The Lenawee series consists of poorly or very poorly drained, moderately slowly permeable soil on lake plains. These soils formed in loamy and clayey lacustrine deposits. Slope is 0 to 2 percent.

Lenawee soils are similar to Toledo soils and are commonly adjacent to Del Rey and Metea soils on the landscape. Toledo soils have more clay in the subsoil. Del Rey soils are somewhat poorly drained. Metea soils have more sand in the solum and are on sandy ridges.

Typical pedon of Lenawee silty clay loam, 1,825 feet north and 390 feet east of the southwest corner of sec. 29, T. 8 S., R. 8 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark gray (10YR 3/1) crushed and smoothed, grayish brown (10YR 5/2) dry; many medium distinct yellowish brown (10YR 5/6) and few fine distinct dark gray (10YR 4/1) mottles; weak coarse subangular blocky structure; firm; neutral; abrupt smooth boundary.

B21g—10 to 15 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and common fine distinct dark gray (10YR 4/1) mottles; weak medium angular blocky structure parting to fine angular blocky; firm; neutral; clear wavy boundary.

B22g—15 to 22 inches; grayish brown (10YR 5/2) silty clay loam, many medium distinct yellowish brown (10YR 5/6) and common fine distinct gray (10YR 6/1) mottles; weak medium prismatic structure parting to medium angular blocky; very firm; grayish brown (10YR 5/2) coatings on vertical faces of prisms and dark gray (10YR 4/1) stains along root channels; neutral; gradual wavy boundary.

B23g—22 to 33 inches; brown (7.5YR 5/2) silty clay, many medium distinct yellowish brown (10YR 5/6) and common fine prominent greenish gray (5GY 6/1) mottles; weak coarse prismatic structure parting to medium angular blocky; very firm; gray (5Y 6/1) coatings on vertical prism faces; mildly alkaline; clear wavy boundary.

C1g—33 to 50 inches; light gray (5Y 6/1) and light olive brown (2.5Y 5/6) silt loam, common medium and coarse distinct yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; friable; gray (5Y 6/1) coating on vertical faces of peds; slight effervescence; mildly alkaline; abrupt wavy boundary.

C2g—50 to 60 inches; olive (5Y 5/4) and greenish gray (5GY 5/1) silt loam, many coarse distinct light olive brown (2.5Y 5/6) and gray (5Y 6/1) mottles; moderate thick platy structure parting to fine platy; friable; light gray (10YR 7/1) carbonate concretions imbedded between strata; strong effervescence; mildly alkaline.

The solum ranges from 33 to 45 inches in thickness. The reaction of the solum is slightly acid to mildly alkaline.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly silty clay loam, but the range includes clay loam.

The B horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay or silty clay loam.

The C horizon has value of 5 or 6 and chroma of 1 or 2. Strata of silty clay loam, clay loam, clay, and silt loam are in some pedons.

Metamora series

The Metamora series consists of somewhat poorly drained, moderately rapidly over moderately slowly permeable soil on lake plains and glacial till plains. These soils formed in loamy glacial till and loamy outwash material. The permeability is moderately rapid in the subsoil and moderately slow in the underlying material. Slope ranges from 0 to 3 percent. These soils have slightly less clay in the Bt horizon than is defined for the Metamora series, but this difference does not alter their use or behavior.

The Metamora soil is commonly adjacent to Blount, Corunna, Pewamo, and Selfridge soils on the landscape. Blount soils have a fine textured subsoil and are on slopes similar to those of Metamora soils. Corunna and Pewamo soils are poorly drained and are in low areas and depressions. Selfridge soils have more sand in the subsoil and are on slopes similar to those of Metamora soils.

Typical pedon of Metamora sandy loam, 0 to 3 percent slopes, 66 feet north and 1,242 feet west of the southeast corner of sec. 4, T. 8 S., R. 6 E.

Ap—0 to 7 inches; black (10YR 2/1) sandy loam, gray (10YR 5/1) dry; weak medium granular structure; very friable; mildly alkaline; abrupt smooth boundary.

A2g—7 to 10 inches; brown (10YR 5/3) sandy loam, many fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; grayish brown (10YR 5/2) coatings on ped surfaces; mildly alkaline; clear wavy boundary.

B21tg—10 to 17 inches; grayish brown (10YR 5/2) sandy loam, many fine and medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few thin discontinuous very dark grayish brown (10YR 3/2) clay films on vertical faces of peds; mildly alkaline; clear wavy boundary.

B22tg—17 to 21 inches; grayish brown (10YR 5/2) sandy loam, many fine faint gray (10YR 5/1) and many fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; clay bridging of sand grains and few thin discontinuous very dark grayish brown (10YR 3/2) clay films on vertical faces of peds; mildly alkaline; abrupt wavy boundary.

IIC—21 to 60 inches; brown (10YR 5/3) silty clay loam, common fine distinct gray (10YR 6/1) and many fine faint yellowish brown (10YR 5/4 and 5/6) mottles; weak very coarse angular blocky structure; very firm; grayish brown (10YR 5/2) lime accumulations on ped faces; 2 percent pebbles; slight effervescence; mildly alkaline.

The solum ranges from 20 to 40 inches in thickness. The reaction ranges from slightly acid to mildly alkaline.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. It is dominantly sandy loam, but the range includes fine sandy loam.

The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is loam or sandy loam.

The IIC horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 3. It is silty clay loam, loam, or clay loam.

Metea series

The Metea series consists of well drained soils on lake plains and glacial outwash plains. These soils formed in sandy and loamy material. The permeability in the subsoil is very rapid and moderately slow in the underlying material. Slope ranges from 2 to 6 percent. These soils have a Bt horizon and a solum that are slightly thinner than those defined for the Metea series, but these differences do not alter their use or behavior.

The Metea soils are commonly adjacent to the Oakville soils that have a loamy substratum and to Selfridge and Pewamo soils. Oakville soils have sand to a depth of more than 40 inches. Selfridge soils are somewhat poorly drained and are on nearly level slopes. Pewamo soils have more clay in the subsoil and are in broad depressional areas and natural drainageways.

Typical pedon of Metea sand, 2 to 6 percent slopes, 800 feet south and 1,040 feet east of the northwest corner of sec. 16, T. 7 S., R. 7 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) sand, brown (10YR 5/3) dry; single grain; loose; neutral; abrupt smooth boundary.

A21—8 to 14 inches; yellowish brown (10YR 5/6) sand; single grain; loose; slightly acid; gradual wavy boundary.

A22—14 to 26 inches; strong brown (7.5YR 5/6) sand; single grain; loose; slightly acid; gradual wavy boundary.

A23—26 to 34 inches; yellowish brown (10YR 5/4) sand; single grain; loose; neutral; abrupt wavy boundary.

B2t—34 to 37 inches; yellowish brown (10YR 5/4) sandy loam; few fine faint yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; friable; mildly alkaline; clear wavy boundary.

IIC—37 to 60 inches; brown (10YR 5/3) clay loam, common medium distinct yellowish brown (10YR 5/8) and gray (10YR 6/1) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum ranges from 20 to 40 inches in thickness. Its reaction ranges from slightly acid or neutral in the upper part to neutral or mildly alkaline in the lower part.

The Ap horizon has color value of 3 or 4 and chroma of 2 or 3. It is dominantly sand, but the range includes loamy sand.

The A2 horizon has hue of 7.5YR and 10YR, value of 5 or 6, and chroma of 4 to 6. It is sand, loamy sand, or fine sand.

The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is sandy loam or loam.

The IIC has value of 5 or 6 and chroma of 2 to 6. It is clay loam or silty clay loam.

Millsdale series

The Millsdale series consists of moderately deep, very poorly drained, moderately slowly permeable soil on glacial till and lake plains. These soils formed in loamy calcareous glacial till underlain by limestone at a depth of 20 to 40 inches. Slope is 0 to 2 percent.

Millsdale soils are commonly adjacent to Pewamo, Ottokee Variant, and Randolph soils on the landscape. Pewamo soils do not have bedrock within a depth of 60 inches. Ottokee Variant soils have more sand in the solum and are moderately well drained. Randolph soils are somewhat poorly drained and are on slight knolls.

Typical pedon of Millsdale clay loam, 290 feet north and 140 feet west of the center of sec. 35, T. 8 S., R. 6 E.

Ap—0 to 11 inches; very dark gray (10YR 3/1) clay loam, grayish brown (10YR 5/2) dry; weak fine angular blocky structure; firm; mildly alkaline; abrupt smooth boundary.

B2tg—11 to 22 inches; dark gray (10YR 4/1) clay loam; many fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium angular blocky structure; firm; thin discontinuous gray (10YR 5/1) clay films on the vertical faces of peds; 2 percent pebbles; mildly alkaline; abrupt wavy boundary.

R—22 inches; limestone bedrock.

The solum ranges from 20 to 40 inches in thickness. The reaction of the solum is neutral or mildly alkaline. Coarse fragments range from 2 to 10 percent by volume throughout the solum.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. It is dominantly clay loam, but the range includes loam or silty clay loam.

The B horizon has a hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3. It is clay loam or silty clay loam.

The C horizon is present in some pedons.

Milton series

The Milton series consists of moderately deep, well drained, moderately or moderately slowly permeable soils on glacial ground moraines. These soils formed in loamy calcareous glacial till underlain by limestone at a depth of 20 to 40 inches. Slope ranges from 2 to 6 percent.

Milton soils are commonly adjacent to Ottokee Variant, Millsdale, and Randolph soils on the landscape. Ottokee Variant soils have more sand in the subsoil. Millsdale soils are poorly drained and are in low-lying areas. Randolph soils are somewhat poorly drained.

Typical pedon of Milton clay loam, 2 to 6 percent slopes, 70 feet north-northeast along Toll Road from edge of small quarry and 45 feet south-southeast from edge of Toll Road in Government Lot 528, T. 6 S., R. 10 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) clay loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; few worm casts; slightly acid; clear wavy boundary.

B1t—9 to 14 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 4/4) clay films on the vertical faces of peds; 2 percent pebbles; medium acid; clear smooth boundary.

B2t—14 to 24 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; 2 percent pebbles; few worm casts; medium acid; clear wavy boundary.

C—24 to 29 inches; dark brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

IIR—29 inches; light gray (10YR 6/1) limestone bedrock.

The solum ranges from 20 to 40 inches in thickness. Pebbles, stones, and flaggs range from 2 to 10 percent by volume throughout the solum.

The Ap horizon has color value of 4 or 5 and chroma of 2 or 3. The reaction is slightly acid or neutral.

The B horizon has hue of 5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. The reaction ranges from medium acid to neutral.

The C horizon is loam or clay loam.

Nappanee series

The Nappanee series consists of somewhat poorly drained, slowly permeable soils on glacial till and lake plains. These soils formed in clayey and silty material. Slope ranges from 0 to 3 percent.

The Nappanee soils are similar to Blount and Del Rey soils and are commonly adjacent to Hoytville and Pewamo soils on the landscape. Blount soils have less clay in the subsoil. Del Rey soils have a stratified substratum. Hoytville and Pewamo soils are poorly drained and are in low-lying areas.

Typical pedon of Nappanee loam, 0 to 3 percent slopes, 810 feet north and 90 feet west of the southeast corner of sec. 6, T. 8 S., R. 6 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

B21gt—8 to 12 inches; grayish brown (10YR 5/2) clay; common fine distinct yellowish brown (10YR 5/6) and common fine faint light gray (10YR 6/1) mottles; weak medium angular blocky structure; very firm; thin continuous gray (10YR 5/1) clay films on the vertical faces of peds; 2 percent pebbles; strongly acid; clear wavy boundary.

B22gt—12 to 24 inches; grayish brown (10YR 5/2) clay; many fine distinct light gray (10YR 6/1) and many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium and coarse angular blocky structure; very firm; thick continuous gray (10YR 5/1) clay films on the vertical faces of peds; 2 percent pebbles; mildly alkaline; clear irregular boundary.

Cg—24 to 60 inches; gray (10YR 5/1) silty clay loam; many fine and medium yellowish brown (10YR 5/6) mottles; massive; firm; 2 percent pebbles of shale and limestone; strong effervescence; moderately alkaline.

The solum ranges from 20 to 40 inches in thickness. Reaction of the solum ranges from strongly acid to mildly alkaline. Pebbles range from 2 to 5 percent by volume in the solum.

The Ap horizon has color value of 4 or 5 and chroma of 2 or 3. It is dominantly loam, but the range includes silty clay loam or clay loam.

The B2g horizon has color value of 4 to 6 and chroma of 1 to 3. It is clay or silty clay loam.

The C horizon is silty clay loam, silty clay, or clay.

Oakville series

The Oakville series consists of well drained or moderately well drained, rapidly permeable soils on lake plains and glacial outwash plains. These soils formed in sandy material. The permeability of Oakville soils that have a loamy substratum is rapid over moderately slow. Slope ranges from 0 to 6 percent.

The Oakville soils are similar to Ottokee soils and are commonly adjacent on the landscape to Granby and Tedrow soils. Ottokee soils have loamy bands in the subsoil. Granby soils are poorly drained and are in low-lying, depressional areas. Tedrow soils are somewhat poorly drained and are in positions slightly lower than those of Oakville soils.

Typical pedon of Oakville fine sand, 0 to 6 percent slopes, 2,000 feet north and 90 feet west of the southeast corner of sec. 7, T. 8 S., R. 8 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) fine sand, grayish brown (10YR 5/2) dry; single grain; loose; slightly acid; abrupt wavy boundary.

B1—7 to 12 inches; dark yellowish brown (10YR 4/4) fine sand; single grain; loose; slightly acid; abrupt wavy boundary.

B2—12 to 20 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; slightly acid; clear wavy boundary.

B3—20 to 27 inches; brown (10YR 5/3) fine sand; single grain; loose; slightly acid; clear wavy boundary.

C—27 to 60 inches; light yellowish brown (10YR 6/4) fine sand; common medium distinct yellowish brown (10YR 5/6) mottles; single grain; loose; slightly acid.

The solum ranges from 20 to 40 inches in thickness. The reaction ranges from medium to neutral.

The Ap horizon has color value of 3 or 4 and chroma of 2 to 4. It is dominantly fine sand but ranges to sand. An A2 horizon is present in some pedons.

The B horizon has a hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is fine sand or sand.

The C horizon has value of 5 or 6 and chroma of 3 to 6. It is fine sand or sand. Discontinuous color bands are present in some pedons.

Ottokee series

The Ottokee series consists of moderately well drained, rapidly permeable soils along glacial drainageways. These soils formed in sandy outwash materials. Slope ranges from 0 to 6 percent.

Ottokee soils are similar and commonly adjacent to Oakville, Tedrow, Thetford, and Spinks soils on the landscape. Oakville and Tedrow soils do not have textural bands. Thetford and Spinks soils have textural bands totaling more than 6 inches in the subsoil.

Typical pedon of Ottokee fine sand, 0 to 6 percent slopes, 790 feet north and 540 feet east of the center of sec. 20, T. 5 S., R. 7 E.

Ap—0 to 9 inches; dark brown (10YR 4/3) fine sand, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

A21—9 to 16 inches; reddish yellow (7.5YR 6/6) fine sand; very weak fine subangular blocky structure; very friable; slightly acid; abrupt wavy boundary.

A22—16 to 33 inches; yellowish brown (10YR 5/6) fine sand; very weak fine subangular blocky structure; very friable; slightly acid; clear wavy boundary.

B21—33 to 41 inches; yellowish brown (10YR 5/4) fine sand; few fine faint grayish brown (10YR 5/2) mottles; single grain; loose; slightly acid; abrupt wavy boundary.

B22t—41 to 46 inches; dark brown (7.5YR 4/4) loamy fine sand; few fine distinct dark grayish (10YR 4/2) mottles; massive; friable; yellowish brown (10YR 5/4) fine sand bands, 1/8 to 1/4 inch thick; single grain; loose; slightly acid; abrupt wavy boundary.

A'&B'—46 to 60 inches; light yellowish brown (10YR 6/4) fine sand (A'2 part); single grain; loose; dark brown (7.5YR 4/4) sandy loam (B't part) in discontinuous 1/8-inch-thick bands; few fine distinct dark grayish brown (10YR 4/2) mottles; massive; friable; slightly acid.

The solum ranges from 40 to 80 inches in thickness.

The Ap horizon has value of 3 or 4. The A2 horizons have hue of 10YR or 7.5YR and value of 5 or 6. The B2 horizon has value of 4 or 5. It is dominantly fine sand, loamy fine sand, or loamy sand.

Ottokee Variant

The Ottokee Variant consists of moderately deep, moderately well drained, rapidly permeable soils on glacial outwash plains. These soils formed in sandy material over limestone. Slope ranges from 0 to 6 percent.

Ottokee Variant soils are commonly adjacent to Channahon and Randolph soils on the landscape. The well drained Channahon soils are shallow and contain many limestone fragments in the subsoil. The somewhat poorly drained Randolph soils are finer textured.

Typical pedon of Ottokee Variant fine sand, 0 to 6 percent slopes, 1,420 feet east and 700 feet south of the northwest corner of sec. 21, T. 8 S., R. 7 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

A21—9 to 12 inches; yellowish brown (10YR 5/4) fine sand; few fine, faint yellowish brown (10YR 5/6) mottles; single grain; loose; slightly acid; clear wavy boundary.

A22—12 to 24 inches; light yellowish brown (10YR 6/4) fine sand; few fine, faint yellowish brown (10YR 5/6) mottles; single grain; loose; slightly acid; clear wavy boundary.

B2t—24 to 26 inches; yellowish brown (10YR 5/4) loamy sand; few fine, faint grayish brown (10YR 5/2) mottles; single grain; loose; clay bridging between some sand grains; slightly acid; abrupt smooth boundary.

IIC—26 to 28 inches; dark yellowish brown (10YR 4/4) loam; common fine, faint yellowish brown (10YR 5/6) mottles; massive; friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

IIIR—28 inches; limestone bedrock.

The solum ranges from 20 to 40 inches in thickness. The reaction of the solum ranges from slightly acid to mildly alkaline. Cobbles range from 0 to 10 percent throughout the solum.

The Ap horizon has value of 3 to 5. The A2 horizon has value of 5 or 6 and chroma of 3 or 4. The A horizon is dominantly fine sand, but range includes sand and loamy sand.

The B horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 5 or 6.

The C horizon has value of 4 or 5.

Pewamo series

The Pewamo series consists of poorly drained, moderately slowly permeable soils on ground moraines and lake plains. These soils formed in loamy glacial till. Slope ranges from 0 to 3 percent.

Pewamo soils are similar to Blount and Hoytville soils and are commonly adjacent to Lenawee, Metamora, and Selfridge soils on the landscape. Blount soils are somewhat poorly drained. Hoytville soils have more clay in the subsoil. Lenawee soils are stratified and are in areas similar to Pewamo soils. Metamora and Selfridge soils have a coarse textured subsoil, are somewhat poorly drained, and are on slight knolls.

Typical pedon of Pewamo clay loam, 1,520 feet north and 600 feet east of the southwest corner of sec. 2, T. 8 S., R. 7 E.

Ap—0 to 9 inches; black (10YR 2/1) clay loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; firm; slightly acid; abrupt smooth boundary.

A12g—9 to 12 inches; very dark gray (10YR 3/1) clay loam, grayish brown (10YR 5/2) dry; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; slightly acid; clear wavy boundary.

B21tg—12 to 15 inches; dark gray (10YR 4/1) clay loam; common fine distinct yellowish brown (10YR 5/8) mottles; moderate medium angular blocky structure; very firm; thin continuous gray (10YR 5/1) clay films on faces of peds; neutral; clear wavy boundary.

B22tg—15 to 35 inches; dark gray (10YR 4/1) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; very firm; thin discontinuous gray (10YR 5/1) clay films on vertical faces of peds; neutral; clear wavy boundary.

Cg—35 to 60 inches; gray (10YR 5/1) clay loam, with common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure and massive; firm; 2 percent pebbles; strong effervescence; mildly alkaline.

The solum ranges from 30 to 46 inches in thickness. The mollic epipedon ranges from 11 to 18 inches thick. The reaction of the solum ranges from slightly acid to mildly alkaline.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. It is dominantly clay loam, but range includes loam.

The Btg horizon has hue of 5Y, 2.5Y, or 10YR; value of 4 or 5; and chroma of 1 or 2. It is clay loam or loam.

The C horizon has hue of 5Y or 10YR, value of 5 or 6, and chroma of 1 or 2. It is clay loam or silty clay loam. Lime concretions are present in some pedons.

Randolph series

The Randolph series consists of moderately deep, somewhat poorly drained, moderately slowly permeable soils on lake plains and glacial till plains. These soils formed in loamy calcareous glacial till and residuum of limestone. Slope ranges from 0 to 3 percent.

Randolph soils are commonly adjacent to Ottokee Variant, Millsdale, and Milton soils on the landscape. Ottokee Variant soils are coarser textured and moderately well drained. Millsdale soils are poorly drained and are in low-lying areas and depressions. Milton soils are well drained, and Ottokee Variant and Milton soils are on slight ridges and knolls.

Typical pedon of Randolph clay loam, 0 to 3 percent slopes, 720 feet south and 39 feet west of the center of sec. 25, T. 8 S., R. 6 E.

Ap—0 to 7 inches; very dark gray (10YR 3/1) clay loam, gray (10YR 6/1) dry; moderate fine subangular blocky structure; friable; mildly alkaline; abrupt smooth boundary.

B1t—7 to 10 inches; brown (10YR 5/3) clay loam; common fine distinct yellowish brown (10YR 5/6) and many fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; very dark gray (10YR 3/2) worm casts and root channels; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; mildly alkaline; clear wavy boundary.

B2t—10 to 20 inches; brown (10YR 5/3) silty clay loam, few fine distinct gray (10YR 5/1) and common fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; mildly alkaline; clear wavy boundary.

IIC—20 to 26 inches; yellowish brown (10YR 5/4) channery clay loam; weak coarse subangular blocky structure; firm; 20 percent limestone fragments; strong effervescence; moderately alkaline; abrupt wavy boundary.

IIR—26 inches; limestone bedrock.

The solum ranges from 20 to 40 inches in thickness. Bedrock is at a depth of 20 to 40 inches. Pebbles and stones make up 0 to 10 percent of the solum.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 1 or 2. It is dominantly clay loam, but the range includes silt loam. The reaction is neutral or mildly alkaline.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is silty clay loam or clay loam. It is slightly acid to moderately alkaline.

The IIC horizon has value of 5 or 6 and chroma of 2 to 6. It is channery clay loam, clay loam, or loam.

Selfridge series

The Selfridge series consists of somewhat poorly drained soils on glacial till and lacustrine lake plains. These soils formed in sandy and loamy material. Permeability is rapid in the upper part of the subsoil and moderately slow in the lower part of the subsoil and the substratum. Slope ranges from 0 to 3 percent.

Selfridge soils are commonly adjacent to Belleville, Metea, Oakville, and Pewamo soils on the landscape. Belleville soils are poorly drained and are in low-lying areas. Oakville soils do not have a loamy substratum, and the well drained Metea soils and moderately well drained Oakville soils are on ridges and knolls. Pewamo soils are finer textured, are poorly drained, and are in low areas.

Typical pedon of Selfridge loamy sand, 0 to 3 percent slopes, 1,970 feet west and 1,280 feet south of northeast corner of sec. 18, T. 6 S., R. 8 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loamy sand, light grayish brown (10YR 6/2) dry; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

A2—8 to 15 inches; brown (10YR 5/3) sand; common fine faint yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; single grain; loose; discontinuous streaks of strong brown (7.5YR 5/8) sand; medium acid; clear wavy boundary.

B1—15 to 25 inches; yellowish brown (10YR 5/6) sand; common fine faint yellowish brown (10YR 5/8) and common fine faint brown (10YR 5/3) mottles; single grain; loose; neutral; abrupt wavy boundary.

B21t—25 to 29 inches; dark brown (10YR 4/3) sandy loam; common medium distinct yellowish brown (10YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure to massive; friable; clay bridging between sand grains; neutral; clear wavy boundary.

IIB22t—29 to 32 inches; reddish brown (5YR 5/3) clay loam; many fine distinct strong brown (7.5YR 5/6) and greenish gray (5GY 6/1) mottles; weak fine angular blocky structure; friable; thin clay films on faces of peds; mildly alkaline; clear wavy boundary.

IIC—32 to 60 inches; reddish gray (5YR 5/2) clay loam; many fine distinct strong brown (10YR 5/6) and greenish gray (5GY 6/1) mottles; massive; friable; many lime concretions; strong effervescence; moderately alkaline.

The solum ranges from 24 to 40 inches in thickness. It ranges from medium acid to neutral. Pebbles range from 0 to 5 percent in the A and B horizons and from 0 to 10 percent in the IIB and IIC horizons.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. In some pedons the A2 horizon is 1 inch to 4 inches thick. The A horizon is dominantly loamy sand, but the range includes sand.

The B1 horizon has value of 4 to 6 and chroma of 3 to 6. It is sand, fine sand, or loamy sand. The B21 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is sandy loam or loam. The IIB22 horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 to 6; and chroma of 1 to 3. It is clay loam, silty clay loam, or loam.

The IIC horizon has hue of 5YR, 7.5YR, or 10YR; value of 5 or 6; and chroma of 1 to 3. It is clay loam, loam, or silty clay loam. In some pedons a sandy C horizon, 1 to 6 inches thick, is above the loamy IIC horizon.

Sloan series

The Sloan series consists of very poorly drained, moderately or moderately slowly permeable soils on flood plains of rivers and streams. These soils formed in waterworked loamy materials. Slope is 0 to 2 percent.

Sloan soils are commonly adjacent to Blount, Ceresco, and Metamora soils on the landscape. Blount soils have an argillic horizon and are on knolls. Ceresco soils have a coarse textured B horizon and are on slight ridges. Metamora soils have more sand in the subsoil and are on convex knolls.

Typical pedon of Sloan loam, 990 feet south and 660 feet east of the northwest corner of sec. 6, T. 9 S., R. 8 E.

Ap—0 to 12 inches; black (10YR 2/1) loam, gray (10YR 5/1) dry; weak medium granular structure; friable; mildly alkaline; abrupt wavy boundary.

B21g—12 to 24 inches; dark gray (10YR 4/1) silt loam; many medium distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; many root channels filled with black (10YR 2/1) loam; few thin sand seams; mildly alkaline; clear wavy boundary.

B22g—24 to 26 inches; gray (10YR 5/1) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; many root channels filled with black (10YR 2/1) loam; few thin sand strata; mildly alkaline; abrupt wavy boundary.

Cg—26 to 60 inches; light gray (10YR 6/1) silt loam; many medium distinct yellowish brown (10YR 5/4) mottles; massive; friable; many thin sand strata; mildly alkaline.

The solum ranges from 20 to 50 inches in thickness. The reaction of the solum is neutral or 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 and silty clay loam.

The B2g horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is silt loam or silty clay loam. Thin strata of sand and very fine sand are present in some pedons.

The C horizon has variable loamy textures.

Spinks series

The Spinks series consists of well drained, moderately rapidly permeable soils on lake plains and glacial outwash plains. These soils formed in deep sandy material. Slope ranges from 0 to 6 percent.

The Spinks soils are similar to Ottokee soils and are commonly adjacent to Granby, Oakville, and Thetford soils on the landscape. Ottokee soils have less than 6 inches of thin, textural bands and are in positions similar to those of Spinks soils. Granby soils are poorly drained and are in low-lying areas. Oakville soils do not have thin, textural bands above 55 inches and are in positions on the landscape similar to those of Spinks soils. Thetford soils are somewhat poorly drained and are in areas below the Spinks soils.

Typical pedon of Spinks loamy sand, 0 to 6 percent slopes, 1,455 feet south and 185 feet west of the center of sec. 28, T. 8 S., R. 7 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loamy sand, brown (10YR 5/3) dry; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

A2—9 to 28 inches; brownish yellow (10YR 6/6) sand; single grain; loose; medium acid; abrupt wavy boundary.

A&B—28 to 49 inches; light yellowish brown (10YR 6/4) sand (A part); many medium distinct brownish yellow (10YR 6/6) mottles; single grain; loose; lamella and bands of strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) loamy sand (B part); very weak fine subangular blocky structure; very friable; clay bridging between sand grains; bands are one-fourth inch to 5 inches thick with total thickness of 10 inches; slightly acid; clear wavy boundary.

C—49 to 60 inches; grayish brown (2.5YR 5/2) sand; single grain; loose; slight effervescence; mildly alkaline.

The solum ranges from 40 to 60 inches in thickness. The reaction ranges from medium acid to neutral.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. It is sand or fine sand.

The A2 horizon has value of 5 or 6 and chroma of 4 to 6. It is dominantly loamy sand, but the range includes fine sand or sand.

In the A&B horizon, the A part is sand, loamy fine sand, and loamy sand. The B part has a hue of 7.5YR or 10YR, value of 4 to 5, and chroma of 4 to 6. It is loamy sand or sandy loam. The C horizon ranges from neutral to moderately alkaline.

Tedrow series

The Tedrow series consists of somewhat poorly drained, rapidly permeable soils on sandy lake plains and outwash plains. These soils formed in sandy material. Slope ranges from 0 to 3 percent.

Tedrow soils are similar and commonly adjacent to Granby, Oakville, and Thetford soils on the landscape. Granby soils are poorly drained and are in low-lying areas. Oakville soils are moderately well drained and are on ridges and knolls. Thetford soils have more clay in the subsoil and are on slopes similar to those of Tedrow soils.

Typical pedon of Tedrow loamy sand, 0 to 3 percent slopes, 480 feet east and 1,423 feet north of the southwest corner of sec. 30, T. 8 S., R. 7 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loamy sand, brown (10YR 4/3) dry; weak fine subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

B1—8 to 15 inches; yellowish brown (10YR 5/6) fine sand, few fine faint light brownish gray (10YR 6/2) and common fine faint dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; very friable; slightly acid; abrupt wavy boundary.

B2—15 to 26 inches; pale brown (10YR 6/3) fine sand, few fine faint light brownish gray (10YR 6/2) and few fine distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; very friable; neutral; clear wavy boundary.

B3—26 to 54 inches; yellowish brown (10YR 5/4) fine sand; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; single grain; loose; neutral; abrupt wavy boundary.

C—54 to 60 inches; brown (10YR 5/3) fine sand; single grain; loose; slight effervescence; mildly alkaline.

The solum ranges from 30 to 54 inches in thickness. Reaction is slightly acid or neutral in the surface and subsurface layers.

The Ap horizon has color value of 2 to 4 and chroma of 2 or 3. It is dominantly loamy sand, but the range includes loamy fine sand or sand.

The B horizon has value of 5 or 6 and chroma of 3 to 6. It is fine sand, loamy sand, or loamy fine sand.

The C horizon has value of 5 or 6 and chroma of 2 or 3. It is fine sand or sand.

Thetford series

The Thetford series consists of somewhat poorly drained, moderately rapidly permeable soils on sandy lake and outwash plains. These soils formed in sandy material. Slope ranges from 0 to 3 percent.

The Thetford soils are similar to Ottokee and Tedrow soils and are commonly adjacent to Granby, Ottokee, Spinks, and Tedrow soils on the landscape. Ottokee soils are moderately well drained and are on high knolls and ridges. Spinks soils are well drained and are on slight knolls and ridges. Granby soils are poorly drained and are in low areas. Tedrow soils do not have textural bands in the solum and are in positions similar to those of Thetford soils.

Typical pedon of Thetford loamy sand, 0 to 3 percent slopes, 900 feet south and 145 feet east of the northwest corner of sec. 20, T. 7 S., R. 6 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very friable; medium acid; abrupt smooth boundary.

B1—9 to 15 inches; yellowish brown (10YR 5/4) sand; few fine distinct brownish yellow (10YR 6/6) mottles; single grain; loose; slightly acid; clear wavy boundary.

A&B—15 to 35 inches; pale brown (10YR 6/3) sand (A part), common medium distinct yellowish brown (10YR 5/6) and common fine faint light brownish gray (10YR 6/2) mottles; single grain; loose; light yellowish brown (10YR 6/4) loamy sand (B part); common fine distinct yellowish red (5YR 5/8), common medium distinct light brownish gray (10YR 6/2) and many medium distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; clay bridging between sand grains; neutral; abrupt wavy boundary.

B21t—35 to 38 inches; pale brown (10YR 6/3) loamy fine sand, many coarse distinct brownish yellow (10YR 6/8) and common medium distinct light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; very friable; clay bridging between sand grains; neutral; clear wavy boundary.

B3—38 to 46 inches; brown (10YR 5/3) sand; common medium distinct yellowish brown (10YR 5/6) mottles; single grain; loose; neutral; clear wavy boundary.

C—46 to 60 inches; grayish brown (10YR 5/2) sand; single grain; loose; slight effervescence; mildly alkaline.

The solum ranges from 30 to 60 inches in thickness. The reaction of the solum is medium acid to mildly alkaline.

The Ap horizon has color value of 3 or 4 and chroma of 2 or 3. It is dominantly loamy sand, but the range includes fine sand or loamy fine sand.

The A part of the A&B horizon has a color value of 6 to 8 and chroma of 2 or 3. The B part has a hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. The A&B horizon has lamella ranging from one-half inch to 2 inches in thickness.

The C horizon is as much as 10 percent pebbles by volume.

Toledo series

The Toledo series consists of very poorly drained, slowly permeable soils on lake plains. These soils formed in clayey, calcareous lacustrine sediment. Slope is 0 to 2 percent.

Toledo soils are similar and adjacent to Del Rey, Fulton, Hoytville, and Lenawee soils on the landscape. Del Rey and Fulton soils are somewhat poorly drained and are in positions slightly higher than those of Toledo soils. Hoytville soils are not stratified and are on slopes similar to those of Toledo soils. Lenawee soils have less clay in the subsoil.

Typical pedon of Toledo silty clay loam, 300 feet north and 1,620 feet east of the center of sec. 10, T. 6 S., R. 9 E.

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; friable; neutral; clear wavy boundary.

B21g—6 to 8 inches; dark gray (10YR 4/1) silty clay; common fine distinct yellowish brown (10YR 5/4) mottles; moderate very fine subangular blocky structure; firm; neutral; abrupt wavy boundary.

B22g—8 to 18 inches; light gray (10YR 6/1) silty clay, common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; neutral; clear wavy boundary.

B23g—18 to 36 inches; gray (5Y 5/1) silty clay, many medium distinct yellowish brown (10YR 5/6) mottles; weak medium angular blocky structure; firm; mildly alkaline; clear wavy boundary.

Cg—36 to 60 inches; light gray (10YR 6/1) stratified clay, silty clay, and silty clay loam; medium distinct yellowish brown (10YR 5/4 and 5/6) and common fine distinct light gray (10YR 7/2) mottles; massive; very firm; strong effervescence; moderately alkaline.

The solum ranges from 30 to 48 inches in thickness. The reaction of the solum is slightly acid or neutral.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly silty clay loam, but the range includes silty clay.

The B horizon has hue of 5Y and 10YR, value of 4 to 6, and chroma of 1 or 2. It is silty clay or clay.

Warners series

The Warners series consists of very poorly drained, moderately or moderately slowly permeable soils in recently drained lakes. These soils formed in muck and marl. Slope is 0 to 2 percent.

Warners soils are commonly adjacent to Lenawee and Nappanee soils on the landscape. Lenawee soils are stratified and have no marl layers. Nappanee soils have no marl layers and are somewhat poorly drained.

Typical pedon of Warners silt loam, 1,980 feet north and 82 feet west of the center of sec. 25, T. 6 S., R. 8 E.

Ap—0 to 12 inches; black (10YR 2/1) silt loam, black (10YR 2/1) dry; weak medium crumb structure; very friable; many fine roots; mildly alkaline; abrupt smooth boundary.

IICca1—12 to 27 inches; very pale brown (10YR 8/3) marl; few gray (10YR 5/1) and grayish brown (10YR 5/2) organic stains in places; massive; very friable; violent effervescence; abrupt smooth boundary.

IIOa1—27 to 29 inches; black (2.5Y 2/0) sapric muck; weak medium subangular blocky structure; very friable; mildly alkaine; abrupt smooth boundary.

IICca2—29 to 42 inches; very pale brown (10YR 8/3) marl; many shell fragments; massive; very friable; violent effervescence; abrupt smooth boundary.

IIOa2—42 to 57 inches; very dark gray (10YR 3/1) muck; massive; very friable; mildly alkaline; abrupt smooth boundary.

IIC3—57 to 60 inches; light gray (10YR 7/1) loamy sand; single grain; loose; strong effervescence.

Marl or friable material impregnated with carbonates is at a depth of 12 to 32 inches.

The Ap horizon has chroma of 1 or 2. It is dominantly silt loam, but the range includes loam. It is mildly alkaline or neutral in reaction.

The IIC2 horizon is loamy sand, sand, or silty clay loam.

Wasepi series

The Wasepi series consists of somewhat poorly drained soils on till plains. These soils formed in sandy and loamy glacial till. Permeability is moderately rapid in the subsoil, very rapid in the upper part of the substratum, and moderately slow in the lower part. Slope ranges from 0 to 3 percent.

Wasepi soils are commonly adjacent to Metamora and Thetford soils on the landscape. Metamora and Thetford soils are on slight knolls. Metamora soils have a finer textured subsoil. Thetford soils have more sand in the subsoil.

Typical pedon of Wasepi sandy loam, loamy substratum, 0 to 3 percent slopes, 2,500 feet east and 40 feet east of the northwest corner of sec. 2, T. 5 S., R. 6 E.

Ap—0 to 7 inches; very dark gray (10YR 3/1) sandy loam, gray (10YR 5/1) dry; weak medium subangular blocky structure; very friable; 5 percent pebbles; neutral; abrupt smooth boundary.

B2t—7 to 21 inches; yellowish brown (10YR 5/4) sandy loam, with many medium distinct grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; friable; 5 percent pebbles; abrupt wavy boundary.

IIC1—21 to 24 inches; light olive brown (2.5Y 5/4) fine sand; single grain; loose 5 percent pebbles; slight effervescence; mildly alkaline; abrupt wavy boundary.

IIC2g—24 to 36 inches; grayish brown (10YR 5/2) sand; single grain; loose; 13 percent pebbles; strong effervescence; mildly alkaline; abrupt wavy boundary.

IIC3g—36 to 46 inches; grayish brown (10YR 5/2) gravelly sand; single grain; loose; 18 percent pebbles; strong effervescence; mildly alkaline; abrupt wavy boundary.

IIIC4g—46 to 60 inches; dark gray (10YR 4/1) silty clay loam; massive; very firm; strong effervescence; mildly alkaline.

The solum is 40 to 60 inches thick. Free carbonates are at a depth of 40 to 60 inches. The solum is neutral or mildly alkaline. Pebble content ranges from 2 to 10 percent in the solum and from 13 to 25 percent in the IIC 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 and loamy fine sand.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4.

The IIC horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 3 to 5. It is sand, fine sand, or stratified sand and gravel.

The IIIC4 horizon has value of 4 or 5 and chroma of 1 or 2. It is silty clay loam or clay loam.

formation of the soils

This section describes the five major soil-forming factors and explains how they interact to form soils from the unconsolidated parent material. The processes of soil formation are then explained under "Processes of soil formation" (*3*).

factors of soil formation

Soil forms through the interaction of five major factors: the physical, chemical, and mineralogical 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, including the depth to the water table; and the length of time the processes of soil formation have acted on the parent material.

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. Relief conditions the effects of climate and plant and animal life. The nature of the parent material also affects the kind of soil profile that is formed and in extreme cases determines it almost entirely. Finally, time changes the parent material into a soil. Generally, it takes a long time for distinct horizons to form.

The factors of soil formation are closely interrelated in their effects on the soils. Few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many other processes of soil formation are not fully understood.

parent material

A soil forms in the unconsolidated mass called parent material. The parent material of the soils of Monroe County was deposited by glaciers or by glacial melt water. Subsequent actions of water and wind reworked and redeposited these parent materials. Glaciers covered the county from about 10,000 to 12,000 years ago.

Parent material determines the limit of the chemical and mineralogical composition of the soil. Although most parent material is of common glacial origin, its properties vary greatly, sometimes within small areas, depending on how the material was deposited. The dominant parent material in Monroe County was deposited as glacial till, outwash deposits, lacustrine deposits, alluvium, and organic material.

Glacial till is material laid down directly by glaciers with minimal water action. It consists of particles of different sizes that are mixed together. The small pebbles in glacial till have sharp corners, indicating that they have not been worn by water washing.

Glacial till in Monroe County was deposited by glaciers and reworked by lakewater. Areas of this glacial till are called lake plains because of the surface geology and the level landscape. This glacial till is calcareous and friable or firm. It is silty clay, silty clay loam, or clay loam. The Pewamo soils, for example, formed in glacial till. Typically they are fine or moderately fine and have a well developed structure.

Outwash material is deposited by running water from melting glaciers. The size of outwash material particles depends on the speed of the stream that carried them. The water deposits the coarser particles as it slows down. Slowly moving water can carry finer particles, such as very fine sand, silt, and clay. Outwash deposits generally consist of layers of particles of similar size, such as sandy loam and gravel or other coarse particles. Gilford soils, for example, formed in deposits of outwash material.

Lacustrine material is deposited from still, or ponded, glacial melt water. It consists of fine soil particles, such as very fine sand and silt loam, that settled out in the still water. In Monroe County, soils that formed in lacustrine deposits are typically medium textured to fine textured. Lenawee soils, for example, formed in lacustrine material.

Alluviul material is deposited by floodwaters of present streams in recent time. The texture of this material depends on the speed of the water that deposited it. Ceresco soils formed in alluviul material.

Organic material consists of deposits of plant residue. After the glaciers withdrew from the area, water remained standing in depressions in outwash plains, flood plains, moraines, and till plains. Grasses and sedges grew around the edges of these lakes, and when the plants died the residue did not decompose because the areas were wet. Later, water tolerant trees grew in these areas. After these trees died, the residue became part of the organic accumulation. Eventually, the lakes filled with organic material and developed into areas of muck. Adrian soils formed in organic material.

plant and animal life

Green plants have been the principal organisms influencing the soils in Monroe County. Bacteria, fungi, earthworms, and the activities of man have also been important. Plants and animals mainly have contributed organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kinds of plants that grow on the soil. The residue of these plants accumulated on the surface, decayed, and eventually became organic matter. Plant roots provide channels for the downward movement of water throughout the soil and add organic matter as the plant roots decay. Bacteria in the soil helps break down the organic matter so that growing plants can use it.

The vegetation in Monroe County has been mainly deciduous forest. Differences in natural soil drainage and changes in parent material affect the composition of forest species.

In general, the well drained upland soils, such as Oakville and Ottokee soils, were mainly covered with white oak, tulip poplar, sugar maple, and hickory. The wet soils were covered mainly with soft maple, swamp white oak, elm, and ash. Gilford and Pewamo soils formed under wet conditions and contain considerable organic matter.

climate

Climate is important in the formation of soils. It determines the kind of plant and animal life on and in the soil and the amount of water available for weathering minerals and transporting soil material. Through its influence on soil temperature, climate determines the rate of chemical reaction in the soil. Climate affects a large area rather than a relatively small area like a county.

The climate in Monroe County is cool and humid. Presumably it is similar to that which existed when the soils formed. The soils in Monroe County differ from soils that formed in a dry, warm climate or from those that formed in a moist, hot climate. Climate is uniform throughout the county except in areas adjacent to and a few miles west of Lake Erie. The differences in climate caused only minor differences in the soils of Monroe County.

relief

Relief, or topography, has a marked influence on the soils of Monroe County through its influence on natural drainage, erosion, plant cover, and soil temperature. In this county, slopes range from 0 to 6 percent. Natural soil drainage ranges from well drained on the sandy ridgetops to very poorly drained in the depressions.

Relief influences the formation of soils by affecting runoff and drainage. Drainage in turn, through its effect on aeration of the soil, determines the color of the soil. Runoff is greatest on the steeper slopes. In low areas, water is temporarily ponded. Water and air move freely through well drained soils but slowly through very poorly drained soils. In well aerated soils, the iron and aluminum compounds that give most soils their color are brightly colored and oxidized; in poorly aerated soils, they are dull gray and mottled. Spinks soils are well drained, well aerated soils. Granby soils are poorly aerated, poorly drained soils. Both soils formed in similar parent material.

time

Generally, it takes a long time for the agents of soil formation to develop distinct horizons from parent material. The degree of development of the soil profile commonly reflects the length of time that the parent materials have been in place. Some soils develop rapidly, others slowly.

The soils in Monroe County range from young to mature. Many of the soils formed in glacial deposits that have been exposed to soil forming factors long enough for distinct horizons to develop. Some soils forming in recent alluvial sediment have not been in place long enough for distinct horizons to develop. Sloan soils, for example, are young soils that formed in alluvial material. Ottokee soils are an example of the effect of the leaching of lime from the soil over a long period.

processes of soil formation

The processes, or soil-forming factors, responsible for the development of the soil horizons from the unconsolidated parent material are known as soil genesis. The physical, chemical, and biological properties of the various soil horizons are called soil morphology.

Several processes were involved in the development of soil horizons in Monroe County: (1) accumulation of organic matter, (2) leaching of lime (calcium carbonate) and other bases, (3) reduction and transfer of iron, and (4) formation and translocation of silicate clay minerals. In most soils, two or more of these processes have been active in the development of the horizon.

Organic matter accumulates on the surface to form an A1 horizon. The A1 horizon is mixed into a plow layer, or Ap horizon, when the soil is plowed. In the soils of Monroe County, the surface layer ranges from high to low in organic matter content. Brookston soils, for example, have high organic matter content in the surface layer, and the Oakville soils have low organic matter content.

Carbonates and other bases have been leached from most of the soils. It is generally believed that leaching of bases in soils usually precedes the translocation of silicate clay minerals. Many of the soils are moderately to strongly leached. For example, Shoals soils are leached of carbonates to a depth of only 34 inches, and Tedrow soils are leached of carbonates to a depth of 54 inches.

The reduction and transfer of iron, a process called gleying, is evident in the somewhat poorly drained, poorly drained, and very poorly drained soils. Gray subsoil indicates the reduction and loss of iron. Lenawee soils exhibit gleying.

The translocation of clay minerals has contributed to horizon development. An eluviated, or leached, A2 horizon above an illuviated B horizon has a platy structure, is lower in content of clay, and typically is lighter in color. The B horizon typically has an accumulation of clay (clay films) in pores and on ped surfaces. Soils displaying this translocation of clay were probably leached of carbonates and soluble salts to a considerable extent before translocation of silicate clay took place. Leaching of bases and translocation of silicate clay are important processes in horizon differentiation. Blount soils have translocated silicate clay in the form of clay films accumulated in the B horizon.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

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.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 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 slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

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.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of 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.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

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.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

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

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

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.

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. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

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.

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.
Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.
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.
Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.
Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.
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.
Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.
Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.
Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.
Wilting poing (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1949-78 at Monroe, Michigan]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	32.7	17.9	25.3	59	-7	0	2.01	.9	3.0	5	7.9
February---	35.4	19.7	27.6	58	-5	0	1.76	.8	2.6	5	7.2
March------	43.9	27.4	35.7	73	7	11	2.51	1.4	3.5	6	6.1
April------	58.0	38.4	48.2	83	20	97	3.07	1.7	4.2	7	1.0
May--------	69.8	49.1	59.4	91	31	315	2.98	1.9	4.0	7	T**
June-------	79.9	59.2	69.5	96	42	593	3.51	2.3	4.6	7	0
July-------	83.8	63.2	73.5	97	50	737	2.71	1.4	3.9	5	0
August-----	82.1	61.3	71.7	96	47	680	2.95	1.6	4.2	6	0
September--	75.1	54.5	64.8	94	36	452	2.69	1.7	3.6	5	0
October----	64.1	43.7	53.9	86	25	186	2.32	1.0	3.4	5	T
November---	48.7	33.3	41.0	73	10	31	2.18	1.3	3.0	6	2.6
December---	36.6	22.9	29.8	62	-2	0	2.32	1.0	3.4	6	8.2
Year-----	59.2	40.9	50.0	99	-9	3,120	31.00	26.0	35.8	69	32.9

*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.)

**T indicates trace.

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1949-78 at Monroe, 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 13	April 25	May 8
2 years in 10 later than--	April 8	April 20	May 4
5 years in 10 later than--	March 30	April 11	April 26
First freezing temperature in fall:			
1 year in 10 earlier than--	October 26	October 17	October 6
2 years in 10 earlier than--	November 1	October 21	October 11
5 years in 10 earlier than--	November 12	October 31	October 20

TABLE 3.--GROWING SEASON

[Recorded in the period 1949-78 at Monroe, Michigan]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	204	182	158
8 years in 10	212	189	165
5 years in 10	226	202	177
2 years in 10	240	215	189
1 year in 10	247	223	195

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
10	Lenawee silty clay loam, ponded	4,810	1.3
11B	Oakville fine sand, 0 to 6 percent slopes	18,800	5.3
12B	Spinks loamy sand, 0 to 6 percent slopes	1,375	0.4
13A	Blount loam, 0 to 3 percent slopes	19,095	5.4
14A	Del Rey silt loam, 0 to 3 percent slopes	10,834	3.0
15A	Fulton silty clay loam, 0 to 3 percent slopes	14,115	4.0
16A	Tedrow loamy sand, 0 to 3 percent slopes	19,375	5.4
17A	Metamora-Corunna sandy loams, 0 to 3 percent slopes	5,200	1.5
18	Granby loamy fine sand	15,580	4.4
19A	Selfridge loamy sand, 0 to 3 percent slopes	20,675	5.8
20A	Selfridge-Pewamo complex, 0 to 3 percent slopes	25,740	7.2
21	Lenawee silty clay loam	21,620	6.1
22	Pewamo clay loam	48,240	13.4
23A	Metamora sandy loam, 0 to 3 percent slopes	10,260	2.9
24	Corunna sandy loam	9,425	2.6
25A	Randolph clay loam, 0 to 3 percent slopes	1,195	0.3
26B	Milton clay loam, 2 to 6 percent slopes	190	0.1
27	Beaches	155	*
28A	Kibbie very fine sandy loam, 0 to 3 percent slopes	3,995	1.1
29	Colwood loam	2,630	0.7
30	Sloan loam	6,715	1.9
31	Aquents, nearly level	3,635	1.0
32	Dumps	605	0.2
33	Pits-Aquents complex	885	0.2
36	Belleville loamy sand	7,385	2.1
37B	Ottokee Variant fine sand, 0 to 6 percent slopes	830	0.2
38	Adrian muck	305	0.1
40A	Thetford loamy sand, 0 to 3 percent slopes	10,195	2.9
41B	Metea sand, 2 to 6 percent slopes	720	0.2
42	Hoytville silty clay loam	24,730	6.8
43A	Nappanee loam, 0 to 3 percent slopes	3,435	1.0
44A	Wasepi sandy loam, loamy substratum, 0 to 3 percent slopes	1,330	0.4
45A	Channahon loam, 0 to 3 percent slopes	330	0.1
46	Ceresco fine sandy loam	3,225	0.9
47	Millsdale clay loam	610	0.2
48	Toledo silty clay loam	7,560	2.1
49B	Oakville fine sand, loamy substratum, 0 to 6 percent slopes	1,635	0.5
50B	Ottokee fine sand, 0 to 6 percent slopes	5,600	1.6
51	Pits, quarries	685	0.2
52	Warners silt loam	210	0.1
55	Gilford sandy loam	7,750	2.2
56A	Urban land-Blount complex, 0 to 3 percent slopes	1,490	0.4
57	Urban land-Lenawee complex	1,605	0.5
58B	Urban land-Oakville complex, 0 to 6 percent slopes	1,060	0.3
59A	Urban land-Selfridge-Pewamo complex, 0 to 3 percent slopes	1,455	0.4
60A	Conover loam, 0 to 3 percent slopes	3,600	1.0
61	Brookston loam	2,490	0.7
62A	Blount-Pewamo-Metamora complex, 0 to 3 percent slopes	2,605	0.7
63	Urban land	555	0.2
	Total	356,544	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Corn silage	Oats	Winter wheat	Soybeans	Grass-legume hay
	Bu	Ton	Bu	Bu	Bu	Ton
10. Lenawee	---	---	---	---	---	---
11B. Oakville	60	11	55	30	---	2.5
12B. Spinks	75	13	60	30	27	3.0
13A. Blount	106	17	64	48	35	4.3
14A. Del Rey	115	18	69	49	37	4.5
15A. Fulton	95	16	75	40	35	4.0
16A. Tedrow	60	11	55	30	30	3.2
17A. Metamora-Corunna	117	18	97	62	40	3.9
18. Granby	75	10	55	35	30	4.0
19A. Selfridge	90	14	70	42	33	3.2
20A. Selfridge-Pewamo	107	16	84	50	19	4.1
21. Lenawee	125	19	100	60	42	4.0
22. Pewamo	125	19	100	60	42	5.0
23A. Metamora	115	18	95	60	40	3.5
24. Corunna	120	18	100	65	40	4.5
25A. Randolph	110	17	80	38	38	4.4
26B. Milton	90	15	75	40	30	4.0
27*. Beaches						
28A. Kibbie	120	18	100	65	40	4.5
29. Colwood	130	20	110	65	45	5.5
30. Sloan	---	---	---	---	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Winter wheat	Soybeans	Grass-legume hay
	Bu	Ton	Bu	Bu	Bu	Ton
31*. Aquents						
32*. Dumps						
33. Pits-Aquents	---	---	---	---	---	---
36. Belleville	105	17	85	50	35	4.2
37B. Ottokee Variant	50	10	45	25	20	1.5
38. Adrian	75	10	---	---	23	---
40A. Thetford	80	12	60	35	30	3.0
41B. Metea	85	14	75	42	30	2.8
42. Hoytville	126	19	90	50	44	5.2
43A. Nappanee	110	17	85	50	32	3.5
44A. Wasepi	90	15	75	45	35	3.0
45A. Channahon	75	13	55	40	29	3.2
46. Ceresco	---	---	---	---	---	---
47. Millsdale	112	17	90	50	44	4.8
48. Toledo	120	18	85	47	42	4.5
49B. Oakville	65	12	60	32	---	3.5
50B. Ottokee	85	14	65	35	34	3.5
51*. Pits						
52. Warners						
55. Gilford	90	16	55	45	30	3.8
56A. Urban land-Blount	---	---	---	---	---	---
57. Urban land-Lenawee	---	---	---	---	---	---
58B. Urban land-Oakville	---	---	---	---	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Winter wheat	Soybeans	Grass-legume hay
	Bu	Ton	Bu	Bu	Bu	Ton
59A: Urban land-Selfridge-Pewamo	---	---	---	---	---	---
60A: Conover	120	18	100	65	40	4.0
61: Brookston	130	20	110	64	45	4.8
62A: Blount-Pewamo-Metamora	114	18	85	56	26	4.3
63*. Urban land						

* 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	164,914	190	164,724	---
III	147,830	720	118,795	28,315
IV	19,630	---	---	19,630
V	7,230	---	7,230	---
VI	---	---	---	---
VII	---	---	---	---
VIII	4,810	---	4,810	---

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	
11B----------------- 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.
12B----------------- Spinks	2s	Slight	Slight	Moderate	Slight	Northern red oak---- White oak----------- Black oak----------- Black cherry--------	66 --- --- ---	Red pine, eastern white pine, Carolina poplar.
13A----------------- Blount	3c	Slight	Slight	Severe	Severe	Northern red oak---- White oak----------- White ash----------- Sugar maple---------	57 57 --- ---	Eastern white pine, northern white-cedar, white spruce, Norway spruce, yellow-poplar.
14A----------------- Del Rey	3c	Slight	Slight	Severe	Severe	Northern red oak---- White ash----------- Red maple----------- White oak----------- American basswood---	56 --- --- --- ---	Northern white-cedar, eastern white pine, Carolina poplar.
15A----------------- Fulton	4c	Slight	Slight	Severe	Severe	Northern red oak---- White oak----------- Red maple----------- Swamp white oak----- Black oak-----------	56 --- --- --- ---	White spruce, Norway spruce, eastern white pine, northern white-cedar.
16A----------------- Tedrow	2s	Slight	Slight	Moderate	Slight	Red oak------------- Silver maple-------- Eastern white pine--	65 --- ---	White spruce, Norway spruce, eastern white pine, Carolina poplar.
17A*:								
Metamora-----------	2o	Slight	Slight	Slight	Slight	Northern red oak---- White ash----------- Bitternut hickory--- Green ash----------- Shagbark hickory---- American basswood--- Sugar maple--------- Red maple-----------	66 --- --- --- --- --- --- ---	White spruce, Norway spruce, eastern white pine, northern white-cedar.
Corunna------------	3w	Slight	Severe	Moderate	Moderate	Red maple----------- White ash----------- American basswood--- Silver maple-------- American sycamore--- Pin oak------------- Swamp white oak-----	56 --- --- --- --- --- ---	Eastern white pine, Norway spruce, Carolina poplar.
18------------------ Granby	5w	Slight	Severe	Severe	Severe	Red maple----------- Silver maple-------- American basswood--- Pin oak------------- Quaking aspen------- Eastern cottonwood-- White ash-----------	40 --- --- --- --- --- ---	Eastern white pine, Norway spruce, white spruce.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
19A: 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	---	
20A*:								
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	---	
Pewamo	2w	Slight	Severe	Moderate	Moderate	Red maple	66	Carolina poplar, eastern white pine, white spruce, Norway spruce.
						American basswood	---	
						Pin oak	---	
						Silver maple	---	
						White ash	---	
						Black ash	---	
						Eastern cottonwood	---	
21: Lenawee	3w	Slight	Severe	Severe	Moderate	Red maple	55	White spruce, Norway spruce, eastern white pine.
						White ash	---	
						American basswood	---	
						Silver maple	---	
22: Pewamo	2w	Slight	Severe	Moderate	Moderate	Red maple	66	Carolina poplar, eastern white pine, white spruce, Norway spruce.
						American basswood	66	
						Pin oak	85	
						Silver maple	91	
						White ash	---	
						Black ash	---	
						Eastern cottonwood	---	
23A: Metamora	2o	Slight	Slight	Slight	Slight	Northern red oak	66	White spruce, Norway spruce, eastern white pine, northern white-cedar.
						White ash	---	
						Bitternut hickory	---	
						Green ash	---	
						Shagbark hickory	---	
						American basswood	---	
						Sugar maple	---	
						Red maple	---	
24: Corunna	3w	Slight	Severe	Moderate	Moderate	Red maple	56	Eastern white pine, Norway spruce, Carolina poplar.
						White ash	---	
						American basswood	---	
						Silver maple	---	
						American sycamore	---	
						Pin oak	---	
						Swamp white oak	---	
25A: Randolph	3c	Slight	Slight	Moderate	Slight	Northern red oak	55	Eastern white pine, yellow-poplar, Norway spruce.
						White ash	55	
						Pin oak	---	
						Swamp white oak	---	
						Red maple	55	
						American beech	---	
26B: Milton	2o	Slight	Slight	Slight	Slight	Northern red oak	65	Eastern white pine, black walnut, yellow-poplar, red pine.
						Yellow-poplar	---	
						Black walnut	---	
						Black cherry	---	
						White oak	---	
						White ash	---	
						Sugar maple	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
28A----------------- Kibbie	2o	Slight	Slight	Slight	Slight	Northern red oak----	66	Carolina poplar, eastern white pine, Norway spruce.
						Red maple-----------	---	
						White ash-----------	---	
						American basswood---	---	
						Quaking aspen-------	---	
29------------------ Colwood	3w	Slight	Severe	Severe	Severe	Red maple-----------	56	Eastern white pine, Carolina poplar, northern white-cedar.
						White ash-----------	56	
						Silver maple--------	82	
						Green ash-----------	56	
						Swamp white oak-----	56	
30------------------ Sloan	2w	Slight	Severe	Severe	Severe	Red maple-----------	66	Northern white-cedar, Carolina poplar, eastern white pine.
						Eastern cottonwood--	89	
						White ash-----------	66	
						Green ash-----------	66	
						Swamp white oak-----	---	
						Pin oak-------------	---	
36------------------ Belleville	5w	Slight	Severe	Moderate	Moderate	Silver maple--------	64	
						Red maple-----------	---	
						White ash-----------	---	
						Swamp white oak-----	---	
37B----------------- Ottokee Variant	3s	Slight	Slight	Severe	Slight	Northern red oak----	56	Eastern white pine, white spruce, red pine.
						White oak-----------	56	
						Shagbark hickory----	---	
						White ash-----------	56	
						Black oak-----------	---	
						Sugar maple---------	53	
38------------------ Adrian	3w	Slight	Severe	Severe	Severe	Red maple-----------	56	
						Silver maple--------	82	
						White ash-----------	56	
						Quaking aspen-------	60	
						Tamarack------------	45	
						Green ash-----------	56	
40A----------------- 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---	---	
41B----------------- Metea	2s	Slight	Slight	Severe	Slight	Northern red oak----	66	Eastern white pine, red pine, white spruce, Norway spruce.
						White oak-----------	---	
						Sugar maple---------	---	
						American basswood---	---	
						Black cherry--------	---	
						Black walnut--------	---	
						Shagbark hickory----	---	
42------------------ Hoytville	3w	Slight	Severe	Severe	Moderate	Northern red oak----	72	Carolina poplar, eastern white pine, northern white-cedar.
						Pin oak-------------	76	
						White ash-----------	77	
						Green ash-----------	---	
						Black cherry--------	---	
						Eastern cottonwood--	---	
						Red maple-----------	---	

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
43A---------------- Nappanee	3c	Slight	Moderate	Severe	Severe	Northern red oak---- White ash----------- Pin oak------------- Swamp white oak----- Red maple----------- American beech------ American sycamore--- Blackgum------------	66 --- --- --- --- --- --- ---	White spruce, eastern white pine, northern white-cedar, Carolina poplar.
44A---------------- Wasepi	3s	Slight	Slight	Moderate	Slight	Red maple----------- Quaking aspen------- Swamp white oak----- Pin oak------------- Silver maple-------- Paper birch---------	56 --- --- --- --- ---	Eastern white pine, Carolina poplar, white spruce, northern white-cedar.
45A---------------- Channahon	3d	Slight	Slight	Moderate	Moderate	Northern red oak---- White oak----------- Northern white-cedar Shagbark hickory----	55 --- --- ---	Eastern white pine, red pine.
46----------------- Ceresco	2o	Slight	Slight	Slight	Slight	Northern red oak---- White ash----------- Red maple----------- Silver maple-------- Eastern cottonwood-- American sycamore--- Black walnut--------	66 --- --- --- --- --- ---	Eastern white pine, white spruce, black walnut, Norway spruce, Carolina poplar.
47----------------- Millsdale	4w	Slight	Severe	Severe	Severe	Red maple----------- White ash----------- Northern red oak---- Silver maple-------- Green ash-----------	45 45 45 --- ---	White spruce, northern white-cedar, eastern white pine.
48----------------- Toledo	3w	Slight	Severe	Severe	Severe	Red maple----------- Swamp white oak----- Pin oak------------- White ash----------- Eastern cottonwood--	56 --- --- 56 91	Northern white-cedar, eastern white pine, white spruce, Carolina poplar.
49B---------------- Oakville	1s	Slight	Slight	Severe	Slight	Red pine------------ Northern red oak---- White oak----------- Quaking aspen------- Black oak----------- Eastern white pine--	80 --- --- --- --- ---	Red pine, eastern white pine, Carolina poplar, Norway spruce.
50B---------------- Ottokee	3s	Slight	Slight	Moderate	Slight	Northern red oak---- White oak----------- Red maple----------- Black oak----------- Bur oak------------- Quaking aspen------- Green ash----------- Slippery elm--------	55 --- --- --- --- --- --- ---	Red pine, eastern white pine.
52----------------- Warners	5w	Slight	Severe	Severe	Severe	Red maple-----------	55	
55----------------- Gilford	3w	Slight	Severe	Severe	Severe	Red maple----------- Silver maple-------- American basswood--- Pin oak------------- White ash----------- Swamp white oak----- Bur oak-------------	56 --- --- --- --- --- ---	Eastern white pine, Norway spruce, white spruce.

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	
60A----------------- Conover	3o	Slight	Slight	Slight	Slight	Northern red oak---- White ash----------- Northern pin oak---- Yellow-poplar------- Black walnut-------- Swamp white oak----- American sycamore--- Red maple-----------	55 --- --- --- --- --- --- ---	Eastern white pine, Carolina poplar, Norway spruce, black walnut, yellow-poplar.
61----------------- Brookston	2w	Slight	Severe	Severe	Moderate	Northern red oak---- White oak----------- Silver maple-------- Red maple----------- White ash----------- American basswood--- American sycamore---	66 --- --- --- --- --- ---	Eastern white pine, white spruce, northern white-cedar.
62A*:								
Blount--------------	3c	Slight	Slight	Severe	Severe	Northern red oak---- White oak----------- White ash----------- Sugar maple---------	57 57 57 54	Eastern white pine, northern white-cedar, white spruce, Norway spruce, yellow-poplar.
Pewamo--------------	2w	Slight	Severe	Moderate	Moderate	Red maple----------- American basswood--- Pin oak------------- Silver maple-------- White ash----------- Black ash----------- Eastern cottonwood--	66 66 85 91 --- --- ---	Carolina poplar, eastern white pine, white spruce, Norway spruce.
Metamora------------	2o	Slight	Slight	Slight	Slight	Northern red oak---- White ash----------- Bitternut hickory--- Green ash----------- Shagbark hickory---- American basswood--- Sugar maple--------- Red maple-----------	66 --- --- --- --- --- --- ---	White spruce, Norway spruce, eastern white pine, northern white-cedar.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
10. Lenawee					
11B---------------- Oakville	---	Silky dogwood, Tatarian honeysuckle, autumn-olive, lilac, Amur privet, white spruce.	Manchurian crabapple.	Eastern white pine, red pine, Austrian pine, Norway spruce.	Carolina poplar.
12B---------------- Spinks	Vanhoutte spirea	Tatarian honeysuckle, Amur privet, autumn-olive, Siberian peashrub, sargent crabapple.	White spruce, eastern redcedar.	Eastern white pine, red pine, Austrian pine.	Carolina poplar.
13A---------------- Blount	---	American cranberrybush, Amur privet, blue spruce, white spruce, lilac.	Austrian pine, northern white-cedar.	Red pine, Norway spruce.	Green ash, Carolina poplar.
14A---------------- Del Rey	Vanhoutte spirea	Tatarian honeysuckle, American cranberrybush, Amur privet, lilac, blue spruce.	Eastern white pine, Austrian pine.	Red pine----------	Green ash, Carolina poplar.
15A---------------- Fulton	---	American cranberrybush, Tatarian honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Green ash, Austrian pine.	Eastern white pine	Carolina poplar.
16A---------------- Tedrow	Vanhoutte spirea	Blue spruce, Tatarian honeysuckle, American cranberrybush, silky dogwood.	Northern white-cedar, Manchurian crabapple.	Eastern white pine, Norway spruce, green ash.	Carolina poplar.
17A*:					
Metamora---------	---	White spruce, silky dogwood, American cranberrybush.	Northern white-cedar, eastern white pine, Austrian pine.	Norway spruce-----	Green ash, Carolina poplar.
Corunna----------	Vanhoutte spirea	White spruce, silky dogwood, American cranberrybush, Tatarian honeysuckle.	Northern white-cedar, Manchurian crabapple.	Green ash, eastern white pine, Norway spruce, golden willow.	Carolina poplar.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
18 Granby	Silky dogwood, American cranberrybush.	Northern white-cedar, Amur privet, white spruce, Tatarian honeysuckle.	Eastern white pine, Norway spruce, Manchurian crabapple, green ash, golden willow.	---	Carolina poplar.
19A Selfridge	Vanhoutte spirea	Silky dogwood, Amur privet, American cranberrybush, Tatarian honeysuckle.	Northern white-cedar, Manchurian crabapple.	Eastern white pine, Norway spruce, green ash, golden willow.	Carolina poplar.
20A*:					
Selfridge	Vanhoutte spirea	Silky dogwood, Amur privet, American cranberrybush, Tatarian honeysuckle.	Northern white-cedar, Manchurian crabapple.	Eastern white pine, Norway spruce, green ash, golden willow.	Carolina poplar.
Pewamo	---	American cranberrybush, silky dogwood, Amur privet, Tatarian honeysuckle.	Northern white-cedar, Siberian crabapple, white spruce.	Green ash, Norway spruce, eastern white pine, golden willow.	Carolina poplar.
21 Lenawee	---	Silky dogwood, Amur privet, white spruce, American cranberrybush, Tatarian honeysuckle.	Northern white-cedar, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce, golden willow.	Carolina poplar.
22 Pewamo	---	American cranberrybush, silky dogwood, Amur privet, Tatarian honeysuckle.	Northern white-cedar, Siberian crabapple, white spruce.	Green ash, Norway spruce, eastern white pine, golden willow.	Carolina poplar.
23A Metamora	---	White spruce, silky dogwood, American cranberrybush.	Northern white-cedar, eastern white pine, Austrian pine.	Norway spruce	Green ash, Carolina poplar.
24 Corunna	Vanhoutte spirea	White spruce, silky dogwood, American cranberrybush, Tatarian honeysuckle.	Northern white-cedar, Manchurian crabapple.	Green ash, eastern white pine, Norway spruce, golden willow.	Carolina poplar.
25A Randolph	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce, eastern white pine.	Carolina poplar.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
26B: Milton	Vanhoutte spirea	Eastern redcedar, radiant crabapple, autumn-olive, Amur privet, lilac, Tatarian honeysuckle, silky dogwood.	Washington hawthorn, northern white-cedar.	Eastern white pine, red pine, Austrian pine, Norway spruce.	Carolina poplar.
27*. Beaches					
28A: Kibbie	Vanhoutte spirea	Silky dogwood, Tatarian honeysuckle, American cranberrybush, Amur privet.	Northern white-cedar, white spruce, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce, golden willow.	Carolina poplar.
29: Colwood	---	Siberian crabapple, silky dogwood, Tatarian honeysuckle, Amur privet, arrowwood, hawthorn.	Northern white-cedar, white spruce.	Norway spruce, eastern white pine, golden willow.	Carolina poplar.
30: Sloan	---	---	---	---	---
31*. Aquents					
32*. Dumps					
33*: Pits.					
Aquents.					
36: Belleville	Silky dogwood, American cranberrybush.	White spruce, northern white-cedar, Amur privet, Tatarian honeysuckle.	Eastern white pine, green ash, Manchurian crabapple, golden willow.	Norway spruce	Carolina poplar.
37B: Ottokee Variant	Vanhoutte spirea	White spruce, autumn-olive, Tatarian honeysuckle, Amur privet.	---	Eastern white pine, red pine.	Carolina poplar.
38: Adrian	---	---	---	---	---
40A: Thetford	Vanhoutte spirea	White spruce, silky dogwood, Tatarian honeysuckle, American cranberrybush.	Northern white-cedar, Manchurian crabapple.	Norway spruce, eastern white pine, golden willow, green ash.	Carolina poplar.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
41B: Metea	Vanhoutte spirea	Autumn-olive, Amur privet, Tatarian honeysuckle, lilac.	White spruce, spruce, eastern redcedar.	Eastern white pine, Norway spruce, red pine, Austrian pine.	Carolina poplar.
42: Hoytville	---	Amur privet, Amur honeysuckle, American cranberrybush.	Northern white-cedar, blue spruce, Washington hawthorn.	Eastern white pine, Norway spruce.	Carolina poplar.
43A: Nappanee	---	White spruce, silky dogwood, Tatarian honeysuckle.	Eastern white pine, northern white-cedar, Siberian crabapple.	Golden willow	Carolina poplar.
44A: Wasepi	Vanhoutte spirea	Silky dogwood, Amur privet, Tatarian honeysuckle, American cranberrybush.	Northern white-cedar, Manchurian crabapple.	Eastern white pine, golden willow, green ash, Norway spruce.	Carolina poplar.
45A. Channahon					
46: Ceresco	---	Tatarian honeysuckle, silky dogwood, American cranberrybush, Amur privet.	White spruce, northern white-cedar, Siberian crabapple.	Eastern white pine, Norway spruce, green ash, golden willow.	Carolina poplar.
47: Millsdale	---	Amur privet, silky dogwood, white spruce, hawthorn.	Northern white-cedar.	Norway spruce	Carolina poplar.
48: Toledo	---	Silky dogwood, Amur privet, white spruce, American cranberrybush.	Northern white-cedar, Manchurian crabapple.	Green ash, eastern white pine, Norway spruce.	Carolina poplar.
49B: Oakville	---	Tatarian honeysuckle, autumn-olive, silky dogwood, lilac, Amur privet, white spruce.	Manchurian crabapple.	Eastern white pine, Austrian pine, red pine, Norway spruce.	Carolina poplar.
50B: Ottokee	Winged euonymus, wayfaringtree.	Autumn-olive, nannyberry viburnum, Tatarian honeysuckle.	Eastern redcedar, Austrian pine, red pine, eastern white pine.	Red pine	Carolina poplar.
51*. Pits					
52: Warners	---	---	---	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
55----------------- Gilford	American cranberrybush.	Northern white-cedar, silky dogwood, white spruce, Amur privet, Tatarian honeysuckle.	Eastern white pine, Norway spruce, Manchurian crabapple, green ash, golden willow.	---	Carolina poplar.
56A*: Urban land.					
Blount------------	---	American cranberrybush, Amur privet, blue spruce, white spruce, lilac.	Austrian pine, northern white-cedar.	Red pine, Norway spruce.	Green ash, Carolina poplar.
57*: Urban land.					
Lenawee-----------	---	Silky dogwood, Amur privet, white spruce, American cranberrybush, Tatarian honeysuckle.	Northern white-cedar, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce, golden willow.	Carolina poplar.
58B*: Urban land.					
Oakville----------	---	Silky dogwood, Tatarian honeysuckle, autumn-olive, Amur privet.	White spruce, Manchurian crabapple.	Eastern white pine, red pine, Norway spruce, Austrian pine.	Carolina poplar.
59A*: Urban land.					
Selfridge---------	Vanhoutte spirea	Silky dogwood, Amur privet, American cranberrybush, Tatarian honeysuckle.	Northern white-cedar, Manchurian crabapple.	Eastern white pine, Norway spruce, green ash, golden willow.	Carolina poplar.
Pewamo------------	---	American cranberrybush, silky dogwood, Amur privet, Tatarian honeysuckle.	Northern white-cedar, Siberian crabapple, white spruce.	Green ash, Norway spruce, eastern white pine, golden willow.	Carolina poplar.
60A---------------- Conover	---	Autumn-olive, white spruce, American cranberrybush, silky dogwood, Amur privet.	Northern white-cedar, Manchurian crabapple.	Eastern white pine, green ash, golden willow, Norway spruce.	Carolina poplar.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
61 Brookston	Vanhoutte spirea	White spruce, silky dogwood, American cranberrybush, Tatarian honeysuckle.	Manchurian crabapple, northern white-cedar.	Eastern white pine, Norway spruce, green ash, golden willow.	Carolina poplar.
62A*:					
Blount	---	American cranberrybush, Amur privet, blue spruce, white spruce, lilac.	Austrian pine, northern white-cedar.	Red pine, Norway spruce, green ash.	Carolina poplar.
Pewamo	---	American cranberrybush, silky dogwood, Amur privet, Tatarian honeysuckle.	Northern white-cedar, Siberian crabapple, white spruce.	Green ash, Norway spruce, eastern white pine.	Carolina poplar, golden willow.
Metamora	---	White spruce, silky dogwood, American cranberrybush.	Northern white-cedar, eastern white pine, Austrian pine.	Norway spruce, green ash.	Carolina poplar.
63*. Urban land					

* 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
10---Lenawee	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: flooding, ponding.
11B---Oakville	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
12B---Spinks	Slight---	Slight---	Moderate: slope, small stones.	Slight---	Moderate: droughty.
13A---Blount	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
14A---Del Rey	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
15A---Fulton	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
16A---Tedrow	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
17A*:					
Metamora---	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Corunna---	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
18---Granby	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
19A---Selfridge	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
20A*:					
Selfridge---	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Pewamo---	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
21---Lenawee	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
22---Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
23A---Metamora	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
24---Corunna	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
25A---Randolph	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness, thin layer.

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
26B--------------------Milton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Severe: erodes easily.	Moderate: thin layer.
27*. Beaches					
28A--------------------Kibbie	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
29---------------------Colwood	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
30---------------------Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
31*. Aquents					
32*. Dumps					
33*: Pits.					
Aquents.					
36---------------------Belleville	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
37B--------------------Ottokee Variant	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, thin layer.
38---------------------Adrian	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
40A--------------------Thetford	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
41B--------------------Metea	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
42---------------------Hoytville	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
43A--------------------Nappanee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
44A--------------------Wasepi	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
45A--------------------Channahon	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: erodes easily.	Severe: thin layer.
46---------------------Ceresco	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
47---------------------Millsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

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
48-------------------- Toledo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
49B------------------- Oakville	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
50B------------------- Ottokee	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
51*. Pits					
52-------------------- Warners	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding.
55-------------------- Gilford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
56A*: Urban land.					
Blount----------------	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
57*: Urban land.					
Lenawee---------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
58B*: Urban land.					
Oakville--------------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
59A*: Urban land.					
Selfridge-------------	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Pewamo----------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
60A------------------- Conover	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
61-------------------- Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
62A*: Blount----------------	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Pewamo----------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Metamora--------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
63*. Urban land					

* 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 herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
10 Lenawee	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
11B Oakville	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
12B Spinks	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
13A Blount	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
14A Del Rey	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
15A Fulton	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
16A Tedrow	Fair	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
17A*:										
Metamora	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Corunna	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
18 Granby	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
19A Selfridge	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
20A*:										
Selfridge	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Pewamo	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
21 Lenawee	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
22 Pewamo	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
23A Metamora	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
24 Corunna	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
25A Randolph	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
26B Milton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
27*. Beaches										
28A Kibbie	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
29------------------ Colwood	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
30------------------ Sloan	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Poor	Good.
31*. Aquents										
32*. Dumps										
33*: Pits.										
Aquents.										
36------------------ Belleville	Poor	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair.
37B----------------- Ottokee Variant	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Poor.
38------------------ Adrian	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
40A----------------- Thetford	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
41B----------------- Metea	Poor	Poor	Good	Good	Good	Poor	Very poor.	Fair	Fair	Very poor.
42------------------ Hoytville	Fair	Fair	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
43A----------------- Nappanee	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
44A----------------- Wasepi	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
45A----------------- Channahon	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
46------------------ Ceresco	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
47------------------ Millsdale	Fair	Fair	Fair	Fair	Poor	Good	Fair	Fair	Fair	Fair.
48------------------ Toledo	Fair	Fair	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
49B----------------- Oakville	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
50B----------------- Ottokee	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
51*. Pits										
52------------------ Warners	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

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
55 Gilford	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
56A*: Urban land.										
Blount	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
57*: Urban land.										
Lenawee	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
58B*: Urban land.										
Oakville	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
59A*: Urban land.										
Selfridge	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Pewamo	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
60A Conover	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
61 Brookston	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
62A*: Blount	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Pewamo	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Metamora	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
63*. Urban land										

* 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
10 Lenawee	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, flooding, ponding.	Severe: flooding, ponding.
11B Oakville	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty.
12B Spinks	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
13A Blount	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
14A Del Rey	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
15A Fulton	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
16A Tedrow	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
17A*:						
Metamora	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
Corunna	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
18 Granby	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
19A Selfridge	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
20A*:						
Selfridge	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
21 Lenawee	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
22 Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

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
23A---------------- Metamora	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
24---------------- Corunna	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
25A---------------- Randolph	Severe: depth to rock, wetness.	Severe: wetness, shrink-swell.	Severe: depth to rock, wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness, thin layer.
26B---------------- Milton	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.	Moderate: thin layer.
27*. Beaches						
28A---------------- Kibbie	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
29---------------- Colwood	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
30---------------- Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
31*. Aquents						
32*. Dumps						
33*: Pits.						
Aquents.						
36---------------- Belleville	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
37B---------------- Ottokee Variant	Severe: depth to rock, cutbanks cave.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: droughty, thin layer.
38---------------- 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.
40A---------------- Thetford	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
41B---------------- Metea	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: droughty, too sandy.
42---------------- Hoytville	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.

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
43A----------------Nappanee	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.	Moderate: wetness.
44A----------------Wasepi	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, droughty.
45A----------------Channahon	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, low strength.	Severe: thin layer.
46-----------------Ceresco	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
47-----------------Millsdale	Severe: depth to rock, ponding.	Severe: ponding, shrink-swell.	Severe: ponding, depth to rock, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
48-----------------Toledo	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
49B----------------Oakville	Severe: cutbanks cave.	Slight----------	Moderate: wetness.	Slight----------	Slight----------	Moderate: droughty.
50B----------------Ottokee	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty.
51*. Pits						
52-----------------Warners	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding.	Severe: ponding.
55-----------------Gilford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
56A*: Urban land.						
Blount------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
57*: Urban land.						
Lenawee-----------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
58B*: Urban land.						
Oakville----------	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: droughty.
59A*: Urban land.						

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
59A*:						
Selfridge--------	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Pewamo-----------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
60A--------------- Conover	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
61---------------- Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
62A*:						
Blount-----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Pewamo-----------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Metamora---------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
63*. Urban land						

* 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
10-------------------- Lenawee	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
11B------------------- Oakville	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
12B------------------- Spinks	Slight-----------	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
13A------------------- Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
14A------------------- Del Rey	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
15A------------------- Fulton	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
16A------------------- Tedrow	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
17A*:					
Metamora------------	Severe: percs slowly, wetness.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
Corunna-------------	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
18-------------------- Granby	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
19A------------------- Selfridge	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
20A*:					
Selfridge-----------	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
Pewamo--------------	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, ponding, hard to pack.

See footnote 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
21------------------- Lenawee	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
22------------------- Pewamo	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, ponding, hard to pack.
23A------------------ Metamora	Severe: percs slowly, wetness.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
24------------------- Corunna	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
25A------------------ Randolph	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: wetness, depth to rock.	Poor: too clayey, area reclaim, hard to pack.
26B------------------ Milton	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey.
27*. Beaches					
28A------------------ Kibbie	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy, wetness.
29------------------- Colwood	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, thin layer.
30------------------- Sloan	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
31*. Aquents					
32*. Dumps					
33*: Pits.					
Aquents.					
36------------------- Belleville	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
37B------------------ Ottokee Variant	Severe: depth to rock, wetness, poor filter.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, seepage, too sandy.	Severe: depth to rock, seepage.	Poor: area reclaim, too sandy.
38------------------- Adrian	Severe: ponding, poor filter.	Severe: seepage, ponding, excess humus.	Severe: ponding, seepage.	Severe: ponding, seepage.	Poor: ponding, excess humus.

See footnote 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
40A: Thetford	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness, thin layer.
41B: Metea	Severe: percs slowly.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
42: Hoytville	Severe: ponding, percs slowly.	Slight	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
43A: Nappanee	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
44A: Wasepi	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness, thin layer.
45A: Channahon	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
46: Ceresco	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
47: Millsdale	Severe: depth to rock, ponding, percs slowly.	Severe: depth to rock, ponding.	Severe: depth to rock, ponding, too clayey.	Severe: depth to rock, ponding.	Poor: too clayey, area reclaim, hard to pack.
48: Toledo	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
49B: Oakville	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy, seepage.
50B: Ottokee	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy.
51*. Pits					
52: Warners	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
55: Gilford	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
56A*: Urban land.					

See footnote 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
56A*:					
Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
57*:					
Urban land.					
Lenawee	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
58B*:					
Urban land.					
Oakville	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
59A*:					
Urban land.					
Selfridge	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
Pewamo	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, ponding, hard to pack.
60A Conover	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
61 Brookston	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, hard to pack.
62A*:					
Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Pewamo	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, ponding, hard to pack.
Metamora	Severe: percs slowly, wetness.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
63*.					
Urban land					

* See description of the map unit for composition and behavior characteristics of the map unit.

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
10 Lenawee	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
11B Oakville	Good	Probable	Improbable: too sandy.	Poor: too sandy.
12B Spinks	Good	Probable	Improbable: too sandy.	Fair: too sandy.
13A Blount	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
14A Del Rey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
15A Fulton	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
16A Tedrow	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy.
17A*:				
Metamora	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Corunna	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, wetness.
18 Granby	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
19A Selfridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, area reclaim, small stones.
20A*:				
Selfridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, area reclaim, small stones.
Pewamo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
21 Lenawee	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
22 Pewamo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
23A 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
24: Corunna	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, wetness.
25A: Randolph	Poor: low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
26B: Milton	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
27*. Beaches				
28A: Kibbie	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
29: Colwood	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
30: Sloan	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
31*. Aquents				
32*. Dumps				
33*: Pits.				
Aquents.				
36: Belleville	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
37B: Ottokee Variant	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
38: Adrian	Poor: wetness, low strength.	Probable	Improbable: too sandy.	Poor: wetness, excess humus.
40A: Thetford	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
41B: Metea	Poor: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
42: Hoytville	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
43A: Nappanee	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
44A: Wasepi	Fair: thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
45A: Channahon	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
46: Ceresco	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
47: Millsdale	Poor: low strength, area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, thin layer.
48: Toledo	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
49B: Oakville	Fair: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
50B: Ottokee	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
51*. Pits				
52: Warners	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
55: Gilford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
56A*: Urban land.				
Blount	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
57*: Urban land.				
Lenawee	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
58B*: Urban land.				
Oakville	Good	Probable	Improbable: too sandy.	Poor: too sandy.
59A*: Urban land.				
Selfridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, area reclaim, small stones.
Pewamo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
60A: Conover	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
61-------------------- Brookston	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
62A*:				
Blount----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Pewamo----------------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Metamora--------------	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
63*. Urban land				

* 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-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
10 Lenawee	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Flooding, frost action, ponding.	Flooding, ponding.	Wetness.
11B Oakville	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
12B Spinks	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
13A Blount	Slight	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, erodes easily.
14A Del Rey	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, erodes easily, percs slowly.
15A Fulton	Slight	Moderate: wetness, hard to pack.	Severe: no water.	Percs slowly	Wetness, percs slowly.	Wetness, erodes easily, percs slowly.
16A Tedrow	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
17A*:						
Metamora	Slight	Severe: wetness, piping.	Severe: slow refill.	Frost action	Wetness, soil blowing.	Wetness.
Corunna	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding, soil blowing.	Wetness, erodes easily.
18 Granby	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
19A Selfridge	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Frost action, percs slowly.	Wetness, fast intake, soil blowing.	Wetness, erodes easily.
20A*:						
Selfridge	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Frost action, percs slowly.	Wetness, fast intake, soil blowing.	Wetness, erodes easily.
Pewamo	Slight	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness.
21 Lenawee	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness.
22 Pewamo	Slight	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness.
23A 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-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
24 Corunna	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding, soil blowing.	Wetness, erodes easily.
25A Randolph	Moderate: depth to rock.	Severe: hard to pack.	Severe: no water.	Depth to rock, frost action.	Wetness, depth to rock.	Wetness, depth to rock, erodes easily.
26B Milton	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock, slope, erodes easily.	Erodes easily, depth to rock.
27*. Beaches						
28A Kibbie	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness, erodes easily.
29 Colwood	Moderate: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Ponding, frost action.	Ponding	Wetness, erodes easily.
30 Sloan	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Wetness, erodes easily, flooding.	Wetness, erodes easily.
31*. Aquents						
32*. Dumps						
33*: Pits.						
Aquents.						
36 Belleville	Severe: seepage.	Severe: ponding.	Severe: slow refill, cutbanks cave.	Ponding, frost action.	Ponding, droughty, fast intake.	Wetness, droughty.
37B Ottokee Variant	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Depth to rock, slope, cutbanks cave.	Wetness, droughty, fast intake.	Droughty, depth to rock.
38 Adrian	Severe: seepage.	Severe: seepage, ponding, excess humus.	Severe: slow refill, cutbanks cave.	Ponding, frost action, subsides.	Ponding, soil blowing.	Wetness.
40A Thetford	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
41B Metea	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
42 Hoytville	Slight	Severe: ponding.	Severe: no water.	Ponding, frost action.	Ponding, percs slowly.	Wetness, rooting depth.
43A Nappanee	Slight	Moderate: wetness, hard to pack.	Severe: no water.	Percs slowly	Wetness, percs slowly.	Wetness, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
44A: Wasepi	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
45A: Channahon	Severe: depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Large stones, erodes easily.
46: Ceresco	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, frost action, cutbanks cave.	Wetness, droughty.	Wetness, droughty.
47: Millsdale	Moderate: depth to rock.	Severe: ponding.	Severe: no water.	Depth to rock, frost action, ponding.	Ponding, depth to rock.	Wetness, depth to rock.
48: Toledo	Slight	Severe: ponding, hard to pack.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding	Wetness, percs slowly.
49B: Oakville	Severe: seepage.	Severe: seepage, piping.	Severe: slow refill, cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
50B: Ottokee	Severe: seepage.	Severe: piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Fast intake, wetness, droughty.	Droughty.
51*. Pits						
52: Warners	Severe: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding, erodes easily.	Wetness, erodes easily.
55: Gilford	Severe: seepage.	Severe: seepage, ponding.	Severe: cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding	Wetness.
56A*: Urban land.						
Blount	Slight	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, erodes easily.
57*: Urban land.						
Lenawee	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness.
58B*: Urban land.						
Oakville	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Fast intake, droughty, soil blowing.	Droughty.
59A*: Urban land.						
Selfridge	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Frost action, percs slowly.	Wetness, fast intake, soil blowing.	Wetness, erodes easily.
Pewamo	Slight	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
60A: Conover	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, erodes easily.
61: Brookston	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness.
62A*:						
Blount	Slight	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, erodes easily.
Pewamo	Slight	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness.
Metamora	Slight	Severe: wetness, piping.	Severe: slow refill.	Frost action	Wetness, soil blowing.	Wetness.
63*. Urban land						

* 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: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
10----------------Lenawee	0-10	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	50-95	25-45	11-22
	10-33	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
11B---------------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
12B---------------Spinks	0-28	Loamy sand, sand	SM	A-2-4	0	100	80-100	50-90	15-30	---	NP
	28-49	Stratified fine sand to loamy fine sand.	SM, SP-SM	A-2-4	0	100	80-100	60-90	10-30	---	NP
	49-60	Sand--------------	SP-SM, SM	A-2-4, A-3	0	100	80-100	50-90	5-25	---	NP
13A---------------Blount	0-8	Loam--------------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	8-22	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
	22-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	90-100	90-100	80-100	70-90	30-45	10-25
14A---------------Del Rey	0-9	Silt loam---------	CL, ML, CL-ML	A-6, A-4, A-7	0	95-100	95-100	90-98	75-95	25-50	5-20
	9-24	Silty clay loam, silty clay.	CH, CL	A-7, A-6	0	95-100	95-100	90-100	70-95	35-55	15-30
	24-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	95-100	95-100	90-100	70-95	30-50	10-25
15A---------------Fulton	0-7	Silty clay loam	CL	A-6, A-7	0	95-100	90-100	80-100	75-95	35-50	12-24
	7-24	Silty clay, clay, silty clay loam.	CH, CL	A-7	0	100	100	90-100	85-100	40-60	18-34
	24-60	Silty clay, clay, silty clay loam.	CH, CL	A-7	0	100	100	90-100	85-100	40-60	18-34
16A---------------Tedrow	0-8	Loamy sand--------	SM	A-2, A-4	0	100	95-100	60-80	20-40	---	NP
	8-54	Fine sand, loamy sand, sand.	SM	A-2, A-4	0	100	95-100	60-80	20-40	---	NP
	54-60	Sand, fine sand	SM, SP, SP-SM	A-2, A-3	0	100	95-100	50-70	3-35	---	NP
17A*:											
Metamora---------	0-10	Sandy loam--------	SM, SM-SC	A-2, A-4	0-5	95-100	95-100	60-80	25-45	<25	NP-7
	10-21	Sandy loam, loamy sand.	SM, SM-SC	A-2, A-4	0-5	95-100	90-100	50-80	15-45	<25	NP-7
	21-60	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
Corunna----------	0-11	Sandy loam--------	SM, ML, SC, CL	A-2, A-4	0-5	95-100	95-100	65-85	25-70	<30	NP-10
	11-34	Sandy loam, loamy fine sand.	SM, SC, SM-SC	A-4, A-2	0-5	95-100	95-100	50-75	15-40	<30	NP-10
	34-60	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	100	95-100	90-100	70-90	25-50	11-25
18----------------Granby	0-12	Loamy fine sand	SM	A-2	0	100	100	50-75	15-30	---	NP
	12-30	Sand, fine sand, loamy sand.	SP, SP-SM, SM	A-3, A-2	0	100	95-100	50-75	0-20	---	NP
	30-60	Sand, fine sand	SP, SP-SM	A-3, A-2	0	100	95-100	50-70	0-5	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
19A--------------- Selfridge	0-25	Loamy sand, sand	SM, SM-SC	A-2	0-5	95-100	95-100	70-85	20-35	<20	NP-5
	25-29	Sandy loam-------	SM, SC, SM-SC	A-2, A-4	0-5	95-100	95-100	65-80	25-45	15-30	NP-10
	29-60	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
20A*: Selfridge-------	0-25	Loamy sand, sand	SM, SM-SC	A-2	0-5	95-100	95-100	70-85	20-35	<20	NP-5
	25-29	Sandy loam-------	SM, SC, SM-SC	A-2, A-4	0-5	95-100	95-100	65-80	25-45	15-30	NP-10
	29-60	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
Pewamo----------	0-12	Clay loam--------	CL	A-6, A-7	0-5	90-100	80-100	80-100	70-90	35-50	15-25
	12-35	Clay loam, clay, silty clay.	CL, CH	A-7, A-6	0-5	95-100	90-100	90-100	75-95	35-55	15-30
	35-60	Clay loam, silty clay loam.	CL	A-7	0-5	95-100	90-100	90-100	70-90	40-50	15-25
21--------------- Lenawee	0-10	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	50-95	25-45	11-22
	10-33	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
22--------------- Pewamo	0-12	Clay loam--------	CL	A-6, A-7	0-5	90-100	80-100	80-100	70-90	35-50	15-25
	12-35	Clay loam, clay, silty clay.	CL, CH	A-7, A-6	0-5	95-100	90-100	90-100	75-95	35-55	15-30
	35-60	Clay loam, silty clay loam.	CL	A-7	0-5	95-100	90-100	90-100	70-90	40-50	15-25
23A-------------- Metamora	0-10	Sandy loam-------	SM, SM-SC	A-2, A-4	0-5	95-100	95-100	60-80	25-45	<25	NP-7
	10-21	Sandy loam, loamy sand.	SM, SM-SC	A-2, A-4	0-5	95-100	90-100	50-80	15-45	<25	NP-7
	21-60	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
24--------------- Corunna	0-11	Sandy loam-------	SM, ML, SC, CL	A-2, A-4	0-5	95-100	95-100	65-85	25-70	<30	NP-10
	11-34	Sandy loam, loamy fine sand.	SM, SC, SM-SC	A-4, A-2	0-5	95-100	95-100	50-75	15-40	<30	NP-10
	34-60	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	100	95-100	90-100	70-90	25-50	11-25
25A-------------- Randolph	0-7	Clay loam--------	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	75-85	20-38	4-15
	7-20	Clay, silty clay, clay loam.	CL, CH	A-7, A-6	0-5	75-95	75-95	75-85	70-80	38-74	14-42
	20-26	Very gravelly clay loam, gravelly sandy clay loam, sandy loam.	GC, SM-SC, SC, GM-GC	A-2, A-1, A-4, A-6	0-15	30-70	20-60	15-55	10-50	20-30	5-15
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
26B-------------- Milton	0-9	Clay loam--------	CL	A-6, A-7	0	95-100	90-100	85-100	70-95	30-45	15-25
	9-29	Clay loam, loam, clay.	CL	A-6, A-7	0	95-100	80-100	75-100	70-95	32-48	12-28
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
27*. Beaches											

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	
28A-------------- Kibbie	0-11	Very fine sandy loam.	SM, ML, SM-SC, CL-ML	A-4	0	100	100	75-95	40-60	18-25	2-7
	11-22	Silt loam, loam, 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
	22-60	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
29--------------- Colwood	0-12	Loam-------------	ML	A-4, A-6	0	100	100	85-100	60-90	15-35	2-12
	12-45	Loam, clay loam, silt loam.	CL, CL-ML	A-6, A-4	0	100	100	80-100	50-90	20-40	6-20
	45-60	Stratified silt loam to very fine sand.	SM, ML	A-2, A-4	0	100	95-100	70-100	30-80	<35	NP-10
30--------------- Sloan	0-12	Loam-------------	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	12-26	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
	26-60	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
31*. Aquents											
32*. Dumps											
33*: Pits.											
Aquents.											
36--------------- Belleville	0-10	Loamy sand-------	SM	A-2	0	100	95-100	70-85	20-35	<20	NP-4
	10-38	Sand, loamy sand, loamy fine sand.	SM	A-2	0-3	95-100	90-100	50-85	15-30	<20	NP-4
	38-60	Clay loam, silty clay loam.	CL	A-6, A-7	0-3	95-100	90-100	90-100	70-90	25-50	10-25
37B-------------- Ottokee Variant	0-9	Fine sand--------	SM	A-2-4	0	100	100	65-80	20-35	---	NP
	9-24	Fine sand, sand, loamy sand.	SM	A-2-4	0	100	100	50-80	15-35	---	NP
	24-28	Loamy sand, loam.	SM	A-2-4	0-3	95-100	95-100	50-80	15-35	---	NP
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
38--------------- Adrian	0-34	Sapric material	Pt	A-8	---	---	---	---	---	---	---
	34-60	Sand, loamy sand, fine sand.	SP, SM	A-2, A-3, A-1	0	80-100	60-100	35-75	0-30	---	NP
40A-------------- Thetford	0-15	Loamy sand, sand	SM	A-2, A-4	0	95-100	90-100	70-85	20-45	<20	NP-4
	15-38	Loamy sand, sandy loam, loamy fine sand.	SM	A-2, A-4	0	95-100	90-100	60-80	20-40	<20	NP-4
	38-60	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	
41B---------------Metea	0-8	Sand-------------	SP-SM, SM	A-3, A-2-4	0	100	100	50-70	5-15	---	NP
	8-34	Loamy sand, loamy fine sand, sand.	SP-SM, SM	A-2-4	0	100	100	50-80	10-35	---	NP
	34-60	Clay loam, sandy loam, silty clay loam.	CL, SC	A-6, A-7	0	90-100	90-95	75-95	40-75	25-50	12-30
42---------------Hoytville	0-9	Silty clay loam	CL	A-7	0-5	100	90-100	80-100	70-100	40-50	22-30
	9-40	Clay, silty clay	CH, CL	A-7	0-5	100	85-100	80-100	75-100	42-66	22-40
	40-60	Clay, silty clay loam, clay loam.	CH, CL	A-7	0-5	100	85-100	80-100	75-100	40-62	22-40
43A--------------Nappanee	0-8	Loam-------------	ML, CL	A-4, A-6	0-5	95-100	95-100	85-100	55-90	25-40	3-15
	8-24	Silty clay, clay	CH	A-7	0-5	95-100	95-100	85-100	70-95	50-70	25-45
	24-60	Silty clay loam, clay, clay loam.	CL, CH	A-7	0-5	95-100	95-100	85-100	70-95	40-60	20-35
44A--------------Wasepi	0-7	Sandy loam-------	SM, SC, SM-SC	A-2-4 A-4	0-5	85-100	80-95	60-95	25-45	<25	NP-10
	7-36	Loamy sand, sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6, A-1	0-5	90-100	85-95	35-85	15-45	10-30	NP-16
	36-46	Sand, gravelly sand, gravel.	SP, GP, SP-SM, GP-GM	A-1, A-3, A-2-4	0-10	40-75	35-70	20-55	0-10	---	NP
	46-60	Clay loam, silty clay loam, silt loam.	CL, CH	A-6, A-7	0-5	95-100	90-100	85-100	70-90	25-60	15-35
45A--------------Channahon	0-8	Loam-------------	CL	A-6, A-4	0-20	95-100	95-100	85-100	55-90	21-38	7-18
	8-15	Loam, sandy clay loam, silty clay loam.	CL	A-6, A-7	0-20	90-100	80-100	75-95	50-85	30-46	15-25
	15-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
46---------------Ceresco	0-18	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-2, A-4	0	100	100	60-90	30-75	10-20	NP-6
	18-60	Fine sandy loam, loamy fine sand, silt loam.	SM, ML, CL, SC	A-2, A-4	0	95-100	80-100	60-95	15-80	15-30	NP-8
47---------------Millsdale	0-11	Clay loam--------	CL	A-6, A-7	0	90-100	80-100	75-100	60-95	32-50	12-25
	11-22	Clay, silty clay loam, clay loam.	CH, CL	A-7	0-5	85-100	80-100	75-100	60-95	40-60	20-35
	22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
48---------------Toledo	0-6	Silty clay loam	MH, CL, ML, CH	A-7, A-6	0	100	100	95-100	85-100	38-54	14-24
	6-36	Silty clay, clay	CH, CL, ML, MH	A-7	0	100	100	95-100	80-100	40-65	18-36
	36-60	Silty clay, clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	80-100	40-65	18-36
49B--------------Oakville	0-9	Fine sand--------	SM	A-2	0	100	100	55-75	15-25	---	NP
	9-52	Fine sand, loamy fine sand, sand.	SM, SP, SP-SM	A-2, A-3	0	100	100	65-95	0-35	---	NP
	52-60	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	25-50	12-30

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
50B: Ottokee	0-9	Fine sand	SM	A-2	0	100	90-100	80-95	20-35	---	NP
	9-60	Loamy fine sand, fine sand, loamy	SM	A-2	0	100	90-100	80-95	20-35	---	NP
51*. Pits											
52: Warners	0-12	Silt loam	ML, OL	A-7, A-5	0	95-100	95-100	90-100	70-95	40-50	5-15
	12-60	Marl	---	---	0	---	---	---	---	---	---
55: 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
	11-28	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
	28-60	Coarse sand, sand, loamy sand.	SM, SP, SP-SM	A-3, A-1-B, A-2-4	0	90-100	85-100	18-60	3-18	---	NP
56A*: Urban land.											
Blount	0-8	Loam	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	8-22	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
	22-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	90-100	90-100	80-100	70-90	30-45	10-25
57*: Urban land.											
Lenawee	0-10	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	50-95	25-45	11-22
	10-33	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
58B*: Urban land.											
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
59A*: Urban land.											
Selfridge	0-25	Loamy sand, sand	SM, SM-SC	A-2	0-5	95-100	95-100	70-85	20-35	<20	NP-5
	25-29	Sandy loam	SM, SC, SM-SC	A-2, A-4	0-5	95-100	95-100	65-80	25-45	15-30	NP-10
	29-60	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
Pewamo	0-12	Clay loam	CL	A-6, A-7	0-5	90-100	80-100	80-100	70-90	35-50	15-25
	12-35	Clay loam, clay, silty clay.	CL, CH	A-7, A-6	0-5	95-100	90-100	90-100	75-95	35-55	15-30
	35-60	Clay loam, silty clay loam.	CL	A-7	0-5	95-100	90-100	90-100	70-90	40-50	15-25
60A: Conover	0-14	Loam	ML, CL, CL-ML	A-4	0-5	95-100	90-100	80-95	55-90	20-30	3-10
	14-34	Clay loam, silty clay loam.	CL	A-6	0-5	95-100	90-100	80-95	50-90	29-40	15-25
	34-60	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	80-95	50-75	25-34	6-14

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	
61---------------- Brookston	0-11	Loam--------------	CL	A-4, A-6	0	98-100	98-100	85-100	60-90	22-40	8-18
	11-30	Clay loam, sandy clay loam.	CL, CH	A-6, A-7	0	98-100	85-100	75-95	60-85	36-52	18-30
	30-60	Loam, sandy loam, clay loam.	CL	A-4, A-6	0-3	90-100	85-95	78-90	55-70	22-30	7-15
62A*:											
Blount-----------	0-8	Loam--------------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	8-22	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
	22-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	90-100	90-100	80-100	70-90	30-45	10-25
Pewamo-----------	0-12	Clay loam---------	CL	A-6, A-7	0-5	90-100	80-100	80-100	70-90	35-50	15-25
	12-35	Clay loam, clay, silty clay.	CL, CH	A-7, A-6	0-5	95-100	90-100	90-100	75-95	35-55	15-30
	35-60	Clay loam, silty clay loam.	CL	A-7	0-5	95-100	90-100	90-100	70-90	40-50	15-25
Metamora---------	0-10	Sandy loam--------	SM, SM-SC	A-2, A-4	0-5	95-100	95-100	60-80	25-45	<25	NP-7
	10-21	Sandy loam, loamy sand.	SM, SM-SC	A-2, A-4	0-5	95-100	90-100	50-80	15-45	<25	NP-7
	21-60	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
63*. Urban land											

* 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 K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
10---------------- Lenawee	0-10	20-35	1.40-1.55	0.6-2.0	0.14-0.22	5.6-7.8	Moderate-----	0.28	4	8	3-5
	10-33	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			
11B--------------- Oakville	0-7	0-10	1.30-1.55	>6.0	0.07-0.09	5.6-7.3	Low----------	0.15	5	1	.5-2
	7-60	0-10	1.30-1.65	>6.0	0.06-0.08	5.6-7.3	Low----------	0.15			
12B--------------- Spinks	0-28	2-15	1.20-1.60	6.0-20	0.08-0.10	5.1-7.3	Low----------	0.17	5	2	2-4
	28-49	0-15	1.20-1.50	2.0-20	0.04-0.08	5.6-7.8	Low----------	0.17			
	49-60	0-10	1.20-1.50	6.0-20	0.04-0.06	6.6-8.4	Low----------	0.17			
13A--------------- Blount	0-8	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
	8-22	35-50	1.40-1.70	0.06-0.6	0.12-0.19	4.5-6.5	Moderate-----	0.43			
	22-60	27-38	1.60-1.85	0.06-0.6	0.07-0.10	7.4-8.4	Moderate-----	0.43			
14A--------------- Del Rey	0-9	20-30	1.30-1.50	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.43	3	6	2-3
	9-24	35-45	1.35-1.55	0.06-0.2	0.12-0.20	6.1-8.4	Moderate-----	0.43			
	24-60	25-35	1.45-1.65	0.06-0.2	0.09-0.11	7.9-8.4	Moderate-----	0.43			
15A--------------- Fulton	0-7	27-40	1.35-1.55	0.2-0.6	0.21-0.23	5.1-7.3	Moderate-----	0.43	3	7	2-3
	7-24	35-59	1.40-1.70	0.06-0.2	0.09-0.13	5.1-7.8	High---------	0.32			
	24-60	35-50	1.45-1.70	0.06-0.2	0.08-0.12	7.4-8.4	High---------	0.32			
16A--------------- Tedrow	0-8	2-10	1.40-1.60	6.0-20	0.08-0.12	6.1-7.3	Low----------	0.17	5	2	1-3
	8-54	2-8	1.50-1.70	6.0-20	0.07-0.11	6.1-7.3	Low----------	0.17			
	54-60	1-8	1.50-1.70	6.0-20	0.05-0.07	6.6-7.8	Low----------	0.17			
17A*:											
Metamora--------	0-10	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
	10-21	5-15	1.40-1.60	2.0-6.0	0.10-0.15	5.1-7.3	Low----------	0.20			
	21-60	12-30	1.45-1.70	0.2-0.6	0.14-0.18	6.6-8.4	Moderate-----	0.32			
Corunna---------	0-11	5-15	1.60-1.70	0.6-6.0	0.14-0.22	6.1-7.8	Low----------	0.20	4	3	1-2
	11-34	10-18	1.30-1.60	0.6-6.0	0.08-0.14	6.1-7.8	Low----------	0.20			
	34-60	18-35	1.45-1.70	0.2-0.6	0.16-0.20	7.4-8.4	Moderate-----	0.43			
18---------------- Granby	0-12	2-14	1.20-1.60	6.0-20	0.10-0.12	5.6-7.3	Low----------	0.17	5	2	4-6
	12-30	0-14	1.45-1.65	6.0-20	0.05-0.12	5.6-7.8	Low----------	0.17			
	30-60	0-10	1.45-1.65	6.0-20	0.05-0.09	6.6-8.4	Low----------	0.17			
19A--------------- Selfridge	0-25	2-15	1.25-1.40	6.0-20	0.10-0.12	5.6-7.3	Low----------	0.15	5	2	1-3
	25-29	8-18	1.35-1.45	6.0-20	0.12-0.14	5.6-7.3	Low----------	0.15			
	29-60	18-35	1.50-1.90	0.2-0.6	0.10-0.14	7.4-8.4	Moderate-----	0.37			
20A*:											
Selfridge-------	0-25	2-15	1.25-1.40	6.0-20	0.10-0.12	5.6-7.3	Low----------	0.15	5	2	1-3
	25-29	8-18	1.35-1.45	6.0-20	0.12-0.14	5.6-7.3	Low----------	0.15			
	29-60	18-35	1.50-1.90	0.2-0.6	0.10-0.14	7.4-8.4	Moderate-----	0.37			
Pewamo----------	0-12	27-40	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.3	Moderate-----	0.24	5	6	3-5
	12-35	35-50	1.40-1.70	0.2-0.6	0.12-0.20	5.6-7.8	Moderate-----	0.24			
	35-60	30-40	1.50-1.75	0.2-0.6	0.14-0.18	7.4-8.4	Moderate-----	0.24			
21---------------- Lenawee	0-10	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
	10-33	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			
22---------------- Pewamo	0-12	27-40	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.3	Moderate-----	0.24	5	6	3-5
	12-35	35-50	1.40-1.70	0.2-0.6	0.12-0.20	5.6-7.8	Moderate-----	0.24			
	35-60	30-40	1.50-1.75	0.2-0.6	0.14-0.18	7.4-8.4	Moderate-----	0.24			

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 K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
23A---------------- Metamora	0-10	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
	10-21	5-15	1.40-1.60	2.0-6.0	0.10-0.15	5.1-7.3	Low-----------	0.20			
	21-60	12-30	1.45-1.70	0.2-0.6	0.14-0.18	6.6-8.4	Moderate------	0.32			
24----------------- Corunna	0-11	5-15	1.60-1.70	0.6-6.0	0.14-0.22	6.1-7.8	Low-----------	0.20	4	3	1-2
	11-34	10-18	1.30-1.60	0.6-6.0	0.08-0.14	6.1-7.8	Low-----------	0.20			
	34-60	18-35	1.45-1.70	0.2-0.6	0.16-0.20	7.4-8.4	Moderate------	0.43			
25A---------------- Randolph	0-7	16-27	1.30-1.45	0.6-2.0	0.17-0.22	5.1-7.3	Low-----------	0.37	3	6	1-3
	7-20	35-50	1.40-1.70	0.2-0.6	0.13-0.16	5.1-7.8	High----------	0.37			
	20-26	18-36	1.50-1.70	0.2-0.6	0.04-0.11	7.4-8.4	Low-----------	0.37			
	26	---	---	---	---	---	--------------	----			
26B---------------- Milton	0-9	27-32	1.35-1.55	0.6-2.0	0.15-0.22	5.1-7.3	Moderate------	0.37	3	7	.5-2
	9-29	35-50	1.45-1.70	0.2-2.0	0.12-0.18	4.5-7.8	Moderate------	0.37			
	29	---	---	---	---	---	--------------	----			
27*. Beaches											
28A---------------- Kibbie	0-11	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
	11-22	18-35	1.40-1.65	0.6-2.0	0.17-0.22	5.6-7.3	Low-----------	0.43			
	22-60	2-18	1.40-1.70	0.6-2.0	0.12-0.22	7.4-8.4	Low-----------	0.43			
29----------------- Colwood	0-12	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
	12-45	18-35	1.30-1.60	0.6-2.0	0.17-0.22	6.1-8.4	Moderate------	0.43			
	45-60	0-12	1.20-1.47	0.6-2.0	0.12-0.22	7.4-8.4	Low-----------	0.43			
30----------------- Sloan	0-12	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
	12-26	22-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate------	0.37			
	26-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low-----------	0.37			
31*. Aquents											
32*. Dumps											
33*: Pits.											
Aquents.											
36----------------- Belleville	0-10	3-12	0.92-1.59	6.0-20	0.10-0.12	6.1-7.8	Low-----------	0.17	5	2	.5-3
	10-38	2-12	1.45-1.73	6.0-20	0.06-0.10	6.1-8.4	Low-----------	0.17			
	38-60	27-35	1.46-1.95	0.2-0.6	0.14-0.20	7.4-8.4	Moderate------	0.32			
37B---------------- Ottokee Variant	0-9	0-10	1.27-1.56	6.0-20	0.07-0.09	6.1-7.3	Low-----------	0.15	4	2	1-2
	9-24	2-12	1.26-1.60	6.0-20	0.06-0.11	6.1-7.8	Low-----------	0.15			
	24-28	5-12	1.20-1.47	6.0-20	0.08-0.17	7.9-8.4	Low-----------	0.15			
	28	---	---	---	---	---	--------------	----			
38----------------- Adrian	0-34	---	0.30-0.55	0.2-6.0	0.35-0.45	5.1-7.8	--------------	----	---	3	55-75
	34-60	2-10	1.40-1.75	6.0-20	0.03-0.08	5.6-8.4	Low-----------	----			
40A---------------- Thetford	0-15	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
	15-38	8-18	1.35-1.45	2.0-6.0	0.08-0.13	5.6-7.8	Low-----------	0.17			
	38-60	0-10	1.25-1.50	6.0-20	0.05-0.08	7.4-8.4	Low-----------	0.17			
41B---------------- Metea	0-8	2-8	1.50-1.65	>20	0.07-0.09	5.6-7.3	Low-----------	0.17	5	1	.5-2
	8-34	2-10	1.50-1.70	>20	0.06-0.11	5.1-7.3	Low-----------	0.17			
	34-60	25-35	1.50-1.70	0.2-0.6	0.15-0.19	5.6-7.3	Moderate------	0.32			
42----------------- Hoytville	0-9	27-40	1.25-1.50	0.2-2.0	0.16-0.21	6.1-7.3	High----------	0.28	5	7	3-6
	9-40	40-55	1.40-1.80	0.2-0.6	0.11-0.15	6.1-7.8	High----------	0.28			
	40-60	35-50	1.40-1.85	0.06-0.2	0.06-0.12	6.6-7.8	High----------	0.28			

* 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 erodi-bility group	Organic matter
								K	T		
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
43A--------------- Nappanee	0-8	20-27	1.30-1.50	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.43	3	6	1-3
	8-24	45-60	1.40-1.80	0.06-0.2	0.08-0.14	5.1-7.8	Moderate-----	0.32			
	24-60	35-50	1.60-1.85	0.06-0.2	0.06-0.12	7.4-8.4	Moderate-----	0.32			
44A--------------- Wasepi	0-7	2-10	1.25-1.41	6.0-20	0.08-0.12	6.1-7.8	Low-----------	0.20	4	2	1-3
	7-36	10-22	1.35-1.45	2.0-6.0	0.08-0.17	6.6-7.8	Low-----------	0.20			
	36-46	0-10	1.25-1.50	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
	46-60	20-35	1.46-1.95	0.2-0.6	0.11-0.20	7.9-8.4	Moderate-----	0.37			
45A--------------- Channahon	0-8	20-27	1.10-1.30	0.6-2.0	0.20-0.24	6.1-8.4	Low-----------	0.37	2	6	2
	8-15	25-35	1.15-1.35	0.6-2.0	0.15-0.22	6.1-8.4	Moderate-----	0.37			
	15-60	---	---	---	---	---	-------------	----			
46---------------- Ceresco	0-18	2-15	1.15-1.60	2.0-6.0	0.13-0.22	6.1-7.8	Low-----------	0.20	5	3	3-5
	18-60	10-20	1.40-1.70	0.6-6.0	0.08-0.13	6.1-8.4	Low-----------	0.20			
47---------------- Millsdale	0-11	27-32	1.30-1.50	0.6-2.0	0.19-0.22	6.1-7.3	Moderate-----	0.32	4	6	4-7
	11-22	35-45	1.40-1.70	0.2-0.6	0.12-0.16	6.1-8.4	High---------	0.32			
	22	---	---	---	---	---	-------------	----			
48---------------- Toledo	0-6	27-40	1.40-1.60	0.2-0.6	0.21-0.23	6.1-7.3	Moderate-----	0.28	5	4	3-6
	6-36	40-60	1.40-1.70	0.06-0.2	0.09-0.13	6.1-7.8	High---------	0.28			
	36-60	35-60	1.45-1.75	0.06-0.2	0.08-0.12	7.4-8.4	High---------	0.28			
49B--------------- Oakville	0-9	2-14	1.30-1.55	6.0-20	0.07-0.09	5.6-7.3	Low-----------	0.15	5	1	.5-2
	9-52	0-10	1.30-1.60	6.0-20	0.06-0.10	5.6-7.3	Low-----------	0.15			
	52-60	27-35	1.60-1.75	0.2-0.6	0.14-0.20	7.9-8.4	Moderate-----	0.37			
50B--------------- Ottokee	0-9	2-10	1.40-1.60	6.0-20	0.07-0.11	6.1-7.3	Low-----------	0.17	5	2	.5-3
	9-60	1-12	1.50-1.70	6.0-20	0.06-0.10	5.6-7.3	Low-----------	0.17			
51*. Pits											
52---------------- Warners	0-12	18-35	1.05-1.40	0.2-2.0	0.17-0.22	6.1-7.8	Low-----------	0.43	5	6	4-8
	12-60	---	---	---	---	7.9-8.4	Low-----------	----			
55---------------- Gilford	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
	11-28	8-17	1.60-1.80	2.0-6.0	0.10-0.14	5.6-7.3	Low-----------	0.20			
	28-60	3-12	1.70-1.90	6.0-20	0.05-0.08	6.6-8.4	Low-----------	0.15			
56A*: Urban land.											
Blount-----------	0-8	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
	8-22	35-50	1.40-1.70	0.06-0.6	0.12-0.19	4.5-6.5	Moderate-----	0.43			
	22-60	27-38	1.60-1.85	0.06-0.6	0.07-0.10	7.4-8.4	Moderate-----	0.43			
57*: Urban land.											
Lenawee----------	0-10	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
	10-33	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			
58B*: Urban land.											
Oakville---------	0-7	0-10	1.30-1.55	>6.0	0.07-0.09	5.6-7.3	Low-----------	0.15	5	1	.5-2
	7-60	0-10	1.30-1.65	>6.0	0.06-0.10	5.6-7.3	Low-----------	0.15			
59A*: Urban land.											
Selfridge--------	0-25	2-15	1.25-1.40	6.0-20	0.10-0.12	5.6-7.3	Low-----------	0.15	5	2	1-3
	25-29	8-18	1.35-1.45	6.0-20	0.12-0.14	5.6-7.3	Low-----------	0.15			
	29-60	18-35	1.50-1.90	0.2-0.6	0.10-0.14	7.4-8.4	Moderate-----	0.37			

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 K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
59A*:											
Pewamo----------	0-12	27-40	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.3	Moderate-----	0.24	5	6	3-5
	12-35	35-50	1.40-1.70	0.2-0.6	0.12-0.20	5.6-7.8	Moderate-----	0.24			
	35-60	30-40	1.50-1.75	0.2-0.6	0.14-0.18	7.4-8.4	Moderate-----	0.24			
60A-------------- Conover	0-14	11-22	1.40-1.55	0.6-2.0	0.18-0.24	5.6-6.5	Low-----------	0.28	5	5	2-3
	14-34	25-35	1.45-1.65	0.2-2.0	0.15-0.18	5.6-7.3	Moderate-----	0.28			
	34-60	15-32	1.55-1.90	0.2-2.0	0.05-0.19	7.4-8.4	Low-----------	0.37			
61--------------- Brookston	0-11	18-27	1.35-1.50	0.6-2.0	0.21-0.24	6.6-7.3	Moderate-----	0.28	5	6	3-5
	11-30	27-35	1.40-1.60	0.6-2.0	0.15-0.19	6.6-7.3	Moderate-----	0.28			
	30-60	15-32	1.45-1.70	0.6-2.0	0.05-0.19	7.4-8.4	Moderate-----	0.28			
62A*:											
Blount----------	0-8	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
	8-22	35-50	1.40-1.70	0.06-0.6	0.12-0.19	4.5-6.5	Moderate-----	0.43			
	22-60	27-38	1.60-1.85	0.06-0.6	0.07-0.10	7.4-8.4	Moderate-----	0.43			
Pewamo----------	0-12	27-40	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.3	Moderate-----	0.24	5	6	3-5
	12-35	35-50	1.40-1.70	0.2-0.6	0.12-0.20	5.6-7.8	Moderate-----	0.24			
	35-60	30-40	1.50-1.75	0.2-0.6	0.14-0.18	7.4-8.4	Moderate-----	0.24			
Metamora--------	0-10	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
	10-21	5-15	1.40-1.60	2.0-6.0	0.10-0.15	5.1-7.3	Low-----------	0.20			
	21-60	18-35	1.45-1.70	0.2-0.6	0.16-0.18	6.1-7.3	Moderate-----	0.32			
63*. Urban land											

* 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 "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
10*---------------- Lenawee	D	None---------	---	---	+2-0.5	Apparent	Sep-Jun	High-----	High-----	Low.
11B---------------- Oakville	A	None---------	---	---	3.0-6.0	Apparent	Nov-Apr	Low------	Low------	Moderate.
12B---------------- Spinks	A	None---------	---	---	>6.0	---	---	Low------	Low------	Low.
13A---------------- Blount	C	None---------	---	---	1.0-3.0	Perched	Jan-May	High-----	High-----	High.
14A---------------- Del Rey	C	None---------	---	---	1.0-3.0	Apparent	Jan-May	High-----	High-----	Low.
15A---------------- Fulton	D	None---------	---	---	1.0-2.5	Perched	Dec-May	Moderate	High-----	Moderate.
16A---------------- Tedrow	B	None---------	---	---	1.0-2.0	Apparent	Jan-Apr	Moderate	Low------	Low.
17A:										
Metamora----------	B	None---------	---	---	0.5-1.5	Apparent	Nov-May	High-----	Moderate	Moderate.
Corunna*----------	B/D	None---------	---	---	+1-1.0	Apparent	Nov-May	High-----	High-----	Low.
18*---------------- Granby	A/D	None---------	---	---	+1-1.0	Apparent	Nov-Jun	Moderate	High-----	Low.
19A---------------- Selfridge	C	None---------	---	---	1.0-2.0	Perched	Nov-May	High-----	High-----	Low.
20A:										
Selfridge---------	C	None---------	---	---	1.0-2.0	Perched	Nov-May	High-----	High-----	Low.
Pewamo*-----------	C/D	None---------	---	---	+1-1.0	Apparent	Dec-May	High-----	High-----	Low.
21*---------------- Lenawee	B/D	None---------	---	---	+1-1.0	Apparent	Nov-May	High-----	High-----	Low.
22*---------------- Pewamo	C/D	None---------	---	---	+1-1.0	Apparent	Dec-May	High-----	High-----	Low.
23A---------------- Metamora	B	None---------	---	---	0.5-1.5	Apparent	Nov-May	High-----	Moderate	Moderate.
24*---------------- Corunna	B/D	None---------	---	---	+1-1.0	Apparent	Nov-May	High-----	High-----	Low.
25A---------------- Randolph	D	None---------	---	---	1.0-2.5	Perched	Jan-Apr	High-----	High-----	Moderate.
26B---------------- Milton	C	None---------	---	---	>6.0	---	---	Moderate	High-----	Moderate.
27. Beaches										
28A---------------- Kibbie	B	None---------	---	---	1.0-2.0	Apparent	Nov-May	High-----	Low------	High.
29*---------------- Colwood	B/D	None---------	---	---	+1-1.0	Apparent	Oct-May	High-----	High-----	Low.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
30----------------- Sloan	B/D	Frequent----	Brief-----	Nov-Jun	0-1.0	Apparent	Nov-Jun	High-----	High-----	Low.
31. Aquents										
32. Dumps										
33: Pits.										
Aquents.										
36*---------------- Belleville	B/D	None---------	---	---	+1-1.0	Apparent	Mar-May	High-----	High-----	Low.
37B---------------- Ottokee Variant	A	None---------	---	---	2.0-3.0	Perched	Dec-Apr	Low------	Low------	Low.
38*---------------- Adrian	A/D	None---------	---	---	+1-1.0	Apparent	Nov-May	High-----	High-----	Moderate.
40A---------------- Thetford	A	None---------	---	---	1.0-2.0	Apparent	Feb-May	Moderate	Low------	Moderate.
41B---------------- Metea	B	None---------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
42*---------------- Hoytville	D	None---------	---	---	+1-1.0	Perched	Jan-Apr	High-----	High-----	Low.
43A---------------- Nappanee	D	None---------	---	---	1.0-2.0	Perched	Nov-May	Moderate	High-----	Low.
44A---------------- Wasepi	B	None---------	---	---	1.0-2.0	Apparent	Nov-May	High-----	Low------	Low.
45A---------------- Channahon	D	None---------	---	---	>6.0	---	---	Moderate	Moderate	Low.
46----------------- Ceresco	B	Frequent----	Brief-----	Mar-May	1.0-2.0	Apparent	Sep-May	High-----	Low------	Low.
47*---------------- Millsdale	B/D	None---------	---	---	+1-1.0	Perched	Jan-Apr	High-----	High-----	Low.
48*---------------- Toledo	D	None---------	---	---	+1-1.0	Perched	Jan-Apr	High-----	High-----	Low.
49B---------------- Oakville	A	None---------	---	---	3.0-6.0	Apparent	Nov-Apr	Low------	Low------	Moderate.
50B---------------- Ottokee	A	None---------	---	---	2.0-3.5	Apparent	Jan-Apr	Low------	Low------	Low.
51. Pits										
52*---------------- Warners	D	None---------	---	---	+1-0.5	Apparent	Nov-Jun	High-----	High-----	Low.
55*---------------- Gilford	B	None---------	---	---	+.5-1.0	Apparent	Dec-May	High-----	High-----	Moderate.
56A: Urban land.										
Blount------------	C	None---------	---	---	1.0-3.0	Perched	Jan-May	High-----	High-----	High.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
57: Urban land.										
Lenawee*	B/D	None	---	---	+1-1.0	Apparent	Nov-May	High	High	Low.
58B: Urban land.										
Oakville	A	None	---	---	>6.0	---	---	Low	Low	Moderate.
59A: Urban land.										
Selfridge	C	None	---	---	1.0-2.0	Perched	Nov-May	High	High	Low.
Pewamo*	C/D	None	---	---	+1-1.0	Apparent	Dec-May	High	High	Low.
60A Conover	B	None	---	---	1.0-2.0	Apparent	Nov-May	High	High	Moderate.
61* Brookston	B/D	None	---	---	+1-1.0	Apparent	Dec-May	High	High	Low.
62A: Blount	C	None	---	---	1.0-3.0	Perched	Jan-May	High	High	High.
Pewamo*	C/D	None	---	---	+1-1.0	Apparent	Dec-May	High	High	Low.
Metamora	B	None	---	---	0.5-1.5	Apparent	Nov-May	High	Moderate	Moderate.
63. Urban land										

* In the "High water table--Depth" column, 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.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Adrian	Sandy or sandy-skeletal, mixed, euic, mesic Terric Medisaprists
Aquents	Mixed, mesic Typic Haplaquents
Belleville	Sandy over loamy, mixed, mesic Typic Haplaquolls
Blount	Fine, illitic, mesic Aeric Ochraqualfs
Brookston	Fine-loamy, mixed, mesic Typic Argiaquolls
Ceresco	Coarse-loamy, mixed, mesic Fluvaquentic Hapludolls
Channahon	Loamy, mixed, mesic Lithic Argiudolls
Colwood	Fine-loamy, mixed, mesic Typic Haplaquolls
Conover	Fine-loamy, mixed, mesic Udollic Ochraqualfs
Corunna	Coarse-loamy, mixed, mesic Typic Haplaquolls
Del Rey	Fine, illitic, mesic Aeric Ochraqualfs
Fulton	Fine, illitic, mesic Aeric Ochraqualfs
Gilford	Coarse-loamy, mixed, mesic Typic Haplaquolls
Granby	Sandy, mixed, mesic Typic Haplaquolls
Hoytville	Fine, illitic, mesic Mollic Ochraqualfs
Kibbie	Fine-loamy, mixed, mesic Aquollic Hapludalfs
Lenawee	Fine, mixed, nonacid, mesic Mollic Haplaquepts
*Metamora	Fine-loamy, mixed, mesic Udollic Ochraqualfs
*Metea	Loamy, mixed, mesic Arenic Hapludalfs
Millsdale	Fine, mixed, mesic Typic Argiaquolls
Milton	Fine, mixed, mesic Typic Hapludalfs
Nappanee	Fine, illitic, mesic Aeric Ochraqualfs
Oakville	Mixed, mesic Typic Udipsamments
Ottokee	Mixed, mesic Aquic Udipsamments
Ottokee Variant	Coarse-loamy, mixed, mesic Mollic Hapludalfs
Pewamo	Fine, mixed, mesic Typic Argiaquolls
Randolph	Fine, mixed, mesic Aeric Ochraqualfs
Selfridge	Loamy, mixed, mesic Aquic Arenic 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
Toledo	Fine, illitic, nonacid, mesic Mollic Haplaquepts
Warners	Fine-silty, carbonatic, mesic Fluvaquentic Haplaquolls
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.

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