United States Department of Agriculture

Soil Conservation Service

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

Soil Survey of Saginaw County, Michigan

How To Use This Soil Survey

General Soil Map

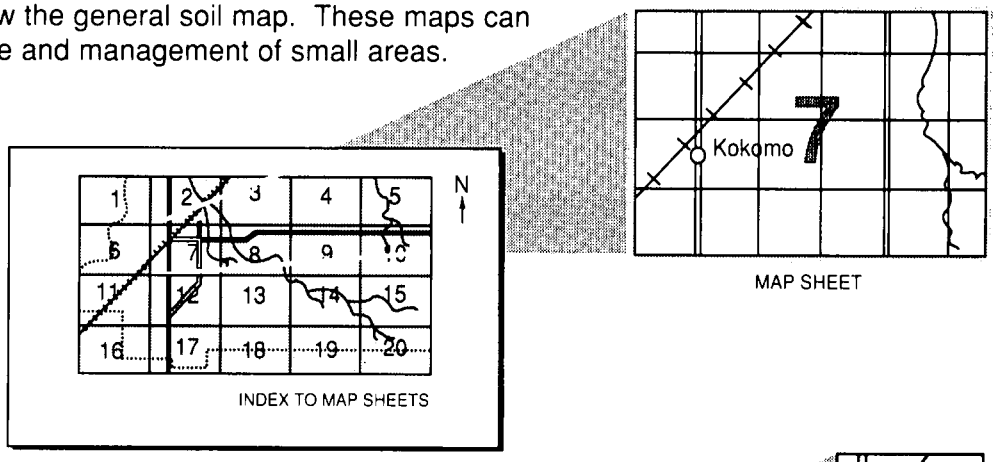
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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

Detailed Soil Maps

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

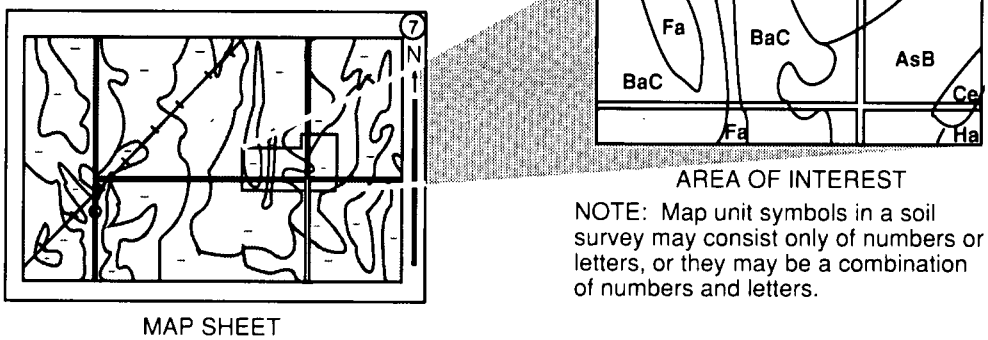
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

MAP SHEET

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



MAP SHEET

AREA OF INTEREST

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

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

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

Major fieldwork for this soil survey was completed in 1989. Soil names and descriptions were approved in 1990. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1989. This survey was made cooperatively by the Soil Conservation Service, the Michigan Agricultural Experiment Station, the Michigan Cooperative Extension Service, and Michigan Technological University. It is part of the technical assistance furnished to the Saginaw Soil Conservation District. Financial assistance was made available by the Saginaw 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.

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

Cover: An area of Zilwaukee-Misteguay complex, rarely flooded. This area is used for corn, one of the major crops in the county.

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Summary of Tables

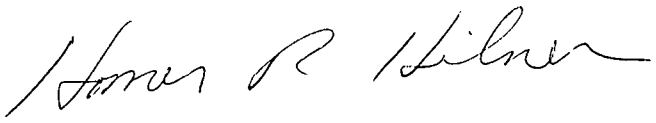
Foreword

This soil survey contains information that can be used in land-planning programs in Saginaw County, Michigan. 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, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

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

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



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Soil Survey of Saginaw County, Michigan

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United States Department of Agriculture, Soil Conservation Service,
in cooperation with
Michigan Agricultural Experiment Station, Michigan Cooperative Extension Service, and Michigan Technological University

SAGINAW COUNTY is in the east-central part of the Lower Peninsula of Michigan (fig. 1). The county has an area of 522,035 acres, or about 815 square miles. In 1980, the population of the county was 228,059 and that of Saginaw, the county seat, was 77,508.

Soil scientists have determined that Saginaw County has 57 different kinds of soil. The soils range widely in texture, natural drainage, slope, and other characteristics. Wetness is a major limitation in many of the soils. Because of extensive tile drainage, however, the soils generally are well suited to field crops. Because of wetness, many of the soils are poorly suited to most other uses.

This soil survey updates the survey of Saginaw County published in 1938 *(8)*. It has more detailed maps and provides more interpretive information.

Figure 1.—Location of Saginaw County in Michigan.

General Nature of the County

This section provides general information about Saginaw County. It describes climate, history and development, farming, forestry, industry and transportation facilities, physiography and drainage, lakes and streams, and natural resources.

Climate

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

The climate in the county is somewhat varied because of topographic differences and the proximity to Saginaw Bay and connecting waterways. These influences cause significant changes in the climate

within distances of only a few miles.

Climatic data for this survey area were recorded at the Tri City Airport, near Freeland, in the period 1951-80; the city of Saginaw in the period 1955-80; and St. Charles in the period 1952-80.

Table 1 gives data on temperature and precipitation for the survey area. 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 23.1 degrees F at the Tri City Airport, 23.8 degrees at Saginaw, and 24.5 degrees at St. Charles. The average daily minimum temperature is 16.4 degrees at the Tri City Airport and Saginaw and 16.9 degrees at St. Charles. The lowest temperature on record is -23 degrees at the Tri City Airport, -17 degrees at Saginaw, and -25 degrees at St. Charles. In summer the average temperature is 68.8 degrees at the Tri City Airport, 69.7 degrees at Saginaw, and 70.2 degrees at St. Charles. The average daily maximum temperature is 79.7 degrees at the Tri City Airport, 81.3 degrees at Saginaw, and 82.8 degrees at St. Charles. The highest recorded temperature is 111 degrees at the Tri City Airport, 105 degrees at Saginaw, and 101 degrees at St. Charles.

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

The total annual precipitation is 29.76 inches at the Tri City Airport, 28.84 inches at Saginaw, and 28.30 inches at St. Charles. Of these totals, 16.84 inches at the Tri City Airport, 17.45 inches at Saginaw, and 16.89 inches at St. Charles usually fall in the period April through September. This period includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 14.34 inches at the Tri City Airport, 14.58 inches at Saginaw, and 14.05 inches at St. Charles. The heaviest 1-day rainfall during the period of record was 4.58 inches at the Tri City Airport, 3.60 inches at Saginaw, and 4.37 inches at St. Charles. Most thunderstorms occur in June, July, and August, which average six each.

Average seasonal snowfall is 45.8 inches at the Tri City Airport, 36.1 inches at Saginaw, and 48.4 inches at St. Charles. The greatest snow depth at any one time during the period of record was 28 inches at the Tri City Airport, 30 inches at Saginaw, and 23 inches at St. Charles. On the average, 72 days at the Tri City Airport, 65 days at Saginaw, and 71 days at St. Charles have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The heaviest 1-day snowfall on record is 21.3 inches at the Tri City Airport, 20.0 inches at Saginaw, and 17.5 inches at St. Charles. The greatest monthly snowfall was 36.0 inches at the Tri City Airport, 42.0 inches at Saginaw, and 30.5 inches at St. Charles. The greatest seasonal snowfall was 87.2 inches at the Tri City Airport, 120.1 inches at Saginaw, and 80.3 inches at St. Charles. The least seasonal snowfall was 7.8 inches at the Tri City Airport, 16.4 inches at Saginaw, and 16.5 inches at St. Charles.

According to data recorded at the National Weather Service at the Flint Airport, the average relative humidity at 1:00 p.m. is about 62 percent. Humidity is higher at night, and the average at 7:00 a.m. is about 81 percent. The prevailing wind is from the southwest. Average windspeed is highest, 11.9 miles per hour, in March. Data from the Detroit Metro Airport indicate that the sun shines 68 percent of the time possible in summer and 39 percent in winter.

History and Development

Saginaw County was organized on January 28, 1835. The industrial life of the county revolved around the lumber industry from that time until the close of the nineteenth century. Agriculture was of little importance until the 1850's, when it became as important as the lumber industry. It developed rapidly during the early 1870's.

The first settlements were made in the vicinity of the present city of Saginaw, along the Saginaw and Tittabawassee Rivers. In 1857, Bay County was formed from part of Saginaw County.

Farming

Saginaw County was heavily forested when the first settlers arrived. Small farms were established within the forested areas along the Saginaw and Tittabawassee Rivers.

In 1880, a total of 3,918 farms made up more than half of the acreage of land in Saginaw County. A mixed agriculture system consisting primarily of corn, small grain, hay, and livestock prevailed in that year.

The principal changes during the next 50 years consisted of the addition of such new crops as alfalfa, sugar beets, and mint and an increase in the importance of beans, silage corn, poultry products, dairy products, and livestock.

The county is one of the top agricultural areas in the United States. Farms make up about 308,269 acres, or nearly 60 percent of the total land area *(4)*. The major crops are soybeans, corn, dry beans, wheat, and sugar

beets. The major kinds of livestock are pigs, dairy cattle, beef cattle, and poultry.

Forestry

At the time of settlement, forests covered a majority of the county, except for approximately 50 square miles of the flood plain along the Saginaw River. A few patches of the original forest still exist. While a map of the original forest cover is not available, the density and distribution of the woodland can be determined in part by the texture and drainage conditions of the soils.

On Capac, Parkhill, and other somewhat poorly drained or poorly drained soils that have a surface layer of loam or clay loam, elm, white ash, red maple, silver maple, swamp white oak, and basswood most likely made up the original dense forest. Poorly drained, sandy soils, such as Granby and Belleville soils, supported a dense forest of elm, white ash, red maple, and silver maple. Gagetown, Strawn, and other moderately well drained or well drained soils that have a surface layer of silt loam or loam supported a sugar maple-beech forest. The better drained sandy soils, such as Grattan and Covert soils, supported a sparse cover dominated by eastern white pine and eastern hemlock.

Industry and Transportation Facilities

Industry makes up about 40 percent of the county's economic base *(7)*. It consists mainly of the manufacturing of automobiles and their parts.

Two airports serve the county. One, in northern Saginaw County near the town of Freeland, serves as a regional airport where several major airlines maintain regularly scheduled flights to the larger cities in the Midwest and Canada. The other, directly east of the city of Saginaw, is primarily an airfreight terminal. Two major railroads serve the county.

The main roads in the county are Interstate 75, U.S. Highways 10 and 23, and State Highways 13, 15, 46, 52, 57, 81, and 83. Most county secondary roads are paved.

Physiography and Drainage

Saginaw County is part of the Saginaw lowland. The terrain is classified as a lake plain interspersed with areas of water-worked till. Slopes are 0 to 4 percent throughout most of the county. On some sand ridges, however, they range to 12 percent, and short, steep slopes along some rivers and streams are as much as 40 percent. The elevation ranges from 580 feet in the northeastern part of the county to 753 feet in the southwestern part.

The county consists of several plains at different elevations. The lowest plain, in the central and northeastern parts of the county, ranges from 580 to 600 feet in elevation. A succession of higher plains ranges from 600 to 753 feet in elevation. The separate plains represent several stages in the recession of a glacial lake that occupied the Saginaw lowland. The rise from a lower to a succeeding higher plain is marked by low ridges of sand or gravel or by escarpments a few feet high along the old lakeshore.

The low central plain is practically flat and featureless. All of the drainage water of the Saginaw River Basin, encompassing more than 6,000 square miles, collects on this plain. Drainage is very slow. Streams have cut only narrow channels, and an area of 75 square miles is periodically flooded.

The Saginaw River, which serves as the drainage outlet, has a fall of only about 1 inch per mile in its northward course from Saginaw to Saginaw Bay.

The higher plains make up the rest of the county, or about 650 square miles. They generally are nearly level or undulating, but their main features are sharply entrenched streams and low, narrow, rounded ridges and knolls, which represent old sandbars, beach ridges, narrow dune ridges, and bluffs that surround the flood plains along some of the larger streams. The valley plains rarely exceed one-half mile in width *(7)*.

In the drainage system of the plain, nearly one-sixth of all the drainage water of the southern peninsula of Michigan crosses the plain through several large streams. In contrast, local tributaries are few in number and short in length. Their valleys are narrow and extend short distances away from the large streams. Even where channels have been cut 25 to 30 feet deep, areas of good natural drainage extend only a short distance away from the valleys or river bluffs.

A youthful, dendritic drainage pattern is evident throughout parts of the higher plains. The tributaries are normally so short and so widely spaced that ditches are necessary for adequate agricultural drainage *(7)*.

Lakes and Streams

Saginaw County has no shoreline of the Great Lakes and very few inland lakes. The major aquatic resources in the county are the Bad, Cass, Flint, Shiawassee, and Tittabawassee Rivers, which meet to form the Saginaw River. In addition to the five main tributaries, several smaller streams discharge into the channels of the main tributaries of the Saginaw River. The largest of these are Misteguay and Swan Creeks. Except for Swan Creek and the Tittabawassee River, all of the streams and creeks flow north *(7)*.

Natural Resources

Forests once were a major resource in the county. As the trees were removed, forestry gave way to farming. Soil is a major natural resource in the county. It provides a growing medium for the grasses grazed by livestock and the crops produced on farms.

Scattered brine wells are in the northwestern part of the county, and a few oil wells are in the southeastern part. A few salt mines were productive in the 1860's. Bituminous coal mines near St. Charles were productive from the turn of the century to the 1920's. The last operating coal mine in Michigan, also near St. Charles, ceased operations in the 1950's.

How This Survey Was Made

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

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

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

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

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

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

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

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

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

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

Survey Procedures

The general procedures followed in making this survey are described in the "National Soils Handbook" and the "Soil Survey Manual" *(9)* of the Soil Conservation Service.

Before going into the field, soil scientists compared each map sheet to the U.S. Geological Survey topographic map of the area. Preliminary boundaries of slopes and landforms were delineated on aerial photographs with the use of a stereoscope.

Traverses were made on foot at intervals of about one-eighth mile. Traverses were made at closer intervals in areas of high variability. The soils were examined along the traverses wherever obvious soil boundaries were crossed. Observations of such items as landforms, uprooted trees, vegetation, and roadbanks were made continuously without regard to spacing. Soil boundaries were determined on the basis of soil examinations, observations of the landscape and vegetation, and photo interpretation.

The soil material was examined with the aid of a hand auger, probe, or spade to a depth of about 5 feet. The pedons described as typical were observed and studied in excavations of about 3 feet by 4 feet in area and about 5 feet in depth.

Samples for chemical and physical analyses were taken from sites of the typical pedon of some of the major soils in the survey area. The analyses were made by the Soil Conservation Service, Soil Survey Laboratory, Lincoln, Nebraska. The results of the analyses are stored in a computerized data file at the laboratory. The results and the laboratory procedures can be obtained on request from the laboratory.

General Soil Map Units

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

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

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

Some of the boundaries on the general soil map of Saginaw County do not match those on the maps of adjacent counties, and some of the soil names and descriptions do not fully agree. Differences result from modifications or refinements in soil series concepts or from variations in the intensity of mapping or in the extent of the soils in the counties.

Soil Descriptions

Dominantly Nearly Level and Very Gently Sloping, Somewhat Poorly Drained and Poorly Drained Soils on Lake Plains and Water-Worked Till Plains

These soils generally are suited to cultivated crops, recreational uses, and woodland. Wetness and the hazard of soil blowing are management concerns.

These soils are poorly suited to sanitary facilities because of wetness and a poor filtering capacity. The suitability for building site development is poor, mainly because of wetness.

1. Pipestone-Granby-Wixom Association

Nearly level and very gently sloping, somewhat poorly drained and poorly drained, sandy soils on lake plains

This association makes up about 13 percent of the county. It is about 33 percent Pipestone and similar soils, 25 percent Granby and similar soils, 15 percent Wixom and similar soils, and 27 percent soils of minor extent (fig. 2). The Pipestone and Wixom soils are on broad flats, low knolls, and low ridges. The Granby soils are in drainageways, in depressional areas, and on low, broad flats.

The Pipestone soils are nearly level and very gently sloping and are somewhat poorly drained. Typically, the surface layer is dark grayish brown sand about 10 inches thick. The subsurface layer is grayish brown sand about 2 inches thick. The subsoil is mottled sand about 33 inches thick. The upper part is dark brown, the next part is yellowish brown, and the lower part is yellow. The substratum to a depth of about 60 inches is pale brown sand.

The Granby soils are nearly level and poorly drained. Typically, the surface layer is black fine sand about 12 inches thick. The subsoil is grayish brown and yellowish brown, mottled fine sand about 36 inches thick. The substratum to a depth of about 60 inches is gray, mottled fine sand.

The Wixom soils are nearly level and very gently sloping and are somewhat poorly drained. Typically, the surface layer is dark brown sand about 12 inches thick. The subsoil is about 14 inches thick. It is mottled. It is dark brown, light yellowish brown, and pale brown sand in the upper part and reddish brown clay loam in the lower part. The substratum to a depth of about 60 inches is reddish brown, mottled clay loam.

Of minor extent in this association are the poorly drained Belleville and Parkhill soils and the moderately well drained Covert soils. Belleville and Parkhill soils are in the same landscape positions as the Granby soils. Belleville soils are sandy in the upper part and loamy in the lower part. Parkhill soils are loamy throughout. Covert soils are on low, narrow beach ridges.

Most areas of this association are used for cultivated crops or woodland. The suitability for cultivated crops is fair. Wetness, the hazard of soil blowing, the loss of plant nutrients, and seasonal droughtiness are management concerns.

This association is suitable as woodland. The equipment limitation, the hazard of windthrow, seedling

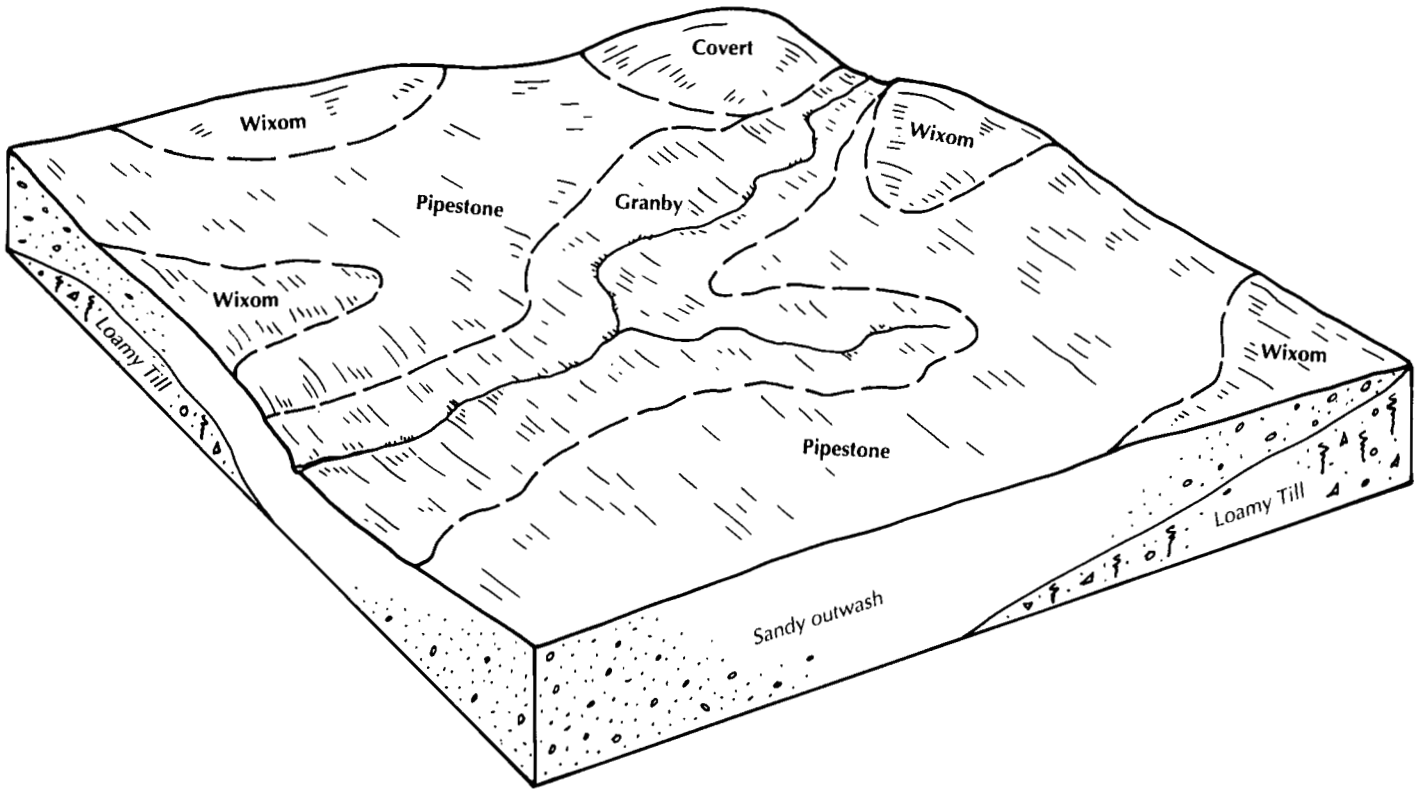

Figure 2.—Pattern of soils and parent material in the Pipestone-Granby-Wixom association.

mortality, and plant competition are management concerns.

All of the major soils are poorly suited to building site development and sanitary facilities. Wetness and a poor filtering capacity are the main limitations.

2. Pipestone-Wixom-Belleville Association

Nearly level and very gently sloping, somewhat poorly drained and poorly drained, sandy soils on lake plains and water-worked till plains

This association makes up about 6 percent of the county. It is about 34 percent Pipestone and similar soils, 27 percent Wixom and similar soils, 16 percent Belleville and similar soils, and 23 percent soils of minor extent. The Pipestone soils are on broad flats, low knolls, and low ridges. The Wixom soils are on low knolls and low ridges. The Belleville soils are in depressions and drainageways.

The Pipestone soils are nearly level and very gently sloping and are somewhat poorly drained. Typically, the surface layer is dark grayish brown sand about 10 inches thick. The subsurface layer is grayish brown sand about 2 inches thick. The subsoil is mottled sand about 33 inches thick. The upper part is dark brown, the next part is yellowish brown, and the lower part is yellow. The substratum to a depth of about 60 inches is pale brown sand.

The Wixom soils are nearly level and very gently sloping and are somewhat poorly drained. Typically, the surface layer is dark brown sand about 12 inches thick. The subsoil is about 14 inches thick. It is mottled. It is dark brown, light yellowish brown, and pale brown sand in the upper part and reddish brown clay loam in the lower part. The substratum to a depth of about 60 inches is reddish brown, mottled clay loam.

The Belleville soils are nearly level and poorly drained. Typically, the surface layer is black fine sand about 12 inches thick. The subsoil is light brownish gray, mottled sand about 5 inches thick. The upper part of the substratum is light brownish gray fine sand. The lower part to a depth of about 60 inches is gray, mottled clay loam and silty clay loam.

Of minor extent in this association are the poorly drained Granby and Parkhill soils and the somewhat poorly drained Capac soils. Granby soils are sandy throughout or are sandy in the upper part and have loamy material below a depth of 40 inches. Parkhill and

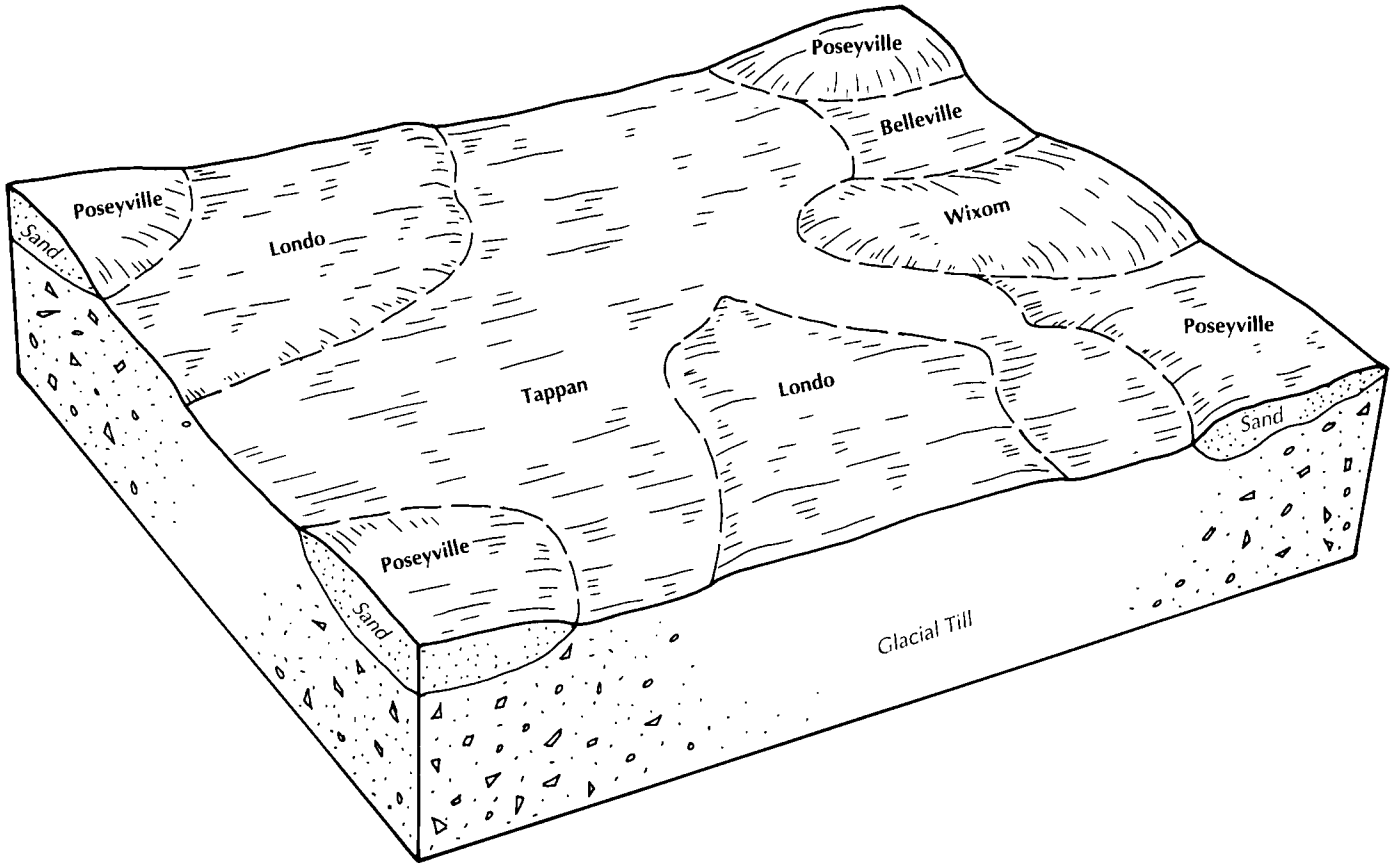

Figure 3.—Pattern of soils and parent material in the Tappan-Londo-Poseyville association.

Capac soils are loamy throughout. Granby and Parkhill soils are in landscape positions similar to those of Belleville soils. Capac soils are in landscape positions similar to those of Pipestone and Wixom soils.

Most areas of this association are used as cropland or woodland. The suitability for cultivated crops is fair. Wetness, the hazard of soil blowing, and the loss of plant nutrients are management concerns. Seasonal droughtiness also is a concern in areas of the Pipestone soils.

This association is suitable as woodland. The equipment limitation, the hazard of windthrow, seedling mortality, and plant competition are management concerns.

The major soils are poorly suited to building site development and sanitary facilities. Wetness and a poor filtering capacity are the main limitations.

Dominantly Nearly Level and Gently Undulating, Poorly Drained and Somewhat Poorly Drained Soils on Water-Worked Till Plains and Other Till Plains

These soils generally are suitable for cultivated crops and woodland. Wetness, deterioration of tilth, and the hazard of soil blowing are management concerns.

These soils are poorly suited to building site development and sanitary facilities. Wetness is the main limitation.

3. Tappan-Londo-Poseyville Association

Nearly level and very gently sloping, poorly drained and somewhat poorly drained, loamy and sandy soils on water-worked till plains

This association makes up about 3 percent of the county. It is about 40 percent Tappan and similar soils, 40 percent Londo and similar soils, 15 percent Poseyville and similar soils, and 5 percent soils of minor extent (fig. 3). The Tappan soils are in drainageways, depressional areas, low areas, and swales. The Londo and Poseyville soils are on broad plains, low knolls, and low ridges.

The Tappan soils are nearly level and poorly drained. Typically, the surface layer is very dark grayish brown loam about 12 inches thick. The subsoil is gray, mottled clay loam about 4 inches thick. The substratum to a

depth of about 60 inches is light brownish gray, mottled silty clay loam.

The Londo soils are nearly level and very gently sloping and are somewhat poorly drained. Typically, the surface layer is very dark grayish brown loam about 9 inches thick. The subsoil is dark brown, mottled clay loam about 4 inches thick. The substratum to a depth of about 60 inches is brown and light brown, mottled loam.

The Poseyville soils are nearly level and very gently sloping and are somewhat poorly drained. Typically, the surface layer is dark brown loamy fine sand about 10 inches thick. The subsurface layer is pale brown sand about 2 inches thick. The subsoil is dark brown, mottled sandy loam about 5 inches thick. The substratum to a depth of about 60 inches is gray, mottled loam.

Of minor extent in this association are the somewhat poorly drained Wixom and poorly drained Belleville soils. Wixom soils have a subsoil that is coarser textured than that of the major soils. They are in landscape positions similar to those of the Poseyville soils. Belleville soils are in depressions and on broad plains.

Most areas of this association are cultivated. The major soils are well suited to cultivated crops if a drainage system is installed. Wetness is a management concern in all of the major soils. Deterioration of tilth is an additional concern in areas of the Tappan and Londo soils. The hazard of soil blowing and the loss of plant nutrients are additional concerns in areas of the Poseyville soils.

The major soils are suitable as woodland. The equipment limitation and plant competition are management concerns on all of the major soils. The hazard of windthrow and seedling mortality are additional concerns on the Tappan soils.

The major soils are poorly suited to building site development and sanitary facilities. Wetness and moderately slow permeability are the main limitations.

4. Tappan-Londo Association

Nearly level and very gently sloping, poorly drained and somewhat poorly drained, loamy soils on till plains

This association makes up about 15 percent of the county. It is about 43 percent Tappan and similar soils, 27 percent Londo and similar soils, and 30 percent soils of minor extent. The Tappan soils are on flats, in drainageways, and in depressional areas. The Londo soils are on broad plains, low knolls, and low ridges.

The Tappan soils are nearly level and poorly drained. Typically, the surface layer is very dark grayish brown loam about 12 inches thick. The subsoil is gray, mottled clay loam about 4 inches thick. The substratum to a depth of about 60 inches is light brownish gray, mottled silty clay loam.

The Londo soils are nearly level and very gently sloping and are somewhat poorly drained. Typically, the surface layer is very dark grayish brown loam about 9 inches thick. The subsoil is dark brown, mottled clay loam about 4 inches thick. The substratum to a depth of about 60 inches is brown and light brown, mottled loam.

Of minor extent in this association are the poorly drained Pella soils and the somewhat poorly drained Wixom and Poseyville soils. Pella soils are stratified. They are in the same landscape positions as the Tappan soils. Wixom and Poseyville soils have a sandy surface layer. They are on low knolls and low ridges.

Most areas of this association are cultivated (fig. 4). The major soils are well suited to cultivated crops if a drainage system is installed. Wetness and deterioration of tilth are management concerns.

The major soils are suitable as woodland. The equipment limitation is a management concern on both of the major soils. The hazard of windthrow, seedling mortality, and plant competition are additional concerns on the Tappan soils.

The major soils are poorly suited to building site development and sanitary facilities. Wetness and moderately slow or slow permeability are the main limitations.

5. Parkhill-Capac Association

Nearly level and gently undulating, poorly drained and somewhat poorly drained, loamy soils on water-worked till plains

This association makes up about 9 percent of the county. It is about 40 percent Parkhill and similar soils, 35 percent Capac and similar soils, and 25 percent soils of minor extent. The Capac soils are on broad plains and low knolls. The Parkhill soils are on low flats, in drainageways, in depressional areas, and in swales.

The Parkhill soils are nearly level and poorly drained. Typically, the surface layer is very dark grayish brown loam about 11 inches thick. The subsoil is gray, mottled clay loam about 21 inches thick. The substratum to a depth of about 60 inches also is gray, mottled clay loam.

The Capac soils are nearly level and gently undulating and are somewhat poorly drained. Typically, the surface layer is very dark grayish brown loam about 12 inches thick. The subsoil is mottled loam about 26 inches thick. The upper part is mixed dark yellowish brown and grayish brown, and the lower part is dark yellowish brown and yellowish brown. The substratum to a depth of about 60 inches is strong brown and dark yellowish brown, mottled loam.

Figure 4.—An area of the Tappan-Londo association, which is used mainly for cultivated crops.

Of minor extent in this association are the somewhat poorly drained Wixom and Shiawassee soils and the poorly drained Belleville soils. Wixom and Belleville soils have a sandy surface layer and subsoil. Wixom soils are slightly higher on the landscape than the Capac soils. Belleville soils are in landscape positions similar to those of the Parkhill soils. Shiawassee soils have a dense substratum. They are in landscape positions similar to those of the Capac soils.

Most areas of this association are used for cultivated crops. The major soils are well suited or moderately well suited to cultivated crops if a drainage system is installed. Wetness and deterioration of tilth are management concerns.

The major soils are suitable as woodland. The equipment limitation and plant competition are management concerns on both of the major soils. The windthrow hazard, seedling mortality, and plant competition are additional concerns on the Parkhill soils.

The major soils are poorly suited to building site development and sanitary facilities. Wetness and moderately slow permeability are the main limitations.

6. Parkhill-Wixom Association

Nearly level and gently undulating, poorly drained and somewhat poorly drained, loamy and sandy soils on water-worked till plains

This association makes up about 25 percent of the county. It is about 35 percent Parkhill and similar soils, 27 percent Wixom and similar soils, and 38 percent soils of minor extent. The Parkhill soils are on low, broad flats, in drainageways, in depressional areas, and in swales. The Wixom soils are on low knolls and low ridges.

The Parkhill soils are nearly level and poorly drained. Typically, the surface layer very dark grayish brown loam about 11 inches thick. The subsoil is gray, mottled clay loam about 21 inches thick. The substratum to a depth of about 60 inches also is gray, mottled clay loam.

The Wixom soils are nearly level and gently undulating and are somewhat poorly drained. Typically, the surface layer is dark brown sand about 12 inches thick. The subsoil is about 14 inches thick. It is mottled. It is dark brown, light yellowish brown, and pale brown

sand in the upper part and reddish brown clay loam in the lower part. The substratum to a depth of about 60 inches is reddish brown, mottled clay loam.

Of minor extent in this association are the poorly drained Belleville soils; the somewhat poorly drained Capac, Londo, and Pipestone soils; and the moderately well drained Covert soils. Belleville soils have a sandy surface layer. They are in the same landscape positions as the Parkhill soils. Capac, Londo, and Pipestone soils are in landscape positions similar to those of the Wixom soils. Capac and Londo soils are loamy throughout, and Pipestone soils are sandy throughout. Covert soils are on narrow beach ridges.

Most areas of this association are used for cultivated crops. The major soils are well suited to cultivated crops if a drainage system is installed. Wetness is a management concern in both of the major soils. Deterioration of tilth is an additional concern in areas of the Parkhill soils. The hazard of soil blowing and the loss of plant nutrients are additional concerns in areas of the Wixom soils.

The major soils are suitable as woodland. The equipment limitation, the hazard of windthrow, seedling mortality, and plant competition are management concerns.

The major soils are poorly suited to building site development and sanitary facilities. Wetness and moderately slow permeability are the main limitations.

7. Wixom-Capac-Parkhill Association

Nearly level and gently undulating, somewhat poorly drained and poorly drained, sandy and loamy soils on water-worked till plains and other till plains

This association makes up about 6 percent of the county. It is about 33 percent Wixom and similar soils, 27 percent Capac and similar soils, 26 percent Parkhill and similar soils, and 14 percent soils of minor extent. The Wixom soils are on broad plains, low knolls, and low ridges. The Capac soils are on broad plains and low knolls. The Parkhill soils are on low flats, in drainageways, in depressional areas, and in swales.

The Wixom soils are nearly level and gently undulating and are somewhat poorly drained. Typically, the surface layer is dark brown sand about 12 inches thick. The subsoil is about 14 inches thick. It is mottled. It is dark brown, light yellowish brown, and pale brown sand in the upper part and reddish brown clay loam in the lower part. The substratum to a depth of about 60 inches is reddish brown, mottled clay loam.

The Capac soils are nearly level and gently undulating and are somewhat poorly drained. Typically, the surface layer is very dark grayish brown loam about 12 inches thick. The subsoil is mottled loam about 26 inches thick. The upper part is mixed dark yellowish brown and grayish brown, and the lower part is dark yellowish brown and yellowish brown. The substratum to a depth of about 60 inches is strong brown and dark yellowish brown, mottled loam.

The Parkhill soils are nearly level and poorly drained. Typically, the surface layer is very dark grayish brown silt loam about 11 inches thick. The subsoil is gray, mottled clay loam about 21 inches thick. The substratum to a depth of about 60 inches also is gray, mottled clay loam.

Of minor extent in this association are the poorly drained Granby and Belleville soils and the somewhat poorly drained Pipestone soils. Granby and Pipestone soils are sandy throughout. Belleville soils are sandy in the upper part and loamy in the lower part. Granby and Belleville soils are in landscape positions similar to those of the Parkhill soils. Pipestone soils are in landscape positions similar to those of the Wixom and Capac soils.

Most areas of this association are used for cultivated crops. If a drainage system is installed, the Capac and Parkhill soils are well suited to cultivated crops and the Wixom soils are moderately well suited. Wetness, the hazard of soil blowing, and the loss of plant nutrients are management concerns in areas of the Wixom soils. Wetness and deterioration of tilth are concerns in areas of the Parkhill and Capac soils.

This association is well suited to pasture. Wetness and deterioration of tilth are the major management concerns.

The major soils are suitable as woodland. The equipment limitation and plant competition are management concerns on all of the major soils. The hazard of windthrow and seedling mortality are additional concerns on the Parkhill and Wixom soils.

The major soils are poorly suited to building site development and sanitary facilities. Wetness and moderately slow permeability are the main limitations.

8. Tappan Association

Nearly level, poorly drained, loamy soils on water-worked till plains

This association makes up about 4 percent of the county. It is about 72 percent Tappan and similar soils and 28 percent soils of minor extent. The Tappan soils are on low, broad flats.

Typically, the Tappan soils have a surface layer of very dark grayish brown loam about 12 inches thick. The subsoil is gray, mottled clay loam about 4 inches thick. The substratum to a depth of about 60 inches is light brownish gray, mottled silty clay loam.

Of minor extent in this association are the somewhat

poorly drained Poseyville, Wixom, and Sanilac soils. Poseyville and Wixom soils have a sandy surface layer. Sanilac soils are stratified. All of the minor soils are slightly higher on the landscape than the Tappan soils.

Most areas of this association are cultivated. The Tappan soils are well suited to cultivated crops if a drainage system is installed. Wetness and deterioration of tilth are management concerns.

This association is suitable as woodland. The equipment limitation, the hazard of windthrow, seedling mortality, and plant competition are the major management concerns.

The Tappan soils are poorly suited to building site development and sanitary facilities. Wetness and slow permeability are the main limitations.

Dominantly Nearly Level, Very Poorly Drained to Somewhat Poorly Drained Soils on Flood Plains

These soils generally are suited to cultivated crops and woodland and poorly suited to building site development and sanitary facilities. Wetness and flooding are the main management concerns.

9. Sloan-Zilwaukee-Misteguay Association

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

This association makes up about 13 percent of the county. It is about 30 percent Sloan and similar soils, 23 percent Zilwaukee and similar soils, 15 percent Misteguay and similar soils, and 32 percent soils of minor extent. The Sloan, Zilwaukee, and Misteguay soils are on flood plains.

The Sloan soils are very poorly drained. Typically, the surface layer is very dark grayish brown, mottled silt loam about 12 inches thick. The subsurface layer is very dark gray, mottled fine sandy loam about 12 inches thick. The subsoil is dark gray, mottled silty clay loam about 18 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled, stratified silt loam and very fine sandy loam.

The Zilwaukee soils are poorly drained. Typically, the surface layer is black, mottled silty clay about 9 inches thick. The subsurface layer also is black, mottled silty clay. It is about 7 inches thick. The substratum to a depth of about 60 inches is strong brown, mottled silty clay.

The Misteguay soils are poorly drained. Typically, the surface layer is very dark grayish brown silty clay about 14 inches thick. The subsoil is olive gray and yellowish brown, mottled silty clay about 11 inches thick. The substratum to a depth of about 60 inches is brown, mottled silty clay.

Of minor extent in this association are the poorly drained Parkhill and Cohoctah soils and the somewhat poorly drained Chesaning and Sanilac soils. Parkhill soils are not stratified. They are in low areas adjacent to the major soils. Cohoctah and Sanilac soils are coarser textured than the major soils. Cohoctah soils are in landscape positions similar to those of the major soils. Sanilac soils are in the slightly higher landscape positions.

In most areas this association is used as cropland. The suitability for cultivated crops is fair. Flooding is the major hazard. Wetness and deterioration of tilth are limitations.

This association is suitable as woodland. The equipment limitation, the hazard of windthrow, seedling mortality, and plant competition are management concerns.

This association is generally unsuited to building site development and sanitary facilities. Flooding and wetness are the main management concerns. Also, slow permeability is a limitation in the Zilwaukee and Misteguay soils.

10. Sloan-Ceresco Association

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

This association makes up about 1 percent of the county. It is about 78 percent Sloan and similar soils, 12 percent Ceresco and similar soils, and 10 percent soils of minor extent. The Sloan and Ceresco soils are in drainageways, on flood plains, on valley flats, in areas of marsh, and on narrow stream bottoms.

The Sloan soils poorly drained. Typically, the surface layer is very dark grayish brown, mottled silt loam about 12 inches thick. The subsurface layer is very dark gray, mottled fine sandy loam about 12 inches thick. The subsoil is dark gray, mottled silty clay loam about 18 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled, stratified silt loam and very fine sandy loam.

The Ceresco soils are somewhat poorly drained. Typically, the surface layer is dark brown silt loam about 11 inches thick. The subsoil is dark yellowish brown, mottled silt loam about 8 inches thick. The upper part of the substratum is light brownish gray, mottled, stratified silt loam and very fine sand. The lower part to a depth of about 60 inches is yellowish brown, mottled fine sandy loam.

Of minor extent in this association are the somewhat poorly drained Chesaning soils and the poorly drained Cohoctah soils. Chesaning soils are underlain by sandy material. They are in landscape positions similar to those of the Ceresco soils. Cohoctah soils are coarser textured than the Sloan soils. They are in landscape

positions similar to those of the Sloan soils.

Most areas of this association are used as woodland. If drained and protected from flooding, the major soils are moderately well suited to cultivated crops. Flooding is the major hazard. Wetness and deterioration of tilth are limitations.

This association is suitable as woodland. The equipment limitation and plant competition are management concerns on both of the major soils. The hazard of windthrow and seedling mortality are additional concerns on the Sloan soils.

This association is generally unsuited to building site development and sanitary facilities. Flooding and wetness are the main management concerns.

Dominantly Nearly Level to Rolling, Moderately Well Drained, Well Drained, and Very Poorly Drained Soils on Lake Plains, Till Plains, and Flood Plains

These soils generally are suited to cultivated crops and woodland. The hazard of erosion, deterioration of tilth, and flooding are management concerns.

These soils are poorly suited or only moderately well suited to building site development and sanitary facilities because of moderately slow permeability and flooding.

11. Gagetown-Strawn-Sloan Association

Nearly level to rolling, moderately well drained, well drained, and very poorly drained, silty soils on lake plains, till plains, and flood plains

This association makes up about 1 percent of the county. It is about 40 percent Gagetown and similar soils, 35 percent Strawn and similar soils, 15 percent Sloan and similar soils, and 10 percent soils of minor extent. The Gagetown and Strawn soils are mainly on side slopes, knolls, and ridges. The Sloan soils are on flood plains along the Cass River.

The Gagetown soils are undulating and gently rolling and are moderately well drained. Typically, the surface layer is very dark grayish brown silt loam about 11 inches thick. The subsoil is yellowish brown silt loam about 3 inches thick. The subsoil to a depth of about 60 inches is light yellowish brown, mottled, stratified silt loam and very fine sandy loam.

The Strawn soils are undulating to rolling and are well drained. Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is brown silty clay loam about 10 inches thick. The substratum to a depth of about 60 inches is brown and light brown silt loam.

The Sloan soils are nearly level and very poorly drained. Typically, the surface layer is very dark grayish brown, mottled silt loam about 12 inches thick. The subsurface layer is very dark gray, mottled fine sandy loam about 12 inches thick. The subsoil is dark gray, mottled silty clay loam about 18 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled, stratified silt loam and very fine sandy loam.

Of minor extent in this association are the somewhat poorly drained Wixom, Ceresco, and Londo soils and the poorly drained Tappan soils. Wixom soils have a subsoil that is coarser textured than that of the major soils. Ceresco soils are slightly higher on the flood plains than the Sloan soils. Londo and Tappan soils are lower on the landscape than the Gagetown and Strawn soils.

In most areas this association is cultivated. It is well suited to cultivated crops. The hazard of water erosion and deterioration of tilth are management concerns in areas of the Gagetown and Strawn soils. Flooding is a major management concern on the Sloan soils.

The major soils are suitable as woodland. Plant competition is a management concern on all of the major soils. The equipment limitation, the hazard of windthrow, and seedling mortality are additional concerns on the Sloan soils.

The Gagetown and Strawn soils are moderately well suited to building site development and sanitary facilities. They are better suited to these uses than the Sloan soils, which are limited by flooding and wetness. Moderately slow permeability is a limitation in all of the major soils.

Dominantly Nearly Level and Gently Undulating, Poorly Drained and Somewhat Poorly Drained Soils on Lake Plains

These soils generally are suited to cultivated crops and woodland. Wetness, the hazard of soil blowing, and deterioration of tilth are management concerns.

These soils are poorly suited to building site development and sanitary facilities. Wetness and moderately slow permeability are the main limitations.

12. Pella-Frankenmuth Association

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

This association makes up about 4 percent of the county. It is about 40 percent Pella and similar soils, 38 percent Frankenmuth and similar soils, and 22 percent soils of minor extent. The Pella soils are in swales and depressions and on low, broad plains. The Frankenmuth soils are on low knolls, low ridges, and broad plains.

The Pella soils are nearly level and poorly drained. Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is mottled silt loam about 15 inches thick. It is grayish brown in the upper part and pinkish gray in the lower part. The subsoil to a depth of about 60 inches is pale brown, mottled, stratified silty clay loam and silt loam.

The Frankenmuth soils are nearly level and gently undulating and are somewhat poorly drained. Typically, the surface layer is very dark grayish brown very fine sandy loam about 9 inches thick. The subsurface layer is light yellowish brown, mottled silt loam about 4 inches thick. The subsoil is dark yellowish brown, mottled silty clay loam about 5 inches thick. The upper part of the substratum is pale brown, mottled sand. The lower part to a depth of about 60 inches is pale brown, mottled, stratified very fine sand and silty clay loam.

Of minor extent in this association are the somewhat poorly drained Wixom soils and the poorly drained Belleville and Corunna soils. Wixom and Belleville soils have a subsoil that is coarser textured than that of the major soils. Belleville and Corunna soils are in landscape positions similar to those of the Pella soils. Wixom soils are in landscape positions similar to those of the Frankenmuth soils.

Most areas of this association are cultivated. The major soils are well suited to cultivated crops if a drainage system is installed. Wetness and the hazard of soil blowing are management concerns in areas of the Frankenmuth soils. Deterioration of tilth and wetness are concerns in areas of the Pella soils.

The major soils are suitable as woodland. The equipment limitation and plant competition are management concerns on both of the major soils. The hazard of windthrow and seedling mortality are additional concerns on the Pella soils.

Both of the major soils are poorly suited to building site development and sanitary facilities. Wetness is the main limitation. Also, slow permeability is a limitation in the Frankenmuth soils.

Broad Land Use Considerations

More than 78 percent of Saginaw County is used as farmland, including pasture and woodland. Large tracts of farmland are in associations 3, 4, 5, and 7. Small tracts of farmland are in associations 6, 7, 11, 12, and 13. The major land use is the production of crops for cash and livestock feed. Much of the cropland has been drained. The loamy, nearly level to undulating soils in associations 3, 4, 5, 6, 7, 8, 11, and 12 are well suited to farming. Tappan, Londo, Parkhill, Capac, Wixom, Pella, and Gagetown are the dominant soils in these associations. Reducing wetness, controlling water erosion and soil blowing, and maintaining tilth are the major management concerns.

Areas where the soils are severely limited as sites for residential and other kinds of urban development are extensive in the county. In large areas of the soils in associations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and 12, a high water table severely limits building site development.

The well drained and moderately well drained soils in association 11 can be developed for residential or other urban uses. Most of these soils, however, have better potential for farmland. This potential should not be overlooked when broad land uses are considered.

Most of the soils in the county have good or fair potential for woodland. Exceptions are the wetter soils in associations 1, 2, 9, and 10. Commercially valuable trees are less common on these soils and generally do not grow so rapidly as the trees on well drained to somewhat poorly drained soils.

The suitability of soils for wildlife habitat is generally good throughout the county. The soils in associations 1, 2, 3, 4, 5, 6, 7, 8, and 12, and the Gagetown soils in association 11 generally are suited to openland and woodland wildlife habitat. The soils in associations 8, 9, and 10 and the poorly drained soils in associations 1, 2, 3, 4, 5, 6, 7, 11, and 12 generally are suited to wetland wildlife habitat.

Detailed Soil Map Units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, 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, Strawn silt loam, 2 to 6 percent slopes, eroded, is a phase of the Strawn 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, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Tappan-Londo-Poseyville 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. Pits, sand, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

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

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

5A—Sumava sandy loam, 0 to 3 percent slopes

Setting

Landform: Lake plains
Position on the landform: Nearly level or very gently sloping areas on broad plains and low knolls
Shape of areas: Irregular
Size of areas: 3 to 570 acres

Typical Profile

Surface layer:
0 to 12 inches—very dark grayish brown sandy loam

Subsoil:
12 to 16 inches—dark brown, mottled sandy loam
16 to 25 inches—dark yellowish brown, mottled sandy clay loam

Substratum:
25 to 38 inches—dark yellowish brown, mottled loam
38 to 60 inches—gray, mottled silty clay loam

Soil Properties and Qualities

Permeability: Moderately rapid in the upper part of the profile and moderate in the lower part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: 1 to 3 feet below the surface from December through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Corunna and Parkhill soils in the lower positions on the landscape

Similar inclusions:
• Soils that have a dense substratum
• Soils that have a surface layer of gravelly sandy loam

Use and Management

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

Cropland

Major management concerns: Wetness, soil blowing

Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.

Buildings

Major management concerns: Wetness

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Wetness

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: None
Michigan soil management group: 3/2b

10C—Grattan sand, 4 to 12 percent slopes

Setting

Landform: Lake plains and water-worked till plains
Position on the landform: Gently sloping or moderately sloping areas on knolls and ridges
Shape of areas: Linear
Size of areas: 3 to 140 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark grayish brown sand

Subsurface layer:
2 to 7 inches—grayish brown sand

Subsoil:
7 to 35 inches—dark brown, strong brown, and yellowish brown sand

Substratum:
35 to 60 inches—brownish yellow sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: More than 6 feet below the surface
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Wixom and Pipestone soils in depressions

Similar inclusions:
• Soils that have a higher content of fine sand than the Grattan soil
• Soils that are moderately well drained

Use and Management

Land use: Dominant uses—building site development, woodland

Buildings

Major management concerns: Slope, the instability of cutbanks

Management measures:
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.
• Because cutbanks are not stable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: A poor filtering capacity

Management measures:
• Because of the poor filtering capacity, measures that prevent the pollution of ground water are needed. Examples are using large lots, installing an absorption system of shallow trenches, and planting shrubbery around the perimeter of the system.

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting seedlings that can withstand droughty conditions can lower the seedling mortality rate. Replanting is needed in some areas.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 9S
Michigan soil management group: 5.3a

12—Corunna sandy loam

Setting

Landform: Water-worked till plains
Position on the landform: Nearly level areas in depressions on broad plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 350 acres

Typical Profile

Surface layer:
0 to 11 inches—very dark gray sandy loam
Subsoil:
11 to 27 inches—dark gray, mottled sandy loam
Substratum:
27 to 60 inches—dark gray, mottled clay loam

Soil Properties and Qualities

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

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Wixom and Capac soils in the higher positions on the landscape

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

Use and Management

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

Cropland

Major management concerns: Wetness, soil blowing

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.

Woodland

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

Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soil is dry, or during midwinter, when the soil is frozen.

• After the trees are cut, competition from brush can delay or prevent the natural regeneration of desirable species. Special harvest methods may be needed to control undesirable plants.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Buildings

Major management concerns: Ponding, the instability of cutbanks

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.
• Because cutbanks are unstable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Ponding, moderately slow permeability

Management measures:
• Measures that overcome the ponding are impractical. As a result, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 2W
Michigan soil management group: 3/2c

13—Belleville fine sand

Setting

Landform: Lake plains
Position on the landform: Nearly level areas in depressions and on broad plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 675 acres

Typical Profile

Surface layer:
0 to 12 inches—black fine sand

Subsoil:
12 to 17 inches—light brownish gray, mottled sand

Substratum:
17 to 23 inches—light brownish gray fine sand
23 to 30 inches—gray, mottled clay loam
30 to 60 inches—gray, mottled silty clay loam

Soil Properties and Qualities

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

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Wixom and Pipestone soils in the higher positions on the landscape

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

Use and Management

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

Cropland

Major management concerns: Wetness, soil blowing, the loss of plant nutrients

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Timing applications of fertilizer so that they meet the needs of the crop for nutrients, using split applications of fertilizer, and applying the fertilizer in bands reduce the risk of nutrient loss through leaching.

Woodland

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

Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soil is dry, or during midwinter, when the soil is frozen.
• After the trees are cut, competition from brush can delay or prevent the natural regeneration of desirable species. Special harvest methods may be needed to control undesirable plants.

• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Buildings

Major management concerns: Ponding, the instability of cutbanks

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.
• Because cutbanks are unstable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Ponding, moderately slow permeability, a poor filtering capacity

Management measures:
• Measures that overcome the ponding, restricted permeability, and poor filtering capacity are impractical. As a result, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 1W
Michigan soil management group: 4/2c

14—Pella silt loam

Setting

Landform: Lake plains
Position on the landform: Nearly level areas in drainageways, in depressions, and on broad plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 4 to 700 acres

Typical Profile

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

Subsoil:
9 to 16 inches—grayish brown, mottled silt loam
16 to 24 inches—pinkish gray, mottled silt loam

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

Soil Properties and Qualities

Permeability: Moderate
Available water capacity: High
Drainage class: Poorly drained
Seasonal high water table: 0.5 foot above to 2.0 feet below the surface from December through June
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Capac and Wixom soils in the higher positions on the landscape

Similar inclusions:
• Soils that are not stratified

Use and Management

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

Cropland

Major management concerns: Wetness, deterioration of tilth

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Subsurface drainage systems should be designed so that the rate of flowing water helps to keep fine sand and silt from plugging the tile lines. Also, suitable filtering material may be needed to keep the silt and fine sand from flowing into the tile lines.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.

Woodland

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

Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soil is dry, or during midwinter, when the soil is frozen.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After the trees are cut, competition from brush can delay or prevent the natural regeneration of desirable

species. Special harvest methods may be needed to control undesirable plants.

Buildings

Major management concerns: Ponding

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Ponding

Management measures:
• Measures that overcome the ponding are impractical. As a result, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

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

15B—Wixom sand, 0 to 4 percent slopes

Setting

Landform: Lake plains and water-worked till plains
Position on the landform: Nearly level or very gently sloping areas on low knolls, low ridges, and broad plains
Shape of areas: Irregular
Size of areas: 3 to 1,050 acres

Typical Profile

Surface layer:
0 to 12 inches—dark brown sand

Subsoil:
12 to 15 inches—dark brown sand
15 to 21 inches—light yellowish brown, mottled sand
21 to 23 inches—pale brown sand
23 to 26 inches—reddish brown, mottled clay loam

Substratum:
26 to 60 inches—reddish brown, mottled clay loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched 0.5 foot to 1.5 feet below the surface from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Belleville and Parkhill soils in the lower positions on the landscape

Similar inclusions:
• Soils that have more clay in the subsoil than the Wixom soil
• Soils that have a surface layer of sandy loam

Use and Management

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

Cropland

Major management concerns: Wetness, soil blowing (fig. 5)

Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Timing applications of fertilizer so that they meet the needs of the crop for nutrients, using split applications of fertilizer, and applying the fertilizer in bands reduce the risk of nutrient loss through leaching.

Woodland

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

Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soil is dry, or during midwinter, when the soil is frozen.
• The trees that can withstand seasonal wetness should be selected for planting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.

Buildings

Major management concerns: Wetness, the instability of cutbanks

Figure 5.—Soil blowing in an area of Wixom sand, 0 to 4 percent slopes.

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Because cutbanks are unstable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Wetness, moderately slow permeability, a poor filtering capacity

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Increasing the size of the absorption area helps to compensate for the restricted permeability of the substratum.
• Because of the poor filtering capacity in the upper part of this soil, measures that prevent the pollution of ground water are needed.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 6W
Michigan soil management group: 5.3a

17B—Frankenmuth very fine sandy loam, 0 to 4 percent slopes

Setting

Landform: Lake plains
Position on the landform: Nearly level or very gently

sloping areas on low knolls, low ridges, and broad plains
Shape of areas: Irregular
Size of areas: 4 to 505 acres

Typical Profile

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

Subsoil:
9 to 13 inches—light yellowish brown, mottled silt loam
13 to 18 inches—dark yellowish brown, mottled silty clay loam

Substratum:
18 to 35 inches—pale brown, mottled very fine sand
35 to 60 inches—pale brown, mottled, stratified very fine sand and silty clay loam

Soil Properties and Qualities

Permeability: Moderate in the upper part of the profile and moderately slow in the lower part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: 1 to 2 feet below the surface from November through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Corunna, Parkhill, and Pella soils in the lower positions on the landscape
• The poorly drained Corunna soils in depressions

Similar inclusions:
• Soils that are not stratified

Use and Management

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

Cropland

Major management concerns: Wetness, soil blowing

Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Subsurface drainage systems should be designed so that the rate of flowing water helps to keep very fine sand and silt from plugging the tile lines. Also, suitable filtering material may be needed to keep the silt and very fine sand from flowing into the tile lines.
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.

Woodland

Major management concerns: Equipment limitation, plant competition

Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soil is dry, or during midwinter, when the soil is frozen.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.

Buildings

Major management concerns: Wetness, a moderate shrink-swell potential

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Wetness, moderately slow permeability

Management measures:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Increasing the size of the absorption area helps to compensate for the restricted permeability in the substratum.

Interpretive Groups

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

18—Lenawee silty clay loam

Setting

Landform: Lake plains
Position on the landform: Nearly level areas in depressions and on broad plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 1,055 acres

Typical Profile

Surface layer:
0 to 12 inches—very dark grayish brown silty clay loam
Subsoil:
12 to 42 inches—gray, mottled clay loam
Substratum:
42 to 60 inches—gray, mottled clay loam

Soil Properties and Qualities

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

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Wixom and Capac soils in the higher positions on the landscape
Similar inclusions:
• Soils that have less clay in the subsoil than the Lenawee soil

Use and Management

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

Cropland

Major management concerns: Wetness, deterioration of tilth

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.

Buildings

Major management concerns: Ponding

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Ponding, slow permeability

Management measures:
• Because of ponding and slow permeability, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 2W
Michigan soil management group: 1.5c

19—Tappan loam

Setting

Landform: Water-worked till plains and other till plains
Position on the landform: Nearly level areas in depressions and on broad plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 10,000 acres

Typical Profile

Surface layer:
0 to 12 inches—very dark grayish brown loam
Subsoil:
12 to 16 inches—gray, mottled clay loam
Substratum:
16 to 60 inches—light brownish gray, mottled silty clay loam

Soil Properties and Qualities

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

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Poseyville and Londo soils in the higher positions on the landscape

Figure 6.—A surface drain in an area of Tappan loam.

Similar inclusions:
- Soils that have a surface layer of sandy loam
- Soils that are not alkaline at the surface

Use and Management

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

Cropland

Major management concerns: Wetness, deterioration of tilth

Management measures:
- Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these (fig. 6).
- Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth.

Buildings

Major management concerns: Ponding

Management measures:
- Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
- Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Ponding, slow permeability

Management measures:
- Measures that overcome the ponding are impractical. As a result, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

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

22B—Parkhill-Wixom complex, 0 to 4 percent slopes

Setting

Landform: Till plains
Position on the landform: Parkhill—nearly level areas on broad plains; Wixom—nearly level or gently undulating areas on broad plains
Shape of areas: Irregular
Size of areas: 3 to 410 acres

Typical Profile

Parkhill

Surface layer:
0 to 11 inches—very dark grayish brown loam
Subsoil:
11 to 32 inches—gray, mottled clay loam
Substratum:
32 to 60 inches—gray, mottled clay loam

Wixom

Surface layer:
0 to 12 inches—dark brown sand
Subsoil:
12 to 15 inches—dark brown sand
15 to 21 inches—light yellowish brown, mottled sand
21 to 23 inches—pale brown sand
23 to 26 inches—reddish brown, mottled clay loam
Substratum:
26 to 60 inches—reddish brown, mottled clay loam

Soil Properties and Qualities

Permeability: Parkhill—moderately slow; Wixom—rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Parkhill—high; Wixom—moderate
Drainage class: Parkhill—poorly drained; Wixom—somewhat poorly drained
Seasonal high water table: Parkhill—1.0 foot above to 1.0 foot below the surface from November through May; Wixom—perched 0.5 foot to 1.5 feet below the surface from November through June
Surface runoff: Parkhill—very slow or ponded; Wixom—very slow
Flooding: None
Organic matter content: Parkhill—high; Wixom—moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Parkhill—slight; Wixom—severe

Composition

Parkhill soil and similar soils: 40 to 55 percent
Wixom soil and similar soils: 35 to 45 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The loamy, somewhat poorly drained Capac and Londo soils in positions on the landscape similar to those of the Wixom soil

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

Use and Management

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

Cropland

Major management concerns: Wetness in both soils; deterioration of tilth in areas of the Parkhill soil; soil blowing and the loss of plant nutrients in areas of the Wixom soil

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Including grasses and legumes in the crop rotation can reduce the risk of nutrient loss, improve soil structure, and provide nitrogen for the succeeding crops.

Buildings

Major management concerns: Parkhill—ponding; Wixom—wetness, the instability of cutbanks

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.
• Because cutbanks in areas of the Wixom soil are unstable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Moderately slow permeability in both soils; wetness and a poor filtering capacity in the Wixom soil; ponding on the Parkhill soil

Management measures:
• Measures that overcome the ponding on the Parkhill soil are impractical. As a result, this soil is generally unsuited to septic tank absorption fields.
• Mounding or adding suitable fill material helps to raise the absorption field above the water table in the Wixom soil.
• Because of the poor filtering capacity in the upper part of the Wixom soil, measures that prevent the pollution of ground water are needed.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: Parkhill—3W; Wixom—6W
Michigan soil management group: Parkhill—2.5c; Wixom—5.3a

23A—Capac loam, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains and other till plains
Position on the landform: Nearly level or very gently sloping areas on broad plains and low knolls
Shape of areas: Irregular
Size of areas: 10 to 900 acres

Typical Profile

Surface layer:
0 to 12 inches—very dark grayish brown loam

Subsurface layer:
12 to 14 inches—dark yellowish brown and grayish brown, mottled loam

Subsoil:
14 to 26 inches—dark yellowish brown, mottled loam
26 to 38 inches—yellowish brown, mottled loam

Substratum:
38 to 51 inches—strong brown, mottled loam
51 to 60 inches—dark yellowish brown, mottled loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: 1 to 2 feet below the surface from November through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Parkhill soils in the lower positions on the landscape

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

Use and Management

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

Cropland

Major management concerns: Wetness, deterioration of tilth

Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth.

Buildings

Major management concerns: Wetness

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Wetness, moderately slow permeability

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Increasing the size of the absorption area helps to compensate for the restricted permeability.

Interpretive Groups

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

24—Parkhill loam

Setting

Landform: Water-worked till plains and other till plains
Position on the landform: Nearly level areas in drainageways, in depressions, and on broad plains

Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 6 to 10,000 acres

Typical Profile

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

Subsoil:
11 to 32 inches—gray, mottled clay loam

Substratum:
32 to 60 inches—gray, mottled clay loam

Soil Properties and Qualities

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

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Wixom and Capac soils in the higher positions on the landscape

Similar inclusions:
• Soils that have more clay in the subsoil than the Parkhill soil
• Soils that are alkaline at the surface

Use and Management

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

Cropland

Major management concerns: Wetness, deterioration of tilth

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.

Buildings

Major management concerns: Ponding

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Ponding, moderately slow permeability

Management measures:
• Measures that overcome the ponding are impractical.
As a result, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

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

26A—Pipestone sand, loamy substratum, 0 to 3 percent slopes

Setting

Landform: Outwash plains, lake plains, and water-worked till plains
Position on the landform: Nearly level or very gently sloping areas on broad plains and low knolls
Shape of areas: Irregular
Size of areas: 3 to 950 acres

Typical Profile

Surface layer:
0 to 12 inches—very dark gray sand

Subsoil:
12 to 17 inches—dark brown, mottled sand
17 to 40 inches—strong brown and yellowish brown, mottled sand

Substratum:
40 to 52 inches—light brownish gray and dark yellowish brown, mottled sand
52 to 60 inches—brown, mottled silt loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderately slow or slow in the lower part
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: 0.5 foot to 1.5 feet below the surface from November through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate

Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Parkhill soils in the lower positions on the landscape
• The loamy, somewhat poorly drained Capac soils in positions on the landscape similar to those of the Pipestone soil

Similar inclusions:
• Soils that are shallower to the loamy substratum than the Pipestone soil
• Soils that have a surface layer of sandy loam

Use and Management

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

Cropland

Major management concerns: Wetness, soil blowing, the loss of plant nutrients

Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Timing applications of fertilizer so that they meet the needs of the crop for nutrients, using split applications of fertilizer, and applying the fertilizer in bands reduce the risk of nutrient loss through leaching.

Woodland

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

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soil is dry, or during midwinter, when the soil is frozen.
• The trees that can withstand seasonal wetness should be selected for planting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.

Buildings

Major management concerns: Wetness, the instability of cutbanks

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Because cutbanks are not stable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Wetness, a poor filtering capacity

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Increasing the size of the absorption area helps to compensate for the restricted permeability of the substratum.
• Because of the poor filtering capacity in the upper part of this soil, measures that prevent the pollution of ground water are needed.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 3W
Michigan soil management group: 5b

28A—Parkhill-Capac complex, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains and other till plains
Position on the landform: Parkhill—nearly level areas on broad plains; Capac—nearly level or gently undulating areas on broad plains
Shape of areas: Irregular
Size of areas: 3 to 1,125 acres

Typical Profile

Parkhill

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

Subsoil:
11 to 32 inches—gray, mottled clay loam

Substratum:
32 to 60 inches—gray, mottled clay loam

Capac

Surface layer:
0 to 12 inches—very dark grayish brown loam

Subsurface layer:
12 to 14 inches—dark yellowish brown and grayish brown, mottled loam

Subsoil:
14 to 26 inches—dark yellowish brown, mottled loam
26 to 38 inches—yellowish brown, mottled loam

Substratum:
38 to 51 inches—strong brown, mottled loam
51 to 60 inches—dark yellowish brown, mottled loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Parkhill—poorly drained; Capac—somewhat poorly drained
Seasonal high water table: Parkhill—1 foot above to 1 foot below the surface from November through May; Capac—1 to 2 feet below the surface from November through May
Surface runoff: Parkhill—very slow or ponded; Capac—slow
Flooding: None
Organic matter content: Parkhill—high; Capac—moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

Parkhill soil and similar soils: 40 to 55 percent
Capac soil and similar soils: 35 to 45 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The stratified Pella and Frankenmuth soils in positions on the landscape similar to those of the Capac soil
• The sandy, somewhat poorly drained Wixom soils in the higher positions on the landscape

Similar inclusions:
• Soils that are more alkaline in the surface layer than the Parkhill and Capac soils
• Soils that have more clay in the subsoil than the Parkhill and Capac soils

Use and Management

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

Cropland

Major management concerns: Wetness, deterioration of tilth

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.

Buildings

Major management concerns: Parkhill—ponding; Capac—wetness

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Parkhill—ponding, moderately slow permeability; Capac—wetness, moderately slow permeability

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: Parkhill—3W; Capac—4W
Michigan soil management group: Parkhill—2.5c; Capac—2.5b

29—Sloan silt loam, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Nearly level areas on alluvial plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 6 to 670 acres

Typical Profile

Surface layer:
0 to 12 inches—very dark grayish brown, mottled loam

Subsurface layer:
12 to 24 inches—very dark gray, mottled fine sandy loam

Subsoil:
24 to 42 inches—dark gray, mottled silty clay loam

Substratum:
42 to 60 inches—grayish brown, mottled, stratified silt loam and very fine sandy loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: At the surface to 1 foot below the surface from November through June
Surface runoff: Very slow or ponded
Flooding: Frequent
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Ceresco and Cohoctah soils in positions on the landscape similar to those of the Sloan soil

Similar inclusions:
• Soils that have a substratum of sand
• Soils that have more clay in the subsoil than the Sloan soil

Use and Management

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

Woodland

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

Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soil is dry, or during midwinter, when the soil is frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After the trees are cut, competition from brush can delay or prevent the natural regeneration of desirable species. Special harvest methods may be needed to control undesirable plants.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.

Interpretive Groups

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

31A—Pipestone sand, 0 to 3 percent slopes

Setting

Landform: Outwash plains and lake plains
Position on the landform: Nearly level or very gently sloping areas on broad plains and low knolls
Shape of areas: Irregular
Size of areas: 3 to 2,200 acres

Typical Profile

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

Subsurface layer:
10 to 12 inches—grayish brown and pinkish gray sand

Subsoil:
12 to 21 inches—dark brown, mottled sand
21 to 26 inches—yellowish brown, mottled sand
26 to 45 inches—yellow, mottled sand

Substratum:
45 to 60 inches—pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: 0.5 foot to 1.5 feet below the surface from October through June
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, less droughty Wixom soils in positions on the landscape similar to those of the Pipestone soil
• The poorly drained Parkhill and Granby soils in the lower positions on the landscape

Similar inclusions:
• Soils that have a loamy substratum

Use and Management

Land use: Dominant uses—cropland (fig. 7), woodland; other use—building site development

Cropland

Major management concerns: Wetness, soil blowing, droughtiness, the loss of plant nutrients

Figure 7.—Soybeans in an area of Pipestone sand, 0 to 3 percent slopes. A drainage system and measures that control soil blowing are needed to ensure high yields on this soil.

Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Leaving crop residue on the surface and adding other organic material conserve moisture.
• Timing applications of fertilizer so that they meet the needs of the crop for nutrients, using split applications of fertilizer, and applying the fertilizer in bands reduce the risk of nutrient loss through leaching.

Woodland

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

Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soil is dry, or during midwinter, when the soil is frozen.
• The trees that can withstand seasonal wetness should be selected for planting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.

Buildings

Major management concerns: Wetness, the instability of cutbanks

Management measures:
• Buildings should be constructed on well compacted fill

material, which can raise the site a sufficient distance above the water table.
• Because cutbanks are not stable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Wetness, a poor filtering capacity

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Because of the poor filtering capacity, measures that prevent the pollution of ground water are needed.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 3W
Michigan soil management group: 5b

33—Granby fine sand

Setting

Landform: Lake plains
Position on the landform: Nearly level areas in depressions and on broad plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 2,200 acres

Typical Profile

Surface layer:
0 to 12 inches—black fine sand

Subsoil:
12 to 20 inches—grayish brown, mottled fine sand

Substratum:
20 to 48 inches—yellowish brown, mottled fine sand
48 to 60 inches—gray, mottled fine sand

Soil Properties and Qualities

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

Composition

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

Inclusions

Contrasting inclusions:
• The loamy, poorly drained Parkhill soils in positions on the landscape similar to those of the Granby soil
• The somewhat poorly drained Wixom and Capac soils in the higher positions on the landscape

Similar inclusions:
• Soils that have a loamy substratum
• Soils that have a mucky surface layer

Use and Management

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

Cropland

Major management concerns: Wetness, soil blowing, the loss of plant nutrients, droughtiness

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Subsurface drainage systems should be designed so that the rate of flowing water helps to keep fine sand from plugging the tile lines. Also, suitable filtering material may be needed to keep the fine sand from flowing into the tile lines.
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Timing applications of fertilizer so that they meet the needs of the crop for nutrients, using split applications of fertilizer, and applying the fertilizer in bands reduce the risk of nutrient loss through leaching.
• Leaving crop residue on the surface and adding other organic material conserve moisture.

Woodland

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

Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soil is dry, or during midwinter, when the soil is frozen.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• After the trees are cut, competition from brush can delay or prevent the natural regeneration of desirable species. Special harvest methods may be needed to control undesirable plants.

Buildings

Major management concerns: Ponding, the instability of cutbanks

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.
• Because cutbanks are not stable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Ponding, a poor filtering capacity

Management measures:
• Measures that overcome the ponding are impractical. As a result, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

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

41A—Shiawassee gravelly sandy loam, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains
Position on the landform: Nearly level or very gently sloping areas on broad plains and low knolls
Shape of areas: Irregular
Size of areas: 3 to 225 acres

Typical Profile

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

Subsoil:
11 to 27 inches—dark yellowish brown, mottled very fine sandy loam
27 to 34 inches—brown, mottled loam

Substratum:
34 to 60 inches—brown, mottled loam

Soil Properties and Qualities

Permeability: Moderately rapid in the upper part of the profile and very slow in the lower part
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched 1 to 2 feet below the surface from November through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Corunna and Parkhill soils in the lower positions on the landscape

Similar inclusions:
• Soils that have a surface layer of sand
• Soils that have less gravel in the surface layer than the Shiawassee soil

Use and Management

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

Cropland

Major management concerns: Wetness, droughtiness, soil blowing

Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.

Buildings

Major management concerns: Wetness

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Wetness, slow permeability

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Increasing the size of the absorption area helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4W
Michigan soil management group: 3/2b-d

44—Sloan-Ceresco complex, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Nearly level areas on alluvial plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 6 to 815 acres

Typical Profile

Sloan

Surface layer:
0 to 12 inches—very dark grayish brown, mottled loam

Subsurface layer:
12 to 24 inches—very dark gray, mottled fine sandy loam

Subsoil:
24 to 42 inches—dark gray, mottled silty clay loam

Substratum:
42 to 60 inches—grayish brown, mottled, stratified silt loam and very fine sandy loam

Ceresco

Surface layer:
0 to 11 inches—dark brown silt loam

Subsoil:
11 to 19 inches—dark yellowish brown, mottled silt loam

Substratum:
19 to 54 inches—light brownish gray, mottled, stratified silt loam and very fine sand
54 to 60 inches—yellowish brown, mottled fine sandy loam

Soil Properties and Qualities

Permeability: Sloan—moderate or moderately slow; Ceresco—moderately rapid
Available water capacity: High
Drainage class: Sloan—very poorly drained; Ceresco—somewhat poorly drained
Seasonal high water table: Sloan—at the surface to 1 foot below the surface from November through June; Ceresco—1 to 2 feet below the surface from September through May
Surface runoff: Very slow
Flooding: Frequent
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

Sloan soil and similar soils: 40 to 55 percent
Ceresco soil and similar soils: 35 to 45 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Capac, Londo, and Pipestone soils on the edges of the mapped areas

Similar inclusions:
• Soils that have a sandy substratum

Use and Management

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

Woodland

Major management concerns: Equipment limitation and plant competition on both soils; seedling mortality and windthrow on the Sloan soil

Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soils are dry, or during midwinter, when the soils are frozen.
• After the trees are cut, competition from brush can delay or prevent the natural regeneration of desirable species. Special harvest methods may be needed to control undesirable plants.
• Because of wetness and flooding, trees are not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: Sloan—3W; Ceresco—4W
Michigan soil management group: L-2c

45A—Fabius sandy loam, 0 to 3 percent slopes

Setting

Landform: Lake plains
Position on the landform: Nearly level or very gently sloping areas on low beach ridges and low knolls
Shape of areas: Irregular
Size of areas: 11 to 210 acres

Typical Profile

Surface layer:
0 to 12 inches—very dark grayish brown sandy loam

Subsurface layer:
12 to 16 inches—brown, mottled sandy loam

Subsoil:
16 to 22 inches—dark yellowish brown, mottled sandy clay loam

Substratum:
22 to 50 inches—yellowish brown and brownish yellow, mottled very gravelly sand
50 to 60 inches—gray, mottled gravelly coarse sand

Soil Properties and Qualities

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

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Corunna and Parkhill soils in the lower positions on the landscape

Similar inclusions:
• Soils that have less clay in the subsoil than the Fabius soil
• Soils that have a surface layer of loamy sand

Use and Management

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

Cropland

Major management concerns: Wetness, soil blowing, droughtiness

Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.

Buildings

Major management concerns: Wetness

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Wetness, a poor filtering capacity

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Because of the poor filtering capacity, measures that prevent the pollution of ground water are needed. Examples are using large lots, installing an absorption system of shallow trenches, and planting shrubbery around the perimeter of the system.

Interpretive Groups

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

46B—Cadmus gravelly sandy loam, 1 to 4 percent slopes

Setting

Landform: Water-worked till plains
Position on the landform: Nearly level or gently undulating areas on low ridges and low knolls
Shape of areas: Linear
Size of areas: 3 to 40 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark grayish brown gravelly sandy loam

Subsoil:
7 to 13 inches—dark yellowish brown gravelly sandy clay loam
13 to 19 inches—yellowish brown, mottled sand

Substratum:
19 to 25 inches—yellowish brown gravelly sandy loam
25 to 60 inches—brown sandy clay loam

Soil Properties and Qualities

Permeability: Moderately rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched 2 to 3 feet below the surface from November through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Wixom and Shiawassee soils in the lower positions on the landscape

Similar inclusions:
• Soils that have less gravel in the subsoil than the Cadmus soil

Use and Management

Land use: Dominant use—cropland
Major management concerns: Water erosion, wetness, soil blowing, droughtiness

Management measures:
• Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations that include grasses and legumes, grade stabilization structures, or a combination of these.
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Subsurface drainage systems can reduce the wetness.

Buildings

Major management concerns: Wetness

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Wetness, moderately slow permeability

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.

Interpretive Groups

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

55B—Gagetown silt loam, 2 to 6 percent slopes

Setting

Landform: Lake plains
Position on the landform: Very gently sloping or gently sloping areas on broad plains, low knolls, and side slopes
Shape of areas: Irregular
Size of areas: 3 to 1,170 acres

Typical Profile

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

Subsoil:
11 to 14 inches—yellowish brown silt loam

Substratum:
14 to 60 inches—light yellowish brown, mottled, stratified silt loam and very fine sandy loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: 2 to 3 feet below the surface from December through March
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Sanilac soils in the lower positions on the landscape

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

Use and Management

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

Cropland

Major management concerns: Water erosion, deterioration of tilth

Management measures:
• Crop rotations that include grasses and legumes and small grain help to control runoff and water erosion.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth.

Woodland

Major management concerns: Plant competition

Management measures:
• Adequate site preparation controls initial plant

competition, and spraying controls subsequent competition.

Buildings

Major management concerns: Wetness, the instability of cutbanks

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Because cutbanks are unstable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Wetness, moderately slow permeability

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table and helps to overcome the moderately slow permeability.
• Increasing the size of the absorption area helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 4A
Michigan soil management group: 2.5a-cs

55C2—Gagetown silt loam, 6 to 12 percent slopes, eroded

Setting

Landform: Lake plains
Position on the landform: Moderately sloping areas on ridges and side slopes
Shape of areas: Irregular
Size of areas: 15 to 60 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown silt loam
Subsoil:
8 to 11 inches—yellowish brown silt loam
Substratum:
11 to 60 inches—light yellowish brown, mottled, stratified silt loam and very fine sandy loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: 2 to 3 feet below the surface from December through March
Surface runoff: High
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: High
Hazard of soil blowing: Slight

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Sanilac soils in the lower positions on the landscape

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

Use and Management

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

Cropland

Major management concerns: Water erosion, deterioration of tilth

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

Buildings

Major management concerns: Wetness, the instability of cutbanks, slope

Management measures:
• Wetness can be reduced by installing a drainage system around buildings with basements or crawl spaces.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.
• Because cutbanks are unstable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Wetness, moderately slow permeability

Management measures:
• Curtain drains upslope from the absorption field can intercept ground water moving through permeable strata.
• Increasing the size of the absorption area helps to compensate for the moderately slow permeability.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 4A
Michigan soil management group: 2.5a-cs

57B—Pella-Frankenmuth complex, 0 to 4 percent slopes

Setting

Landform: Lake plains
Position on the landform: Pella—nearly level areas on broad plains; Frankenmuth—nearly level or very gently sloping areas on broad plains
Shape of areas: Irregular
Size of areas: 6 to 1,340 acres

Typical Profile

Pella

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

Subsoil:
9 to 16 inches—grayish brown, mottled silt loam
16 to 24 inches—pinkish gray, mottled silt loam

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

Frankenmuth

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

Subsoil:
9 to 13 inches—light yellowish brown, mottled silt loam
13 to 18 inches—dark yellowish brown, mottled silty clay loam
18 to 35 inches—pale brown, mottled very fine sand

Substratum:
35 to 60 inches—pale brown, mottled, stratified very fine sand and silty clay loam

Soil Properties and Qualities

Permeability: Pella—moderate; Frankenmuth—moderate in the upper part of the profile and moderately slow in the lower part
Available water capacity: Pella—high; Frankenmuth—moderate
Drainage class: Pella—poorly drained; Frankenmuth—somewhat poorly drained
Seasonal high water table: Pella—0.5 foot above to 2.0 feet below the surface from December through June; Frankenmuth—1.0 to 2.0 feet below the surface from November through May
Surface runoff: Pella—very slow or ponded; Frankenmuth—slow
Flooding: None
Organic matter content: Pella—high; Frankenmuth—moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Pella—slight; Frankenmuth—moderate

Composition

Pella soil and similar soils: 40 to 55 percent
Frankenmuth soil and similar soils: 35 to 45 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Capac, Wixom, and Londo soils in positions on the landscape similar to those of the Frankenmuth soil

Similar inclusions:
• Soils that have an alkaline surface layer
• Soils that have less clay in the subsoil than the Pella and Frankenmuth soils

Use and Management

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

Cropland

Major management concerns: Wetness in both soils; deterioration of tilth in areas of the Pella soil; soil blowing in areas of the Frankenmuth soil

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Subsurface drainage systems should be designed so that the rate of flowing water helps to keep fine sand and silt from plugging the tile lines. Also, suitable filtering material may be needed to keep the silt and fine sand from flowing into the tile lines.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.

Buildings

Major management concerns: Pella—ponding; Frankenmuth—wetness, the instability of cutbanks

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.
• Because cutbanks are unstable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Pella—ponding; Frankenmuth—wetness, moderately slow permeability

Management measures:
• Measures that overcome the ponding on the Pella soil are impractical. As a result, this soil is generally unsuited to septic tank absorption fields.
• Mounding or adding suitable fill material helps to raise the absorption field above the water table in the Frankenmuth soil.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability of the Frankenmuth soil.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: Pella—3W; Frankenmuth—4W
Michigan soil management group: Pella—2.5c-s; Frankenmuth—2.5b-s

58B—Covert sand, 1 to 6 percent slopes

Setting

Landform: Outwash plains and water-worked till plains
Position on the landform: Nearly level to gently sloping areas on low knolls and low beach ridges
Shape of areas: Linear
Size of areas: 3 to 140 acres

Typical Profile

Surface layer:
0 to 4 inches—black and light gray sand

Subsurface layer:
4 to 8 inches—brown sand

Subsoil:
8 to 11 inches—dark brown sand
11 to 17 inches—strong brown sand
17 to 24 inches—yellowish brown, mottled sand
24 to 35 inches—brownish yellow sand

Substratum:
35 to 60 inches—yellowish brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: 2.0 to 3.5 feet below the surface from November through April
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Wixom and Pipestone soils in the lower positions on the landscape

Similar inclusions:
• Soils that are excessively drained

Use and Management

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

Buildings

Major management concerns: Wetness, the instability of cutbanks

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Because cutbanks are not stable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: A poor filtering capacity, wetness

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Because of the poor filtering capacity, measures that prevent the pollution of ground water are needed. Examples are using large lots, elevating the absorption system, installing an absorption system of shallow trenches, and planting shrubbery around the perimeter of the system.

Woodland

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

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting seedlings that can withstand droughty conditions can lower the seedling mortality rate. Replanting is needed in some areas.
• Adequate site preparation controls initial plant

competition, and spraying controls subsequent competition.

Interpretive Groups

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

59—Zilwaukee-Misteguay complex, rarely flooded

Setting

Landform: Flood plains
Position on the landform: Nearly level areas on alluvial plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 20 to 5,950 acres

Typical Profile

Zilwaukee

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

Subsurface layer:
9 to 16 inches—black, mottled silty clay

Substratum:
16 to 60 inches—strong brown, mottled silty clay

Misteguay

Surface layer:
0 to 14 inches—very dark grayish brown silty clay

Subsoil:
14 to 25 inches—olive gray, yellowish brown, and brown, mottled silty clay
25 to 60 inches—brown, mottled silty clay

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: At the surface to 1 foot below the surface from October through May
Surface runoff: Very slow
Flooding: Rare
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

Zilwaukee soil and similar soils: 45 to 55 percent
Misteguay soil and similar soils: 35 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Wixom and Capac soils in the higher positions on the landscape

Similar inclusions:
• Soils that have less clay in the subsoil than the Zilwaukee and Misteguay soils
• Soils that have a surface layer of sand

Use and Management

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

Cropland

Major management concerns: Wetness, deterioration of tilth

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.

Buildings

Major management concerns: Wetness, flooding

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Wetness, slow permeability

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table and helps to overcome the restricted permeability.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 2W
Michigan soil management group: 2.5c

60B—Arkona sand, 0 to 4 percent slopes

Setting

Landform: Lake plains
Position on the landform: Nearly level or very gently sloping areas on low knolls, low ridges, and broad plains

Shape of areas: Irregular
Size of areas: 4 to 185 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark grayish brown sand
Subsoil:
10 to 27 inches—strong brown, brown, and pale brown, mottled sand
27 to 35 inches—grayish brown, mottled silty clay loam
35 to 60 inches—brown, mottled silty clay

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and very slow in the lower part
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched 1 to 2 feet below the surface from November through May
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Belleville and Tappan soils in the lower positions on the landscape
Similar inclusions:
• Soils that have less clay in the subsoil than the Arkona soil

Use and Management

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

Cropland

Major management concerns: Wetness, soil blowing, the low content of organic matter, the loss of plant nutrients
Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the content of organic matter.
• Increasing the content of organic matter in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.

Woodland

Major management concerns: Equipment limitation, seedling mortality, plant competition
Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soil is dry, or during midwinter, when the soil is frozen.
• The trees that can withstand seasonal wetness should be selected for planting.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.

Buildings

Major management concerns: Wetness, the instability of cutbanks, a high shrink-swell potential in the substratum
Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Because cutbanks are unstable and can cave in, the sides of shallow excavations should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Wetness, very slow permeability, a poor filtering capacity
Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Increasing the size of the absorption area helps to compensate for the very slow permeability in the substratum.
• Because of the poor filtering capacity in the upper part of this soil, measures that prevent the pollution of ground water are needed.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 2W
Michigan soil management group: 4/1b

61A—Tappan-Poseyville complex, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains

Position on the landform: Tappan—nearly level areas on broad plains; Poseyville—nearly level or gently undulating areas on broad plains
Shape of areas: Irregular
Size of areas: 8 to 3,000 acres

Typical Profile

Tappan

Surface layer:
0 to 12 inches—very dark grayish brown loam

Subsoil:
12 to 16 inches—gray, mottled clay loam

Substratum:
16 to 60 inches—light brownish gray, mottled silty clay loam

Poseyville

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

Subsurface layer:
10 to 12 inches—pale brown sand

Subsoil:
12 to 17 inches—dark brown, mottled sandy loam

Substratum:
17 to 60 inches—gray, mottled loam

Soil Properties and Qualities

Permeability: Tappan—moderately slow in the upper part of the profile and slow in the lower part; Poseyville—rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Tappan—high; Poseyville—moderate
Drainage class: Tappan—poorly drained; Poseyville—somewhat poorly drained
Seasonal high water table: Tappan—1 foot above to 1 foot below the surface from November through May; Poseyville—1 to 2 feet below the surface from November through May
Surface runoff: Tappan—very slow or ponded; Poseyville—slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Tappan—slight; Poseyville—severe

Composition

Tappan soil and similar soils: 50 to 65 percent
Poseyville soil and similar soils: 30 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The stratified Pella and Frankenmuth soils in positions on the landscape similar to those of the Tappan and Poseyville soils

Similar inclusions:
• Soils that are less alkaline in the surface layer than the Tappan soil
• Soils that have a surface layer of sand

Use and Management

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

Cropland

Major management concerns: Tappan—wetness, deterioration of tilth; Poseyville—soil blowing, wetness, the content of organic matter, the loss of plant nutrients

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the content of organic matter.
• Increasing the content of organic matter in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.

Buildings

Major management concerns: Tappan—ponding; Poseyville—wetness

Management measures:
• A surface or subsurface drainage system helps to lower the water table.
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Tappan—ponding, slow permeability; Poseyville—wetness, moderately slow permeability

Management measures:
• Measures that overcome the ponding on the Tappan soil are impractical. As a result, this soil is generally unsuited to septic tank absorption fields.

• Mounding or adding suitable fill material helps to raise the absorption field above the water table in the Poseyville soil.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability of the Poseyville soil.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W
Michigan soil management group: Tappan—2.5c-c; Poseyville—3/2b

62A—Tappan-Londo complex, 0 to 3 percent slopes

Setting

Landform: Till plains
Position on the landform: Tappan—nearly level areas on broad plains; Londo—nearly level or very gently sloping areas on broad plains
Shape of areas: Irregular
Size of areas: 10 to 16,600 acres

Typical Profile

Tappan

Surface layer:
0 to 12 inches—very dark grayish brown loam

Subsoil:
12 to 16 inches—gray, mottled clay loam

Substratum:
16 to 60 inches—light brownish gray, mottled silty clay loam

Londo

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

Subsoil:
9 to 13 inches—dark brown, mottled clay loam

Substratum:
13 to 40 inches—brown, mottled loam
40 to 60 inches—light brown, mottled loam

Soil Properties and Qualities

Permeability: Tappan—moderately slow in the upper part of the profile and slow in the lower part; Londo—moderately slow
Available water capacity: High
Drainage class: Tappan—poorly drained; Londo—somewhat poorly drained
Seasonal high water table: Tappan—1 foot above to 1 foot below the surface from November through May; Londo—1 to 2 feet below the surface from November through May
Surface runoff: Tappan—very slow or ponded; Londo—slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

Tappan soil and similar soils: 45 to 55 percent
Londo soil and similar soils: 40 to 45 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The stratified Pella and Frankenmuth soils in positions on the landscape similar to those of the Tappan and Londo soils
• The somewhat poorly drained Poseyville soils in the slightly higher positions on the landscape

Similar inclusions:
• Soils that are less alkaline in the surface layer than the Tappan and Londo soils
• Soils that have more clay in the subsoil than the Tappan and Londo soils

Use and Management

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

Cropland

Major management concerns: Wetness, deterioration of tilth, the content of organic matter

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the content of organic matter.

Buildings

Major management concerns: Tappan—ponding; Londo—wetness

Management measures:
• A surface or subsurface drainage system helps to lower the water table.
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Tappan—ponding, slow permeability; Londo—wetness, moderately slow permeability

Management measures:

• Measures that overcome the ponding on the Tappan soil are impractical. As a result, this soil is generally unsuited to septic tank absorption fields.

• Mounding or adding suitable fill material helps to raise the absorption field above the water table in the Londo soil.

• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability of the Londo soil.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W
Michigan soil management group: Tappan—2.5c-c; Londo—2.5b

63A—Urban land-Tappan complex, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains and other till plains
Position on the landform: Nearly level or very gently sloping areas on broad plains
Shape of areas: Irregular
Size of areas: 20 to 2,300 acres

Typical Profile

Tappan

Surface layer:
0 to 12 inches—very dark grayish brown loam

Subsoil:
12 to 16 inches—gray, mottled clay loam

Substratum:
16 to 60 inches—light brownish gray, mottled silty clay loam

Soil Properties and Qualities

Tappan

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

Composition

Urban land: 45 to 65 percent
Tappan soil and similar soils: 25 to 45 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:

• The somewhat poorly drained Londo, Wixom, and Poseyville soils in the higher positions on the landscape

Similar inclusions:

• Soils that are less alkaline in the surface layer than the Tappan soil

Use and Management

Land use: Urban land—streets, parking lots, buildings, and other structures; Tappan—gardens, borrow areas, lawns, building sites

Gardens, lawns, and environmental plantings

Major management concerns: Tappan—ponding

Management measures:

• Perennial plants that can withstand wetness should be selected for planting.

Buildings

Major management concerns: Tappan—ponding

Management measures:

• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Tappan—ponding, slow permeability

Management measures:

• Sanitary facilities should be connected to a central sewer system or treatment facility.

Interpretive Groups

Land capability classification: None
Woodland ordination symbol: Tappan—3W
Michigan soil management group: None

64A—Sanilac very fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Lake plains
Position on the landform: Nearly level or very gently sloping areas on broad plains and low knolls
Shape of areas: Irregular

Size of areas: 15 to 145 acres

Typical Profile

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

Subsoil:
10 to 15 inches—brownish yellow, mottled very fine sandy loam

Substratum:
15 to 60 inches—light yellowish brown, mottled, stratified very fine sand and silt

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: 1 to 2 feet below the surface from October through June
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Pella and Tappan soils in the lower positions on the landscape

Similar inclusions:
• Soils that have a surface layer of sand, sandy loam, or silt loam

Use and Management

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

Cropland

Major management concerns: Wetness, soil blowing

Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Including grasses and legumes in the crop rotation can reduce the risk of nutrient loss, improve soil structure, and provide nitrogen for the succeeding crops.

Buildings

Major management concerns: Wetness, the instability of cutbanks

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Because cutbanks are unstable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Wetness, moderately slow permeability

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Increasing the size of the absorption area helps to compensate for the restricted permeability.

Interpretive Groups

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

65A—Shiawassee sandy loam, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains
Position on the landform: Nearly level or very gently sloping areas on broad plains and low knolls
Shape of areas: Irregular
Size of areas: 3 to 225 acres

Typical Profile

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

Subsoil:
11 to 27 inches—dark yellowish brown, mottled very fine sandy loam
27 to 34 inches—brown, mottled loam

Substratum:
34 to 60 inches—brown, mottled loam

Soil Properties and Qualities

Permeability: Moderately rapid in the upper part of the profile and very slow in the lower part
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched 1 to 2 feet below the surface from November through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Corunna and Parkhill soils in the lower positions on the landscape

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

Use and Management

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

Cropland

Major management concerns: Wetness, droughtiness, soil blowing

Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Leaving crop residue on the surface and adding other organic material conserve moisture.

Buildings

Major management concerns: Wetness

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Wetness, very slow permeability

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Increasing the size of the absorption area helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4W
Michigan soil management group: 3/2b

68A—Tappan-Londo-Poseyville complex, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains
Position on the landform: Tappan—nearly level areas on broad plains; Londo and Poseyville—nearly level or very gently sloping areas on broad plains
Shape of areas: Irregular
Size of areas: 12 to 15,000 acres

Typical Profile

Tappan

Surface layer:
0 to 12 inches—very dark grayish brown loam

Subsoil:
12 to 16 inches—gray, mottled clay loam

Substratum:
16 to 60 inches—light brownish gray, mottled silty clay loam

Londo

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

Subsoil:
9 to 13 inches—dark brown, mottled clay loam

Substratum:
13 to 40 inches—brown, mottled loam
40 to 60 inches—light brown, mottled loam

Poseyville

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

Subsurface layer:
10 to 12 inches—pale brown sand

Subsoil:
12 to 17 inches—dark brown, mottled sandy loam

Substratum:
17 to 60 inches—gray, mottled loam

Soil Properties and Qualities

Permeability: Tappan—moderately slow in the upper part of the profile and slow in the lower part; Londo—moderately slow; Poseyville—rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Tappan and Londo—high; Poseyville—moderate
Drainage class: Tappan—poorly drained; Londo and Poseyville—somewhat poorly drained
Seasonal high water table: Tappan—1 foot above to 1 foot below the surface from October through May; Londo and Poseyville—1 to 2 feet below the surface from November through May
Surface runoff: Tappan—very slow or ponded; Londo and Poseyville—slow
Flooding: None
Organic matter content: Moderate

Hazard of water erosion: Slight
Hazard of soil blowing: Tappan and Londo—slight; Poseyville—severe

Composition

Tappan soil and similar soils: 40 to 45 percent
Londo soil and similar soils: 40 to 45 percent
Poseyville soil and similar soils: 15 to 20 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The stratified Pella and Frankenmuth soils in positions on the landscape similar to those of the Tappan, Londo, and Poseyville soils

Similar inclusions:
• Soils that are less alkaline in the surface layer than the Tappan and Londo soils
• Soils that have more clay in the subsoil than the Tappan, Londo, and Poseyville soils

Use and Management

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

Cropland

Major management concerns: Tappan and Londo—wetness, deterioration of tilth; Poseyville—soil blowing, wetness, the content of organic matter, the loss of plant nutrients

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the content of organic matter.
• Increasing the content of organic matter in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.

Buildings

Major management concerns: Tappan—ponding; Londo and Poseyville—wetness

Management measures:
• A surface or subsurface drainage system helps to lower the water table.
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Tappan—ponding, moderately slow permeability; Londo and Poseyville—wetness, moderately slow permeability

Management measures:
• Measures that overcome the ponding on the Tappan soil are impractical. As a result, this soil is generally unsuited to septic tank absorption fields.
• Mounding or adding suitable fill material helps to raise the absorption field above the water table in the Londo and Poseyville soils.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability of the Londo and Poseyville soils.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W
Michigan soil management group: Tappan—2.5c-c; Londo—2.5b; Poseyville—3/2b

69—Sloan silt loam, rarely flooded

Setting

Landform: Flood plains
Position on the landform: Nearly level areas on alluvial plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 20 to 1,575 acres

Typical Profile

Surface layer:
0 to 12 inches—very dark grayish brown, mottled loam

Subsurface layer:
12 to 24 inches—very dark gray, mottled fine sandy loam

Subsoil:
24 to 42 inches—dark gray, mottled silty clay loam

Substratum:
42 to 60 inches—grayish brown, mottled, stratified silt loam and very fine sandy loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: At the surface to 1 foot below the surface from November through June
Surface runoff: Very slow or ponded

Flooding: Rare
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Ceresco and Cohoctah soils in the slightly higher positions on the landscape

Similar inclusions:
• Soils that have a substratum of sand
• Soils that have more clay in the subsoil than the Sloan soil

Use and Management

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

Cropland

Major management concerns: Wetness, deterioration of tilth

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.

Buildings

Major management concerns: Wetness, flooding

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Wetness, moderately slow permeability

Management measures:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.

Interpretive Groups

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

70—Udipsamments, undulating

Setting

Landform: Outwash plains and lake plains
Position on the landform: Nearly level to undulating areas on broad plains, ridges, and knolls
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 120 acres

Typical Profile

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

Substratum:
4 to 60 inches—yellowish brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Well drained to somewhat poorly drained
Seasonal high water table: 2 to more than 6 feet below the surface
Surface runoff: Slow
Flooding: None
Organic matter content: Low
Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Composition

Udipsamments: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Contrasting Inclusions

• The poorly drained Belleville and Granby soils and Aquents in the lower positions on the landscape
• The excessively drained Grattan soils in the higher positions on the landscape

Use and Management

Land use: Former use—source of borrow material; current uses—none

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

Interpretive Groups

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

71—Udorthents, loamy, nearly level to steep

Setting

Landform: Water-worked till plains, other till plains, and lake plains
Position on the landform: Nearly level to steep areas on broad plains, ridges, and knolls
Slope: 0 to 25 percent
Shape of areas: Irregular
Size of areas: 3 to more than 150 acres

Typical Profile

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

Substratum:
4 to 60 inches—strong brown and dark yellowish brown, mottled loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Moderately well drained or somewhat poorly drained
Seasonal high water table: 3 feet above to more than 6 feet below the surface
Surface runoff: Slow to rapid
Flooding: None
Hazard of water erosion: Slight to severe
Hazard of soil blowing: Slight

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Parkhill soils in the lower positions on the landscape
• The excessively drained Grattan soils in the higher positions on the landscape

Similar inclusions:
• Soils that are sandy loam or clay loam

Use and Management

Land use: Dominant uses—freeway interchanges, airports, borrow areas

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

Interpretive Groups

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

72—Aquents, ponded

Setting

Landform: Flood plains, lake plains, and till plains
Position on the landform: Shallow, closed depressions and other depressional areas on broad plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 4 to more than 20 acres

Soil Properties and Qualities

Texture: Sandy or loamy
Permeability: Very slow
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: At the surface to 1 foot above the surface throughout the year
Surface runoff: Very slow or ponded
Flooding: Frequent
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

Aquents: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Contrasting Inclusions

• Poorly drained soils on the edges of the mapped areas

Use and Management

Land use: Wildlife habitat

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

Interpretive Groups

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

73—Pits, sand

Setting

Landform: Lake plains and outwash plains
Position on the landform: Knolls and ridges
Slope: 0 to 18 percent
Shape of areas: Irregular
Size of areas: 4 to more than 25 acres

Composition

Pits: 100 percent

Use and Management

Land use: Source of sand

Management measures:
• Once the pits are abandoned, onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

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

74—Urban land

Setting

Landform: Lake plains, water-worked till plains, and other till plains
Position on the landform: Nearly level or very gently sloping areas on broad plains
Shape of areas: Irregular
Size of areas: 30 to more than 485 acres

Composition

Urban land: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Contrasting Inclusions

• The poorly drained Parkhill and Tappan soils in small vacant lots and in gardens
• The somewhat poorly drained Wixom soils in vacant lots and gardens on the slightly higher parts of the landscape

Use and Management

Land use: Urban land—streets, parking lots, buildings, and other structures

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

Interpretive Groups

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

75B2—Strawn silt loam, 2 to 6 percent slopes, eroded

Setting

Landform: Till plains
Position on the landform: Very gently sloping or gently sloping areas on broad plains, low knolls, and side slopes
Shape of areas: Irregular
Size of areas: 3 to 175 acres

Typical Profile

Surface layer:
0 to 10 inches—dark brown silt loam

Subsoil:
10 to 20 inches—brown silty clay loam
20 to 28 inches—brown silt loam

Substratum:
28 to 60 inches—light brown silt loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: More than 6 feet below the surface
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Londo soils in the lower positions on the landscape

Similar inclusions:
• Soils that have a severely eroded surface layer
• Soils that have a surface layer of loamy sand or sand
• Soils that have mottles in the lower part of the subsoil

Use and Management

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

Cropland

Major management concerns: Water erosion, deterioration of tilth

Management measures:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Buildings

Major management concerns: Slope

Management measures:
• Some land grading may be needed.

Septic tank absorption fields

Major management concerns: Moderately slow permeability

Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 4A
Michigan soil management group: 2.5a

75C2—Strawn silt loam, 6 to 12 percent slopes, eroded

Setting

Landform: Till plains
Position on the landform: Moderately sloping areas on knolls, ridges, and side slopes
Shape of areas: Irregular
Size of areas: 4 to 150 acres

Typical Profile

Surface layer:
0 to 10 inches—dark brown silt loam

Subsoil:
10 to 20 inches—brown silty clay loam
20 to 28 inches—brown silt loam

Substratum:
28 to 60 inches—light brown silt loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: More than 6 feet below the surface
Surface runoff: Medium
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Londo soils in the lower positions on the landscape

Similar inclusions:
• Soils that are moderately well drained
• Soils that have a surface layer of loamy sand or sand
• Soils that have mottles in the lower part of the subsoil

Use and Management

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

Cropland

Major management concerns: Water erosion, deterioration of tilth

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

Buildings

Major management concerns: Slope

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

Septic tank absorption fields

Major management concerns: Moderately slow permeability

Management measures:
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.
• Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 4A
Michigan soil management group: 2.5a

75D3—Strawn silt loam, 12 to 18 percent slopes, severely eroded

Setting

Landform: Till plains
Position on the landform: Strongly sloping areas on ridges, shoulder slopes, and side slopes
Shape of areas: Irregular

Size of areas: 6 to 125 acres

Typical Profile

Surface layer:
0 to 10 inches—brown silt loam

Subsoil:
10 to 16 inches—brown silty clay loam
16 to 28 inches—brown silt loam

Substratum:
28 to 60 inches—light brown silt loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: More than 6 feet below the surface
Surface runoff: Rapid
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Severe
Hazard of soil blowing: Slight

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Londo soils in the lower positions on the landscape

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

Use and Management

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

Woodland

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

Management measures:
• Seeding landings, logging areas, and skid roads after the trees are logged helps establish a protective plant cover.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.

Buildings

Major management concerns: Slope

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

Septic tank absorption fields

Major management concerns: Slope, moderately slow permeability

Management measures:
• Land shaping, pressurizing the absorption field, and installing the distribution lines on the contour help to ensure that the absorption field functions properly.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 4R
Michigan soil management group: 2.5a

76A—Londo loam, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains and other till plains
Position on the landform: Nearly level or very gently sloping areas on broad plains and low knolls
Shape of areas: Irregular
Size of areas: 3 to 1,200 acres

Typical Profile

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

Subsoil:
9 to 13 inches—dark brown, mottled clay loam

Substratum:
13 to 40 inches—brown, mottled loam
40 to 60 inches—light brown, mottled loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: 1 to 2 feet below the surface from November through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Tappan and Parkhill soils in the lower positions on the landscape

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

Use and Management

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

Cropland

Major management concerns: Wetness, deterioration of tilth

Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Buildings

Major management concerns: Wetness

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Wetness, moderately slow permeability

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability.

Interpretive Groups

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

77—Chesaning-Cohoctah complex, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Nearly level areas on alluvial plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 720 acres

Typical Profile

Chesaning

Surface layer:
0 to 6 inches—very dark grayish brown silt loam

Substratum:
6 to 18 inches—dark brown, mottled very fine sandy loam
18 to 22 inches—dark grayish brown, mottled sandy loam
22 to 28 inches—yellowish brown, mottled sandy loam
28 to 44 inches—yellowish brown, mottled loamy sand
44 to 53 inches—pale brown sand
53 to 60 inches—gray, mottled sand

Cohoctah

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

Substratum:
10 to 22 inches—dark gray, mottled very fine sandy loam
22 to 27 inches—dark grayish brown, mottled sandy loam
27 to 40 inches—dark grayish brown, mottled sand
40 to 50 inches—grayish brown, mottled sand
50 to 60 inches—dark grayish brown coarse sand

Soil Properties and Qualities

Permeability: Moderately rapid in the upper part of the profile and rapid in the lower part
Available water capacity: Moderate
Drainage class: Chesaning—somewhat poorly drained; Cohoctah—poorly drained
Seasonal high water table: Chesaning—1 to 2 feet below the surface from September through May; Cohoctah—at the surface to 1 foot below the surface from September through May
Surface runoff: Very slow
Flooding: Frequent
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Chesaning—slight; Cohoctah—moderate

Composition

Chesaning soil and similar soils: 40 to 55 percent
Cohoctah soil and similar soils: 35 to 45 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Capac, Londo, and Pipestone soils on the edges of the mapped areas

Similar inclusions:
• Soils that have layers of gravelly sand or very gravelly sand in the lower part of the substratum
• Soils that have more clay in the substratum than the Chesaning and Cohoctah soils

Use and Management

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

Woodland

Major management concerns: Chesaning—equipment limitation, plant competition; Cohoctah—equipment limitation, seedling mortality, plant competition

Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soils are dry, or during midwinter, when the soils are frozen.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.
• After the trees are cut, competition from brush can delay or prevent the natural regeneration of desirable species. Special harvest methods may be needed to control undesirable plants.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on the Cohoctah soil.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: Chesaning—9W; Cohoctah—2W
Michigan soil management group: L-2c

78—Fluvaquents, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Nearly level areas on alluvial plains
Slope: 0 to 2 percent
Size of areas: 25 to more than 125 acres

Soil Properties and Qualities

Texture: Sandy or loamy
Permeability: Moderate to slow
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from October through June
Surface runoff: Very slow or ponded
Flooding: Frequent
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

Fluvaquents: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Contrasting Inclusions

• The very poorly drained Sloan and poorly drained Misteguay, Zilwaukee, and Cohoctah soils on the edges of the mapped areas

Use and Management

Land use: Wildlife habitat

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

Interpretive Groups

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

82—Granby sand, loamy substratum

Setting

Landform: Lake plains
Position on the landform: Nearly level areas in depressions and on broad plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 3 to 625 acres

Typical Profile

Surface layer:
0 to 11 inches—black sand

Subsoil:
11 to 19 inches—dark grayish brown, mottled sand
19 to 22 inches—pale brown, mottled sand

Substratum:
22 to 42 inches—dark brown sand
42 to 49 inches—light brownish gray sand
49 to 60 inches—gray, mottled silty clay loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface from November through June
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Composition

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

Inclusions

Contrasting inclusions:
• The loamy, poorly drained Parkhill soils in positions on the landscape similar to those of the Granby soil
• The somewhat poorly drained Wixom and Capac soils in the higher positions on the landscape

Similar inclusions:
• Soils that do not have a loamy substratum
• Soils that have a mucky surface layer

Use and Management

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

Cropland

Major management concerns: Wetness, soil blowing, droughtiness, the loss of plant nutrients

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Leaving crop residue on the surface and adding other organic material conserve moisture.
• Timing applications of fertilizer so that they meet the needs of the crop for nutrients, using split applications of fertilizer, and applying the fertilizer in bands reduce the risk of nutrient loss through leaching.

Woodland

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

Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soil is dry, or during midwinter, when the soil is frozen.
• After the trees are cut, competition from brush can delay or prevent the natural regeneration of desirable species. Special harvest methods may be needed to control undesirable plants.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on this soil.

Buildings

Major management concerns: Ponding, the instability of cutbanks

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.
• Because cutbanks are not stable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Ponding, a poor filtering capacity, moderately slow permeability in the substratum

Management measures:
• Measures that overcome the ponding are impractical. As a result, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

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

84A—Parkhill-Poseyville complex, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains
Position on the landform: Parkhill—nearly level areas on broad plains; Poseyville—nearly level or very gently sloping areas on broad plains
Shape of areas: Irregular
Size of areas: 9 to 135 acres

Typical Profile

Parkhill

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

Subsoil:
11 to 32 inches—gray, mottled clay loam

Substratum:
32 to 60 inches—gray, mottled clay loam

Poseyville

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

Subsurface layer:
10 to 12 inches—pale brown sand

Subsoil:
12 to 17 inches—dark brown, mottled sandy loam

Substratum:
17 to 60 inches—gray, mottled loam

Soil Properties and Qualities

Permeability: Parkhill—moderately slow; Poseyville—rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Parkhill—high; Poseyville—moderate
Drainage class: Parkhill—poorly drained; Poseyville—somewhat poorly drained
Seasonal high water table: Parkhill—1 foot above to 1 foot below the surface from November through May; Poseyville—1 to 2 feet below the surface from November through May
Surface runoff: Parkhill—very slow or ponded; Poseyville—slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Parkhill—slight; Poseyville—moderate

Composition

Parkhill soil and similar soils: 50 to 65 percent
Poseyville soil and similar soils: 30 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The stratified Pella and Frankenmuth soils in positions on the landscape similar to those of the Parkhill and Poseyville soils
• The poorly drained Corunna soils in the lower positions on the landscape

Similar inclusions:
• Soils that are more alkaline in the surface layer than the Parkhill soil
• Soils that have a surface layer of sand

Use and Management

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

Cropland

Major management concerns: Parkhill—wetness, deterioration of tilth; Poseyville—wetness, droughtiness, soil blowing, the content of organic matter, the loss of plant nutrients

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.
• Conservation tillage, crop residue management, windbreaks, and cover crops conserve moisture and help to control soil blowing.
• Inclusion of green manure crops in the cropping sequence, no-till planting, and crop residue management increase the content of organic matter.
• Increasing the content of organic matter in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.

Buildings

Major management concerns: Parkhill—ponding; Poseyville—wetness

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Parkhill—ponding, moderately slow permeability; Poseyville—wetness, moderately slow permeability, a poor filtering capacity in the upper part of the profile

Management measures:
• Measures that overcome the ponding on the Parkhill soil are impractical. As a result, this soil is generally unsuited to septic tank absorption fields.
• Mounding or adding suitable fill material helps to raise the absorption field above the water table in the Poseyville soil.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the moderately slow permeability of the Poseyville soil.
• Because of the poor filtering capacity in the upper part of the Poseyville soil, measures that prevent the pollution of ground water are needed.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W
Michigan soil management group: Parkhill—2.5c; Poseyville—3/2b

88B—Boyer sandy loam, 2 to 8 percent slopes

Setting

Landform: Water-worked till plains
Position on the landform: Very gently sloping to moderately sloping areas on low beach ridges
Shape of areas: Linear

Size of areas: 40 to 145 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark grayish brown sandy loam
Subsurface layer:
10 to 23 inches—dark yellowish brown sandy loam
Subsoil:
23 to 34 inches—strong brown sandy loam
Substratum:
34 to 60 inches—brown very gravelly sand

Soil Properties and Qualities

Permeability: Moderately rapid in the upper part of the profile and very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: More than 6 feet below the surface
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Fabius soils in the lower positions on the landscape
Similar inclusions:
• Soils that are moderately well drained

Use and Management

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

Cropland

Major management concerns: Soil blowing, droughtiness, the content of organic matter
Management measures:
• Establishing windbreaks and vegetative barriers, growing cover crops, applying a system of conservation tillage, stripcropping, and leaving crop residue on the surface help to control soil blowing.
• Conservation tillage and additions of organic material increase the content of organic matter and the available water capacity.

Buildings

Major management concerns: The instability of cutbanks, slope
Management measures:
• Because cutbanks are not stable and can cave in, the sides of shallow excavations should be reinforced.
• Some land grading may be needed.

Septic tank absorption fields

Major management concerns: A poor filtering capacity
Management measures:
• Because of the poor filtering capacity, measures that prevent the pollution of ground water are needed. Examples are using large lots, installing an absorption system of shallow trenches, and planting shrubbery around the perimeter of the system.

Interpretive Groups

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

89—Roundhead muck

Setting

Landform: Lake plains
Position on the landform: Nearly level areas in closed depressions
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Surface layer:
0 to 9 inches—black muck
Substratum:
9 to 18 inches—grayish brown, mottled silt loam
18 to 31 inches—grayish brown, mottled very fine sandy loam
31 to 60 inches—dark gray, mottled silt loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: 1.0 foot above to 1.5 feet below the surface from December through June
Surface runoff: Very slow or ponded
Flooding: None
Organic matter content: Very high
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Capac and Wixom soils on the edges of the mapped areas

Similar inclusions:
• Soils that have a mineral surface layer
• Soils that are stratified

Use and Management

Land use: Cropland

Cropland

Major management concerns: Wetness, soil blowing

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Windbreaks, vegetative barriers, crop residue management, and cover crops, such as rye, help to control soil blowing.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: None
Michigan soil management group: 1.5c

91B—Branch sand, loamy substratum, 0 to 6 percent slopes

Setting

Landform: Water-worked till plains
Position on the landform: Nearly level to gently sloping areas on low knolls, low beach ridges, and side slopes
Shape of areas: Linear
Size of areas: 5 to more than 60 acres

Typical Profile

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

Subsurface layer:
8 to 18 inches—dark yellowish brown sand
18 to 27 inches—yellowish brown, mottled sand

Subsoil:
27 to 34 inches—dark yellowish brown, mottled gravelly sandy loam

Substratum:
34 to 45 inches—dark yellowish brown, mottled sand
45 to 49 inches—brown, mottled very gravelly sand
49 to 60 inches—brown, mottled clay loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: 2.5 to 3.5 feet below the surface from November through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Composition

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

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Fabius soils in the lower positions on the landscape
• The well drained Boyer soils in the higher positions on the landscape

Similar inclusions:
• Soils that do not have a loamy substratum
• Soils that have a surface layer of sandy loam

Use and Management

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

Cropland

Major management concerns: Soil blowing, droughtiness, the content of organic matter, the loss of plant nutrients

Management measures:
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, and cover crops help to control soil blowing.
• Conservation tillage and additions of organic material increase the content of organic matter and the available water capacity.
• Timing applications of fertilizer so that they meet the needs of the crop for nutrients, using split applications of fertilizer, and applying the fertilizer in bands reduce the risk of nutrient loss through leaching.

Woodland

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

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate. The seedlings should be planted when the soil is moist.

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

Buildings

Major management concerns: The instability of cutbanks, wetness

Management measures:
• Because cutbanks are not stable and can cave in, the sides of shallow excavations should be reinforced.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Wetness, a poor filtering capacity, moderately slow permeability

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Because of the poor filtering capacity, measures that prevent the pollution of ground water are needed.
• Increasing the size of the absorption area helps to compensate for the restricted permeability.

Interpretive Groups

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

93A—Capac gravelly sandy loam, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains
Position on the landform: Nearly level or very gently sloping areas on broad plains and low knolls
Shape of areas: Irregular
Size of areas: 5 to 1,650 acres

Typical Profile

Surface layer:
0 to 12 inches—very dark grayish brown gravelly sandy loam

Subsurface layer:
12 to 14 inches—dark yellowish brown and grayish brown, mottled loam

Subsoil:
14 to 26 inches—dark yellowish brown, mottled loam
26 to 38 inches—yellowish brown, mottled loam

Substratum:
38 to 51 inches—strong brown, mottled loam
51 to 60 inches—dark yellowish brown, mottled loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: 1 to 2 feet below the surface from November through May
Surface runoff: Slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Parkhill soils in the lower positions on the landscape

Similar inclusions:
• Soils that have a surface layer of loam
• Soils that have no gravel in the surface layer

Use and Management

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

Cropland

Major management concerns: Wetness, soil blowing

Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Conservation tillage, windbreaks, vegetative barriers, cover crops, stripcropping, and cropping systems that include close-growing crops help to control soil blowing.

Buildings

Major management concerns: Wetness

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Wetness, moderately slow permeability

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Increasing the size of the absorption area helps to compensate for the moderately slow permeability.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4W

Michigan soil management group: 2.5b

94—Zilwaukee-Misteguay complex, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Nearly level areas on alluvial plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 2,285 acres

Typical Profile

Zilwaukee

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

Subsurface layer:
9 to 16 inches—black, mottled silty clay

Substratum:
16 to 60 inches—strong brown, mottled silty clay

Misteguay

Surface layer:
0 to 14 inches—very dark grayish brown silty clay

Subsoil:
14 to 25 inches—olive gray, yellowish brown, and brown, mottled silty clay
25 to 60 inches—brown, mottled silty clay

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: At the surface to 1 foot below the surface from October through May
Surface runoff: Very slow
Flooding: Frequent
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

Zilwaukee soil and similar soils: 45 to 55 percent
Misteguay soil and similar soils: 35 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Wixom and Capac soils in the higher positions on the landscape

Similar inclusions:
• Soils that have less clay in the subsoil than the Zilwaukee and Misteguay soils
• Soils that have a surface layer of sand

Use and Management

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

Woodland

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

Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soils are dry, or during midwinter, when the soils are frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.
• Because of wetness, seedling mortality, and plant competition, trees are not planted on these soils.
• After the trees are cut, competition from brush can delay or prevent the natural regeneration of desirable species. Special harvest methods may be needed to control undesirable plants.

Cropland

Major management concerns: Wetness, deterioration of tilth

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.

Buildings

Major management concerns: Wetness, flooding

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Flooding, wetness, slow permeability

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the level of flooding and the water table and helps to overcome the restricted permeability.

Interpretive Groups

Land capability classification: IIIw

Woodland ordination symbol: 2W
Michigan soil management group: 1c

95—Sloan-Ceresco complex, rarely flooded

Setting

Landform: Flood plains
Position on the landform: Nearly level areas on alluvial plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 40 to 2,140 acres

Typical Profile

Sloan

Surface layer:
0 to 12 inches—very dark grayish brown, mottled loam

Subsurface layer:
12 to 24 inches—very dark gray, mottled fine sandy loam

Subsoil:
24 to 42 inches—dark gray, mottled silty clay loam

Substratum:
42 to 60 inches—grayish brown, mottled, stratified silt loam and very fine sandy loam

Ceresco

Surface layer:
0 to 11 inches—dark brown silt loam

Subsoil:
11 to 19 inches—dark yellowish brown, mottled silt loam

Substratum:
19 to 54 inches—light brownish gray, mottled, stratified silt loam and very fine sand
54 to 60 inches—yellowish brown, mottled fine sandy loam

Soil Properties and Qualities

Permeability: Sloan—moderately slow; Ceresco—moderately rapid
Available water capacity: High
Drainage class: Sloan—very poorly drained; Ceresco—somewhat poorly drained
Seasonal high water table: Sloan—at the surface to 1 foot below the surface from November through June; Ceresco—1 to 2 feet below the surface from September through May
Surface runoff: Very slow
Flooding: Rare
Organic matter content: High
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Composition

Sloan soil and similar soils: 40 to 55 percent
Ceresco soil and similar soils: 35 to 45 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Capac, Londo, and Pipestone soils on the edges of the mapped areas

Similar inclusions:
• Soils that have a sandy substratum

Use and Management

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

Cropland

Major management concerns: Wetness, deterioration of tilth

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.

Buildings

Major management concerns: Wetness, flooding, the instability of cutbanks

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.
• Because cutbanks in areas of the Ceresco soil are not stable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Sloan—wetness, moderately slow permeability; Ceresco—wetness

Management measures:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drain fields helps to overcome the restricted permeability in the Sloan soil.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: Sloan—3W; Ceresco—4W
Michigan soil management group: L-2c

96—Chesaning-Cohoctah complex, rarely flooded

Setting

Landform: Flood plains
Position on the landform: Nearly level areas on alluvial plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 25 to 135 acres

Typical Profile

Chesaning

Surface layer:
0 to 6 inches—very dark grayish brown silt loam

Substratum:
6 to 18 inches—dark brown, mottled very fine sandy loam
18 to 22 inches—dark grayish brown, mottled sandy loam
22 to 28 inches—yellowish brown, mottled sandy loam
28 to 44 inches—yellowish brown, mottled loamy sand
44 to 53 inches—pale brown sand
53 to 60 inches—gray, mottled sand

Cohoctah

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

Substratum:
10 to 22 inches—dark gray, mottled very fine sandy loam
22 to 27 inches—dark grayish brown, mottled sandy loam
27 to 40 inches—dark grayish brown, mottled sand
40 to 50 inches—grayish brown, mottled sand
50 to 60 inches—dark grayish brown coarse sand

Soil Properties and Qualities

Permeability: Moderately rapid in the upper part of the profile and rapid in the lower part
Available water capacity: Moderate
Drainage class: Chesaning—somewhat poorly drained; Cohoctah—poorly drained
Seasonal high water table: Chesaning—1 to 2 feet below the surface from September through May; Cohoctah—at the surface to 1 foot below the surface from September through May
Surface runoff: Very slow
Flooding: Rare
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Chesaning—slight; Cohoctah—moderate

Composition

Chesaning soil and similar soils: 40 to 55 percent
Cohoctah soil and similar soils: 35 to 45 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Capac, Londo, and Pipestone soils on the edges of the mapped areas

Similar inclusions:
• Soils that have layers of gravelly sand or very gravelly sand in the lower part of the substratum
• Soils that have more clay in the substratum than the Chesaning and Cohoctah soils

Use and Management

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

Cropland

Major management concerns: Chesaning—wetness, deterioration of tilth; Cohoctah—wetness, soil blowing, the content of organic matter

Management measures:
• Excess water can be removed by open ditches, subsurface drains, surface drains, pumps, or a combination of these.
• Applying a system of conservation tillage and deferring tillage during wet periods help to prevent deterioration of tilth.
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Keeping crop residue on the surface, regularly adding other organic material, and applying a system of no-till planting increase the content of organic matter.

Buildings

Major management concerns: Wetness, the instability of cutbanks

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.
• Because cutbanks are not stable and can cave in, the sides of shallow excavations should be reinforced.

Septic tank absorption fields

Major management concerns: Wetness, a poor filtering capacity

Management measures:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Because of the poor filtering capacity of these soils, measures that prevent the pollution of ground water are needed.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: Chesaning—9W; Cohoctah—2W
Michigan soil management group: L-2c

98A—Poseyville loamy fine sand, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains
Position on the landform: Nearly level or very gently sloping areas on low knolls and broad plains
Shape of areas: Irregular
Size of areas: 3 to more than 60 acres

Typical Profile

Surface layer:
0 to 10 inches—dark brown loamy fine sand
Subsurface layer:
10 to 12 inches—pale brown sand
Subsoil:
12 to 17 inches—dark brown, mottled sandy loam
Substratum:
17 to 60 inches—gray, mottled loam

Soil Properties and Qualities

Permeability: Rapid in the upper part of the profile and moderately slow in the lower part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: 1 to 2 feet below the surface from November through May
Surface runoff: Very slow
Flooding: None
Organic matter content: Moderate
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate

Composition

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

Inclusions

Contrasting inclusions:
• The poorly drained Belleville, Parkhill, and Tappan soils in the lower positions on the landscape

Similar inclusions:
• Soils that have more clay in the subsoil than the Poseyville soil
• Soils that have a surface layer of sandy loam

Use and Management

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

Cropland

Major management concerns: Wetness, droughtiness, soil blowing, the content of organic matter, the loss of plant nutrients

Management measures:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Conservation tillage, crop residue management, windbreaks, and cover crops conserve moisture and help to control soil blowing.
• Inclusion of green manure crops in the cropping sequence, no-till planting, and crop residue management increase the content of organic matter.
• Increasing the content of organic matter in the root zone can improve the ability of the soil to hold water, nutrients, and pesticides and thus reduce the risk of ground-water pollution.

Woodland

Major management concerns: Equipment limitation, plant competition

Management measures:
• Because of the seasonal high water table, equipment should be used only during midsummer, when the soil is dry, or during midwinter, when the soil is frozen.
• Adequate site preparation controls initial plant competition, and spraying controls subsequent competition.

Buildings

Major management concerns: Wetness

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Wetness, moderately slow permeability

Management measures:
• Mounding or adding suitable fill material helps to raise the absorption field above the water table.
• Increasing the size of the absorption area helps to compensate for the restricted permeability of the substratum.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W
Michigan soil management group: 3/2b

99A—Urban land-Parkhill complex, 0 to 3 percent slopes

Setting

Landform: Water-worked till plains and other till plains
Position on the landform: Nearly level or very gently sloping areas on broad plains
Shape of areas: Irregular
Size of areas: 95 to 2,250 acres

Typical Profile

Parkhill

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

Subsoil:
11 to 32 inches—gray, mottled clay loam

Substratum:
32 to 60 inches—gray, mottled clay loam

Soil Properties and Qualities

Parkhill

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

Composition

Urban land: 45 to 65 percent
Parkhill soil and similar soils: 20 to 45 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Capac, Wixom, and Poseyville soils in the higher positions on the landscape

Similar inclusions:
• Soils that are more alkaline in the surface layer than the Parkhill soil

Use and Management

Land use: Urban land—streets, parking lots, buildings, and other structures; Parkhill—gardens, lawns, building sites

Gardens, lawns, and environmental plantings

Major management concerns: Parkhill—ponding

Management measures:
• Perennial plants that can withstand wetness should be selected for planting.

Buildings

Major management concerns: Ponding

Management measures:
• Buildings should be constructed on well compacted fill material, which can raise the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around buildings with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Parkhill—ponding, slow permeability

Management measures:
• Sanitary facilities should be connected to a central sewer system or treatment facility.

Interpretive Groups

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

Prime Farmland

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

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify as prime farmland only in areas where these limitations hazards have been overcome by drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

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

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

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

Crops and Pasture

Gerald E. Malone, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 277,062 acres in Saginaw County was used for crops and pasture in 1988. Of this total, about 63,000 acres was used for corn, 14,000 acres for dry beans, 130,000 acres for soybeans, 18,200 acres for sugar beets, 4,300 acres for oats, and 26,000 acres for wheat. The remaining acreage was used primarily for hay and pasture *(4)*. A small acreage was used for specialty crops. The most common commercial specialty crops are pickling cucumbers, sweet corn, melons, bell peppers, and tomatoes. Apples and blueberries are the main fruit crops.

The acreage used for field crops fluctuates greatly from year to year because of weather conditions and anticipated market prices. The county generally ranks among the top counties in Michigan for crop production. Farms make up more than 62 percent of the total land area. Much of the farmland has a land capability classification of II, indicating only moderate limitations that can be easily overcome. Crop production could be increased by applying soil and water conservation practices and crop production technology to all of the cropland in the county. Applicable management is given in the section "Detailed Soil Map Units."

Many soil-related limitations or hazards are common to a large number of different soils. The measures that can overcome these limitations or hazards generally apply to many soils. The following paragraphs describe the common concerns in managing the cropland and pasture in Saginaw County.

Soil wetness is the major management concern on most of the cropland in the county. Some soils are too wet for crop production unless they are drained. Examples are the poorly drained Belleville, Corunna,

Figure 8.—A cultivated area of Capac loam, 0 to 3 percent slopes. Tillage at the proper moisture content helps to maintain good tilth in this soil.

Granby, Lenawee, Parkhill, Tappan, and Zilwaukee soils and the very poorly drained Sloan and Roundhead soils.

Unless drained, somewhat poorly drained soils are so wet that crops are damaged during most years. Examples are Capac, Ceresco, Londo, Pipestone, Poseyville, and Wixom soils.

The design of surface and subsurface drainage systems varies with the natural drainage, permeability, and texture of the soil. A combination of surface and subsurface drains is needed in most of the somewhat poorly drained, poorly drained, and very poorly drained soils. Sandy, rapidly permeable soils, such as Granby and Pipestone soils, can be overdrained if the distance between the tile lines is not wide enough. In slowly permeable soils, such as Zilwaukee and Tappan soils, the tile lines should be more closely spaced and adequate surface drainage systems are needed. In some areas of poorly drained and very poorly drained soils, outlets for tile drainage systems are not readily available. Catchments and lift pumps are needed in these areas.

When surface water enters large ditches, gullies can form on the ditchbanks. The surface water from surface drainage systems and from ponded areas can be lowered safely into ditches through a drop pipe or concrete box structure. Sugar beets and dry beans are examples of crops that are very sensitive to ponded water.

Information about the design of drainage systems for each kind of soil is available at the local office of the Soil Conservation Service.

Soil compaction is a major management concern on loamy and clayey soils, such as Zilwaukee, Capac, and Londo soils (fig. 8). It can considerably lower crop yields. Intensive cultivation, especially when the soils

are wet, can result in compaction. Because the crop rotations in the county consist mainly of crops that produce a small amount of crop residue, only a small amount of organic matter is returned to the soil. Crop rotations that include more grasses and legumes, green manure and cover crops, minimum tillage, and surface and subsurface drainage systems help to prevent excessive compaction.

Soil fertility is naturally low in the sandy soils in the county, such as Covert, Grattan, and Pipestone soils, and medium or high in most of the loamy soils, such as Capac, Parkhill, and Tappan soils. Fertility varies considerably, however, because of differences in past land use and management. Crops on most of the soils respond well to applications of fertilizer. Some of the soils require periodic applications of ground limestone to raise their reaction sufficiently for alfalfa and other crops that grow well on slightly acid or neutral soils. On all soils, the amount of lime and fertilizer to be applied should be based on the kind of crop, the expected level of yields, and the results of soil tests *(5)*. Proper management of fertilizer can minimize the leaching of nitrates into ground water and the runoff of phosphates into surface water, both of which can create health hazards and lower the quality of water.

Water erosion is a hazard on Gagetown, Strawn, and Boyer soils because of their slope and surface texture.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on Strawn, Gagetown, and other soils that have a silty subsoil and on soils that tend to be droughty, such as Boyer and Shiawassee soils. Second, erosion of farmland results in the sedimentation of streams. Controlling erosion minimizes this pollution and improves the quality of water for municipal and recreational uses and for fish and wildlife.

On eroded spots in many rolling areas, preparing a good seedbed and tilling are difficult because the original friable surface layer has been lost. Such spots are on the upper parts of side slopes in areas of the gently rolling Strawn and Gagetown soils.

Erosion-control practices provide a protective cover, reduce the runoff rate, and increase the rate of water infiltration. A cropping system that keeps a plant cover on the surface for extended periods can hold soil losses to an amount that does not reduce the productivity of the soils. On livestock farms, where pasture and hay are needed, including forage crops of grasses and legumes in the cropping sequence helps to control erosion on the more sloping land, provides nitrogen for the following crop, and improves tilth.

Soil blowing is a hazard on sandy soils, such as Grattan, Covert, Branch, Corunna, Belleville, Wixom, Pipestone, Granby, Arkona, Frankenmuth, and Poseyville soils, and on soils that have a moderately coarse textured surface layer, such as Boyer, Cadmus, and Shiawassee soils. It also is a hazard in some soils that have a finer textured surface layer, such as Gagetown and Strawn soils, especially where the soil structure is poor because of excessive tillage. Soil blowing can damage the soils and crops in a very short period if winds are strong and the field is dry and unprotected by crop residue or vegetation. A surface mulch of crop residue or a cover crop can greatly reduce the hazard of soil blowing. Properly spaced grass barriers, buffer strips of small grain, windbreaks, and tillage methods that leave the surface rough also help to control soil blowing.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

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

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops *(10)*. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

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

Capability classes, the broadest groups, are designated by 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 or hazards that restrict their use.

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

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

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

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

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

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

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

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

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

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Also given at the end of each map unit description is a Michigan soil management group. The soils are assigned to a group according to the dominant profile texture, the natural drainage class, and the major management concerns *(6)*.

Woodland Management and Productivity

Commercial forests cover 82,700 acres in Saginaw County, or about 16 percent of the total land area. Approximately 3,300 acres is owned by the State, and the remaining 79,400 acres is under private ownership. The largest areas of woodland are in the Pipestone-Granby-Wixom and Parkhill-Wixom associations, which are described under the heading "General Soil Map Units." Other areas of woodland are in the Parkhill-Capac and Sloan-Zilwaukee-Misteguay associations. Woodlots and plantations of red pine, eastern white pine, Scotch pine, Norway spruce, and white spruce are in scattered areas throughout the other associations in the county. Christmas tree plantations and apple orchards are in a few areas.

Four major kinds of natural forest-cover types are in the county. Each is distinctly different, and each has a different value and potential for forest use and for woodland products. The soils in areas of one of these cover types generally are quite different from those in areas of another cover type. The types are sugar maple, red oak-hickory, elm-green ash-red maple-silver maple, and aspen. Sawtimber-size stands are in areas of all the major types, except for aspen, but only in the red oak-hickory type do they account for a significant portion (55 percent) of the total forest type class.

The sugar maple cover type, which is in areas of the Parkhill-Capac association, makes up about 30,000 acres in the county. Sugar maple is the dominant species.

The red oak-hickory cover type, which is in areas of the Pipestone-Granby-Wixom association, makes up about 26,000 acres. Red oak and shagbark hickory are the dominant species.

The elm-green ash-red maple-silver maple cover type, which is in areas of the Sloan-Zilwaukee-Misteguay and Sloan-Ceresco associations, makes up about 19,000 acres. Red maple, silver maple, and green ash are the most common trees and are almost always dominant. Many large American elms, which were once a major overstory component, have died of Dutch elm disease, but many small American elms are in the understory of this cover type.

The aspen cover type, which is in areas of most of the associations in the county, makes up about 7,000 acres. Quaking aspen is the dominant species.

Most of the commercial woodland in the county could be improved by thinning the stands or harvesting mature trees. Removing overstocked trees allows the more desirable trees to grow.

The management needed to improve the woodland and obtain sustained yields of wood varies from one area to another. It should include erosion control, planting in areas where natural regeneration is undesirable or insufficient, control of competing vegetation, restricted grazing, measures that improve seedling survival, measures that minimize windthrow on the wetter sites, timely harvesting, control of the damage caused by insects and diseases, removal of cull trees and undesirable species, and maintenance of optimum stand density. The Soil Conservation Service, the Michigan Department of Natural Resources, and the Cooperative Extension Service can help in determining specific woodland management needs.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; and *F*, a high content of rock fragments in the soil. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, and F.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table, the length of the period when the water table is high, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main

restrictions that affect rooting are a seasonal high water table and the depth to limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand. The volume was determined through the use of standard yield tables *(12)*.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

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

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

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

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 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 or the Cooperative Extension Service or from a commercial nursery.

Recreation

About 22,900 acres of National wildlife refuges and State game areas and numerous rivers provide opportunities for recreation in Saginaw County. The Shiawassee National Wildlife Refuge Area, which makes up approximately 8,984 acres and is in the center of the county, is used partially for farming and also is open for controlled hunting. Also available for recreation are the Shiawassee State Game Area, which makes up approximately 9,000 acres and is directly west of the Shiawassee National Wildlife Area; the Gratiot-Saginaw State Game Area, which makes up approximately 3,500 acres and is in the southwestern part of the county; and the Crow Island State Game Area, which makes up approximately 1,360 acres and is in the northeastern part of the county. The Flint, Shiawassee, Cass, and Bad Rivers are used for boating and fishing. The survey area has 4 county parks, 70 city and township parks, and 13 public and private golf courses.

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil

properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface absorbs rainfall readily but remains firm, and it 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 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 firm after rains and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

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

Wildlife Habitat

Lynn Sampson, biologist, Soil Conservation Service, helped prepare this section.

Before settlement by Europeans, Saginaw County was inhabited by many wildlife species associated with wilderness areas, mainly black bear, mountain lion, lynx, bobcat, elk, and timber wolf. The passenger pigeon, which became extinct at the beginning of the 20th century, and the eastern wild turkey were abundant in the pristine forests of the county.

Human activities since settlement have significantly affected the composition of the wildlife species. As the areas of forest regenerated following logging, the white-tailed deer population, which was low in the pristine forests, soared in response to abundant browse. The coyote, one of the more adaptable species, replaced the timber wolf. Most of the wildlife species in the county are those that adapt to second-growth forest, brushy edges, and agricultural areas.

The ring-necked pheasant was introduced in the newly created agricultural areas. The eastern wild turkey was recently reintroduced in the county. Some species were inadvertently introduced. Examples are the European starling, the Norway rat, and the house mouse.

The mixture of farmland and woodland is ideal for white-tailed deer, which are common in the county. The deer population can increase to such levels during years of consecutive mild winters as to cause damage to crops, tree seedlings, and saplings and to the native vegetation, especially eastern white-cedar.

The ring-necked pheasant is in its northern range in Saginaw County, but it can be prolific on farmland if enough cover and food are available. An undisturbed nesting cover of grasses and legumes is critical in maintaining this species. The Sichuan pheasant might prove to be hardier in this survey area.

The population of ruffed grouse in the county fluctuates from year to year. It is probably more abundant than it was in the pristine forests because of the expansion of the aspen forest type. Grouse generally are associated with aspen forest during winter and early spring because the catkins of the male flowers are high-energy food for this bird. Hawthorn and other shrubs that bear small fruit attract grouse in fall and late summer. Grouse also use small openings in woods because of the insects in those areas. Young, dense stands of aspen are inhabited by grouse broods. The slightly larger aspens provide winter food. Aspen stands can be managed to provide cover, food, and drumming sites for ruffed grouse throughout the year.

Cottontail rabbits inhabit cropland, farmsteads, woody abandoned fields, and some residential areas. Providing cover or brush piles next to crop fields and grassy areas can improve the habitat for these rabbits.

Fox squirrels are in nearly every hardwood farm woodlot in the county. Because they eat corn, they thrive in agricultural areas. Gray squirrels inhabit the oak forests in the county. Red squirrels inhabit the pine forests and swampy areas.

Much of the original wetland habitat in the county has been drained. Exceptions are the Shiawassee River Flats, an important waterfowl area, and a waterfowl refuge known as the Shiawassee River State Game Area. The variety of habitat in these two areas attracts more than 190 species of birds during some part of the year. During periods of the peak migration, more than 25,000 Canada geese and 50,000 ducks rest on the

Shiawassee River Flats. In 1953, the 9,000-acre Shiawassee National Wildlife Refuge, adjacent to the state reserve, was established as a northern link in the Mississippi Flyway Chain of Refuges. The remaining marshy and flooded areas in the county also are important for a variety of waterfowl. Flooded timber areas are good nesting sites for wood ducks. The population of these ducks has increased in recent years because nesting boxes have been provided in the appropriate habitat.

The rivers and streams of Saginaw County provide habitat for many species of fish, mainly bass, catfish, northern pike, and various species of sunfish. A walleye fishery is in the Saginaw River.

The wildlife in the county include many species recognized as rare, threatened, or endangered. Examples are eastern fox snake (*Elaphe vulpina gloydi*), the whorled pogonia (*Isotria verticillata*), the channel darter (*Percina copelandi*), and the river darter (*Percina shumardi*). The bald eagle, which is listed by the U.S. Fish and Wildlife Service as threatened, nests in the county. The county has unique areas of the mesic southern forest community.

Several species of furbearers are abundant in the county, mainly mink, muskrat, raccoon, and red fox. The thousands of acres of wetlands provide good habitat for these species.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, rye, and barley.

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

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are lambsquarters, goldenrod, cinquefoil, fescue, and reed canarygrass.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, aspen, cherry, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil

properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, and slope. Examples of wetland plants are smartweed, wild millet, wildrice, rushes, sedges, and reeds.

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

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to

overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to a very firm dense layer, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

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

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, and flooding affect absorption of the effluent.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel are less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is

required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, flooding, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope can cause construction problems.

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

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

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, slope, and flooding affect both types of landfill. Texture, highly organic layers, and soil reaction affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by a high water table and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential and slopes of 15 to 25 percent. 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, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for

commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

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

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

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

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, or 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, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to 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 organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on permeability, depth to a high water table or depth of standing water if the soil is subject to ponding, slope, susceptibility to flooding, subsidence of organic layers, and the potential

for frost action. Excavating and grading and the stability of ditchbanks are affected by slope and the hazard of cutbanks caving. Availability of drainage outlets is not considered in the ratings.

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

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control water erosion and conserve moisture by intercepting runoff. Slope, wetness, and large stones affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Wetness and slope affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

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

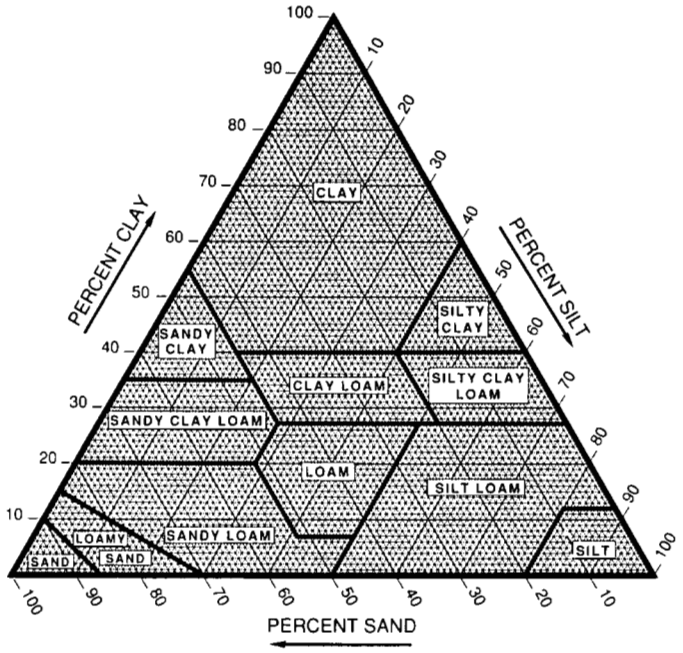

Figure 9.—Percentages of clay, silt, and sand in the basic textural classes of the U.S. Department of Agriculture.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 9). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and

highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for

fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low

runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 18, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and

electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Soil Characterization Data for Selected Soils

Several of the soils in Saginaw County were sampled by the Soil Survey Laboratory in Lincoln, Nebraska. The laboratory data obtained from the soil samples include analyses of particle-size distribution, coarse fragments, bulk density, and moisture retention. Complete chemical analyses also were performed on each sample. Standard National Cooperative Soil Survey procedures were used for all of the analyses.

These data were used in classifying and correlating the soils and in evaluating their behavior. In addition to the data from Saginaw County, soil characterization data are available from nearby counties having many of the same soils. All data are available at the office of the Soil Conservation Service in East Lansing, Michigan.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(11)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Haplaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(9)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(11)*. 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."

Arkona Series

The Arkona series consists of somewhat poorly drained soils on lake plains. These soils formed in sandy glaciofluvial material over clayey lacustrine material. Permeability is rapid in the upper part of the

profile and very slow in the lower part. Slopes range from 0 to 4 percent.

Typical pedon of Arkona sand, 0 to 4 percent slopes, 100 feet south and 2,140 feet west of the northeast corner of sec. 9, T. 11 N., R. 3 E., Swan Creek Township:

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

Bs1—10 to 17 inches; strong brown (7.5YR 4/6) sand; few fine prominent yellowish brown (10YR 5/4) mottles; single grain; loose; about 10 percent weakly cemented ortstein; neutral; clear wavy boundary.

Bs2—17 to 25 inches; brown (10YR 5/3) sand; few medium faint yellowish brown (10YR 5/4) mottles; single grain; loose; neutral; gradual wavy boundary.

E—25 to 27 inches; pale brown (10YR 6/3) sand; single grain; loose; neutral; abrupt smooth boundary.

2Btg—27 to 35 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct dark yellowish brown (10YR 3/4 and 4/6) mottles; moderate thick platy structure; firm; common faint gray (10YR 6/1) clay films in root channels and pores; neutral; gradual wavy boundary.

2C—35 to 60 inches; brown (10YR 5/3) silty clay; common medium and coarse faint dark yellowish brown (10YR 4/4) mottles; moderate thick platy structure; firm; common light gray (10YR 7/1) coatings of carbonate throughout; slight effervescence; moderately alkaline.

Depth to the 2Bt horizon ranges from 27 to 38 inches. The depth to free carbonates ranges from 35 to 42 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Bs horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 3 to 6. It is sand or loamy sand. The E horizon has chroma of 3 or 4. The 2Btg horizon has value of 4 or 5. The 2C horizon has hue of 10YR or 5Y and value of 4 or 5. It is silty clay loam or silty clay.

Belleville Series

The Belleville series consists of poorly drained soils on lake plains. These soils formed in sandy material over loamy lacustrine material. Permeability is rapid in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Belleville fine sand, 25 feet north and 300 feet east of the southwest corner of sec. 3, T. 10 N., R. 2 E., Brant Township:

Ap—0 to 12 inches; black (10YR 2/1) fine sand, dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

Bg—12 to 17 inches; light brownish gray (2.5Y 6/2) sand; common fine and medium prominent yellowish brown (10YR 5/6) mottles; single grain; loose; neutral; abrupt wavy boundary.

Cg1—17 to 23 inches; light brownish gray (10YR 6/2) fine sand; single grain; loose; slight effervescence; slightly alkaline; abrupt wavy boundary.

2Cg2—23 to 30 inches; gray (10YR 5/1) clay loam; common coarse prominent yellowish brown (10YR 5/8) mottles; massive; firm; slight effervescence; slightly alkaline; gradual wavy boundary.

2Cg3—30 to 60 inches; gray (5Y 5/1) silty clay loam; common coarse prominent yellowish brown (10YR 5/8) mottles; massive; firm; slight effervescence; slightly alkaline.

Depth to the 2C horizon ranges from 23 to 37 inches. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Bg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. Some pedons have a BC horizon. The Cg horizon has value of 4 to 6 and chroma of 1 or 2. It is sand, loamy sand, fine sand, or loamy fine sand. The 2Cg horizon has hue of 10YR, 2.5Y, or 5Y or is neutral in hue. It has value of 4 or 5 and chroma of 0 or 1. It is loam, silt loam, silty clay loam, or clay loam.

Boyer Series

The Boyer series consists of well drained soils on beach ridges on water-worked till plains. These soils formed in glacial shoreline deposits. Permeability is moderately rapid in the upper part of the profile and very rapid in the lower part. Slopes range from 2 to 8 percent.

Typical pedon of Boyer sandy loam, 2 to 8 percent slopes, 1,485 feet north and 1,380 feet west of the southeast corner of sec. 36, T. 9 N., R. 1 E., Chapin Township:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; about 10 percent fine and medium gravel; neutral; abrupt smooth boundary.

E—9 to 23 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine subangular blocky structure; very friable; about 10 percent fine and medium gravel; slightly alkaline; gradual wavy boundary.

Bt—23 to 34 inches; strong brown (7.5YR 4/6) sandy loam; weak medium subangular blocky structure; very friable; common distinct dark grayish brown

(10YR 4/2) colloid bridges between mineral grains; about 10 percent fine and medium gravel; slightly alkaline; abrupt wavy boundary.
2C—34 to 60 inches; brown (10YR 5/3) very gravelly sand; single grain; loose; about 45 percent medium and coarse gravel; violent effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 40 inches. The content of gravel ranges from 5 to 55 percent throughout the profile.

The Ap horizon has chroma of 2 or 3. The E horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam or gravelly sandy loam. The Bt horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 4 to 6. It is sandy loam, gravelly sandy clay loam, coarse sandy clay loam, or coarse sandy loam. The 2C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. It is sand, coarse sand, or the gravelly or very gravelly analogs of those textures.

Branch Series

The Branch series consists of moderately well drained soils on water-worked till plains. These soils formed in sandy and loamy beach deposits over loamy glacial till. Permeability is moderately rapid in the upper part of the profile, very rapid in the upper part of the substratum, and moderately slow in the lower part of the substratum. Slopes range from 0 to 6 percent.

Typical pedon of Branch sand, loamy substratum, 0 to 6 percent slopes, 200 feet north and 400 feet east of the southwest corner of sec. 13, T. 12 N., R. 6 E., Blumfield Township:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; about 5 percent fine and medium gravel; neutral; abrupt smooth boundary.
E1—8 to 18 inches; dark yellowish brown (10YR 4/6) sand; single grain; loose; about 12 percent fine and medium gravel; neutral; gradual wavy boundary.
E2—18 to 27 inches; yellowish brown (10YR 5/6) sand; common coarse faint dark yellowish brown (10YR 4/6) mottles; single grain; loose; about 12 percent fine and medium gravel; neutral; gradual wavy boundary.
Bt—27 to 34 inches; dark yellowish brown (10YR 3/4) gravelly sandy loam; common medium faint yellowish brown (10YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; very friable; few faint dark brown (7.5YR 3/4) colloid bridges between mineral grains; about 25 percent fine gravel; neutral; clear wavy boundary.
C1—34 to 45 inches; dark yellowish brown (10YR 4/6) sand; few fine faint yellowish brown (10YR 5/6) mottles; single grain; loose; neutral; abrupt wavy boundary.
2C2—45 to 49 inches; brown (10YR 5/3) very gravelly sand; few fine distinct yellowish brown (10YR 5/6) mottles; single grain; loose; about 5 percent coarse and 50 percent medium and fine gravel; violent effervescence; moderately alkaline; abrupt smooth boundary.
3C3—49 to 60 inches; brown (10YR 5/3) clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; violent effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 30 to 50 inches. The content of gravel ranges from 0 to 55 percent throughout the profile.

The Ap horizon has value of 3 or 4 and chroma of 2 to 4. The E horizon has value of 4 or 5. It is sand or loamy sand. The Bt horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 4 to 6. The C and 2C horizons have value of 4 or 5. They are very gravelly sand or sand. The 3C horizon has hue of 10YR or 5Y and value of 5 or 6. It is clay loam or silty clay loam.

Cadmus Series

The Cadmus series consists of moderately well drained, moderately slowly permeable soils on water-worked till plains. These soils formed in stratified, loamy and gravelly outwash and beach deposits over till deposits. Slopes range from 1 to 4 percent.

The Cadmus soils in Saginaw County have a subsoil that is thinner and less clayey than is definitive for the series. These differences, however, do not significantly affect the use and management of the soils.

Typical pedon of Cadmus gravelly sandy loam, 1 to 4 percent slopes, 2,400 feet north and 1,110 feet east of the southwest corner of sec. 31, T. 9 N., R. 4 E., Maple Grove Township:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; friable; about 20 percent fine and medium gravel; neutral; abrupt smooth boundary.
Bt—7 to 13 inches; dark yellowish brown (10YR 3/4) gravelly sandy clay loam; moderate medium subangular blocky structure; firm; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; about 20 percent fine and medium gravel;

slightly alkaline; gradual wavy boundary.
2BC—13 to 19 inches; yellowish brown (10YR 5/6) sand; common medium distinct dark yellowish brown (10YR 4/4) mottles in the lower 3 inches; single grain; loose; about 10 percent gravel; slightly alkaline; gradual wavy boundary.
3C1—19 to 25 inches; yellowish brown (10YR 5/4) gravelly sandy loam; weak medium subangular blocky structure; very friable; about 20 percent gravel; strong effervescence; moderately alkaline; gradual wavy boundary.
4C2—25 to 60 inches; brown (10YR 5/3) sandy clay loam; massive; firm; violent effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 19 to 36 inches. The content of gravel ranges from 0 to 20 percent throughout the profile.

The Ap horizon has chroma of 2 or 3. The Bt horizon has value of 3 to 5. It is gravelly sandy clay loam or gravelly loam. The 2BC horizon has hue of 10YR or 2.5Y and chroma of 4 to 6. It is sand, loamy sand, sandy loam, or gravelly analogs of those textures. The 3C and 4C horizons have hue of 10YR or 2.5Y. They are gravelly sandy loam, gravelly loam, or sandy clay loam.

Capac Series

The Capac series consists of somewhat poorly drained, moderately slowly permeable soils on till plains. These soils formed in loam or clay loam glacial till. Slopes range from 0 to 3 percent.

Typical pedon of Capac loam, 0 to 3 percent slopes, 50 feet south and 50 feet east of the northwest corner of sec. 11, T. 11 N., R. 1 E., Lakefield Township:

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; weak fine and medium subangular blocky structure; firm; about 3 percent fine gravel; neutral; abrupt smooth boundary.
B/E—12 to 14 inches; dark yellowish brown (10YR 4/6) loam (B); common grayish brown (10YR 5/2) coatings on faces of peds (E); common medium prominent reddish brown (5YR 4/4) mottles; weak fine and medium subangular blocky structure; firm; about 3 percent fine gravel; neutral; clear wavy boundary.
Bt1—14 to 26 inches; dark yellowish brown (10YR 4/4) loam; many medium and coarse distinct dark yellowish brown (10YR 4/6) and many medium and coarse distinct grayish brown (10YR 5/2) mottles; moderate fine and medium subangular blocky structure; firm; many faint grayish brown silt coatings on faces of peds; few distinct dark yellowish brown (10YR 4/6) clay films on faces of peds; about 3 percent fine gravel; neutral; clear wavy boundary.
Bt2—26 to 38 inches; yellowish brown (10YR 5/6) loam; many medium and coarse distinct dark yellowish brown (10YR 4/4) and many medium and coarse distinct grayish brown (10YR 5/2) mottles; weak fine and medium subangular blocky structure; firm; many faint grayish brown silt coatings on faces of peds; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 3 percent fine gravel; neutral; clear wavy boundary.
C1—38 to 51 inches; strong brown (7.5YR 5/6) loam; common medium distinct dark yellowish brown (10YR 4/6) and common medium prominent grayish brown (10YR 5/2) mottles; massive; firm; about 3 percent gravel; slight effervescence; slightly alkaline; gradual wavy boundary.
C2—51 to 60 inches; dark yellowish brown (10YR 4/4) loam; common fine and medium distinct grayish brown (10YR 5/2) mottles; massive; firm; about 3 percent fine gravel; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 26 to 38 inches. The content of gravel ranges from 1 to 10 percent throughout the profile.

The Ap horizon has value of 3 or 4 and chroma of 1 or 2. It is loam or gravelly sandy loam. The B part of the B/E horizon has value of 4 or 5 and chroma of 3 to 6. The E part has hue of 10YR or 7.5YR and value of 4 or 5. Some pedons do not have a B/E horizon. The Bt and C horizons are loam or clay loam. The Bt horizon has hue 10YR or 7.5YR and chroma of 3 to 6. The C horizon has value of 4 to 6 and chroma of 2 to 4.

Ceresco Series

The Ceresco series consists of somewhat poorly drained soils on flood plains. These soils formed in loamy alluvial material. Permeability is moderate. Slopes range from 0 to 2 percent.

Typical pedon of Ceresco silt loam, in an area of Sloan-Ceresco complex, rarely flooded, 1,500 feet south and 300 feet east of the northwest corner of sec. 2, T. 10 N., R. 4 E., Albee Township:

Ap—0 to 11 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; slightly alkaline; abrupt smooth boundary.
Bw—11 to 19 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct yellowish brown (10YR

5/8) and common medium faint pale brown (10YR 6/3) mottles; weak fine subangular blocky structure; friable; neutral; clear wavy boundary.

Cg—19 to 54 inches; light brownish gray (10YR 6/2), stratified silt loam and very fine sand; common medium prominent yellowish brown (10YR 5/8), common medium prominent strong brown (7.5YR 5/6), and common medium faint light gray (10YR 7/2) mottles; weak medium subangular blocky structure; friable; prominent black (10YR 2/1) organic coatings on horizontal faces of peds; slight effervescence; moderately alkaline; clear wavy boundary.

2C—54 to 60 inches; yellowish brown (10YR 5/6) fine sandy loam; common medium distinct yellowish brown (10YR 5/8), common medium distinct strong brown (7.5YR 4/6), and common medium distinct light brownish gray (10YR 6/2) mottles; weak very fine subangular blocky structure; friable; strong effervescence; moderately alkaline.

The depth to free carbonates ranges from 20 to 40 inches. The Ap horizon has chroma of 2 or 3. The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 or 4.

Chesaning Series

The Chesaning series consists of somewhat poorly drained soils on flood plains. These soils formed in loamy alluvial material over sandy alluvial material. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Chesaning silt loam, in an area of Chesaning-Cohoctah complex, rarely flooded, 80 feet north and 2,340 feet east of the southwest corner of sec. 22, T. 11 N., R. 2 E., Richland Township:

A—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; neutral; clear smooth boundary.

C—6 to 18 inches; dark brown (10YR 4/3) very fine sandy loam; few medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very friable; slight effervescence; slightly alkaline; gradual wavy boundary.

Cg—18 to 22 inches; dark grayish brown (10YR 4/2) sandy loam; common medium distinct dark yellowish brown (10YR 4/6) and prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; very friable; few faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slight effervescence; slightly alkaline; gradual wavy boundary.

C′—22 to 28 inches; yellowish brown (10YR 5/4) sandy loam; common medium distinct yellowish brown (10YR 5/6) and prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; very friable; slight effervescence; slightly alkaline; gradual wavy boundary.

2C1—28 to 44 inches; yellowish brown (10YR 5/6) loamy sand; common fine and medium distinct strong brown (7.5YR 5/6) mottles; weak fine granular structure; very friable; slight effervescence; slightly alkaline; gradual wavy boundary.

2C2—44 to 53 inches; pale brown (10YR 6/3) sand; single grain; loose; slight effervescence; slightly alkaline; gradual wavy boundary.

2Cg—53 to 60 inches; gray (10YR 5/1) sand; few fine prominent yellowish brown (10YR 5/6) mottles; single grain; loose; few faint very dark grayish brown (10YR 3/2) organic stains; slight effervescence; slightly alkaline.

Depth to the sandy material ranges from 25 to 40 inches. The A or Ap horizon has chroma of 1 or 2. It is silt loam, fine sandy loam, or very fine sandy loam. The C horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 to 4. It is sandy loam, very fine sandy loam, or stratified very fine sandy loam, silt loam, and loamy very fine sand. The 2C horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6. It is sand, loamy sand, or gravelly sand. The content of gravel in this horizon ranges from 0 to 25 percent.

Cohoctah Series

The Cohoctah series consists of poorly drained soils on flood plains. These soils formed in calcareous, loamy and sandy material. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 2 percent.

The Cohoctah soils in Saginaw County are taxadjuncts because they are calcareous to the surface. This difference, however, does not significantly affect the use and management of the soils.

Typical pedon of Cohoctah very fine sandy loam, in an area of Chesaning-Cohoctah complex, rarely flooded, 360 feet north and 1,680 feet west of the southeast corner of sec. 10, T. 10 N., R. 3 E., St. Charles Township:

A—0 to 10 inches; very dark gray (10YR 3/1) very fine sandy loam, gray (10YR 5/1) dry; weak fine granular structure; very friable; violent effervescence; moderately alkaline; clear wavy boundary.

Cg1—10 to 22 inches; dark gray (10YR 4/1) very fine sandy loam; common medium distinct dark brown (10YR 4/3) mottles; moderate fine subangular blocky structure; very friable; violent effervescence; moderately alkaline; clear wavy boundary.
Cg2—22 to 27 inches; dark grayish brown (10YR 4/2) sandy loam; few fine prominent yellowish brown (10YR 5/8) and common medium faint brown (10YR 5/3) mottles; weak fine subangular blocky structure; very friable; violent effervescence; moderately alkaline; abrupt wavy boundary.
2Cg3—27 to 40 inches; dark grayish brown (10YR 4/2) sand; few fine prominent yellowish brown (10YR 5/8) and common medium faint brown (10YR 5/3) mottles; single grain; loose; violent effervescence; moderately alkaline; clear wavy boundary.
2Cg4—40 to 50 inches; grayish brown (10YR 5/2) sand; few fine faint brown (10YR 5/3) mottles; single grain; loose; strong effervescence; moderately alkaline; clear wavy boundary.
2Cg5—50 to 60 inches; dark grayish brown (10YR 4/2) coarse sand; single grain; loose; violent effervescence; moderately alkaline.

The depth to sandy material ranges from 24 to 33 inches. The A or Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Cg horizon has value of 3 to 6. It is very fine sandy loam, fine sandy loam, or sandy loam. The 2Cg horizon has hue of 10YR or 2.5Y, value of 2 to 7, and chroma of 1 or 2. It is sand or coarse sand.

Corunna Series

The Corunna series consists of poorly drained soils on water-worked till plains. These soils formed in loamy glacial till. Permeability is moderately rapid in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Corunna sandy loam, 40 feet north and 100 feet east of the southwest corner of sec. 22, T. 10 N., R. 1 E., Marion Township:

Ap—0 to 11 inches; very dark gray (10YR 3/1) sandy loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure parting to weak medium granular; about 5 percent fine and medium gravel; friable; slightly alkaline; abrupt smooth boundary.
Bg—11 to 27 inches; gray (5Y 5/1) sandy loam; few medium prominent strong brown (7.5YR 5/8) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; about 5 percent fine gravel; slightly alkaline; abrupt wavy boundary.
2Cg—27 to 60 inches; dark gray (5Y 4/1) clay loam; common medium prominent strong brown (7.5YR 5/8) and few medium prominent strong brown (7.5YR 5/6) mottles; massive; firm; about 6 percent fine gravel; strong effervescence; slightly alkaline.

The thickness of the solum and the depth to free carbonates range from 26 to 40 inches. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Bg horizon has hue of 5Y or 10YR and chroma of 1 or 2. Some pedons have a Cg horizon. The 2Cg horizon has value of 4 to 6 and chroma of 1 or 2. It is clay loam, loam, or silty clay loam.

Covert Series

The Covert series consists of moderately well drained, rapidly permeable soils on outwash plains and beach ridges on water-worked till plains. These soils formed in sandy outwash and beach deposits. Slopes range from 1 to 6 percent.

Typical pedon of Covert sand, 1 to 6 percent slopes, 190 feet north and 760 feet east of the southwest corner of sec. 7, T. 10 N., R. 2 E., Brant Township:

A—0 to 4 inches; black (10YR 2/1) and light gray (10YR 7/1) sand, gray (10YR 5/1) dry; single grain; loose; strongly acid; clear wavy boundary.
E—4 to 8 inches; brown (7.5YR 5/2) sand; single grain; loose; medium acid; clear irregular boundary.
Bs1—8 to 11 inches; dark brown (7.5YR 3/4) sand; single grain; loose; about 10 percent weakly cemented ortstein; medium acid; gradual wavy boundary.
Bs2—11 to 17; strong brown (7.5YR 4/6) sand; single grain; loose; medium acid; gradual irregular boundary.
Bs3—17 to 24 inches; yellowish brown (10YR 5/6) sand; common fine distinct strong brown (7.5YR 5/6) mottles; single grain; loose; slightly acid; gradual wavy boundary.
BC—24 to 35 inches; light yellowish brown (10YR 6/4) sand; many coarse prominent yellowish red (5YR 5/8) and common medium prominent strong brown (7.5YR 5/8) mottles; single grain; loose; neutral; gradual irregular boundary.
C—35 to 60 inches; yellowish brown (10YR 5/6) sand; common medium distinct yellowish brown (10YR 5/8) mottles; single grain; loose; neutral.

The thickness of the solum ranges from 30 to 45 inches. The A or Ap horizon has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 1 to 3. The E horizon has hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 1 to 3. The Bs horizon has hue of 10YR, 7.5YR, or 5YR and value and chroma of 3 to 6. The content of small ortstein fragments in this horizon ranges from 0 to

20 percent. Some pedons do not have a BC horizon. The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6.

Fabius Series

The Fabius series consists of somewhat poorly drained soils on low beach ridges on lake plains. These soils formed in loamy material over gravelly shoreline deposits. Permeability is moderate in the upper part of the profile and rapid or very rapid in the lower part. Slopes range from 0 to 3 percent.

Typical pedon of Fabius sandy loam, 0 to 3 percent slopes, 200 feet north and 2,040 feet west of the southeast corner of sec. 34, T. 9 N., R. 2 E., Brady Township:

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; about 6 percent fine and medium gravel; slightly alkaline; abrupt smooth boundary.

E—12 to 16 inches; brown (10YR 5/3) sandy loam; common medium prominent strong brown (7.5YR 5/6) and few fine distinct brownish yellow (10YR 6/6) mottles; weak medium subangular blocky structure; friable; about 6 percent fine and medium gravel; slightly alkaline; clear wavy boundary.

Bt—16 to 22 inches; dark yellowish brown (10YR 4/4) sandy clay loam; common medium prominent strong brown (7.5YR 5/6) and few fine distinct brownish yellow (10YR 6/6) mottles; weak medium subangular blocky structure; friable; few clay bridges between mineral grains; about 12 percent fine and medium gravel; slightly alkaline; abrupt wavy boundary.

2C—22 to 50 inches; yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) very gravelly sand; single grain; loose; about 50 percent fine and medium gravel and 10 percent coarse gravel; strong effervescence; slightly alkaline; clear wavy boundary.

2Cg—50 to 60 inches; gray (10YR 6/1) gravelly coarse sand; single grain; loose; about 25 percent fine and medium gravel; violent effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 30 inches. The Ap horizon has chroma of 2 or 3. The E horizon has hue of 10YR or 2.5Y and chroma of 3 or 4. It is sandy loam or loamy coarse sand. The Bt horizon has value of 4 or 5 and chroma of 3 or 4. It is sandy clay loam, sandy loam, or the gravelly analogs of those textures. The 2Cg horizon has value of 5 or 6 and chroma of 1 to 6.

Frankenmuth Series

The Frankenmuth series consists of somewhat poorly drained, moderately slowly permeable soils on lake plains. These soils formed in stratified, silty lacustrine material. Slopes range from 0 to 4 percent.

Typical pedon of Frankenmuth very fine sandy loam, in an area of Pella-Frankenmuth complex, 0 to 4 percent slopes, 650 feet south and 100 feet west of the northeast corner of sec. 33, T. 13 N., R. 3 E., Tittabawassee Township:

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

E—9 to 13 inches; light yellowish brown (10YR 6/4) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; neutral; abrupt wavy boundary.

Bt—13 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and common medium prominent greenish gray (5G 6/1) mottles; moderate fine and medium subangular blocky structure; firm; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; many distinct and common faint silt coatings on faces of peds; neutral; clear smooth boundary.

C1—18 to 35 inches; pale brown (10YR 6/3) very fine sand; common medium and coarse distinct brownish yellow (10YR 6/6) mottles; massive; friable; slightly alkaline; gradual smooth boundary.

C2—35 to 60 inches; pale brown (10YR 6/3), stratified very fine sand and silty clay loam; common coarse prominent yellowish brown (10YR 5/8), common coarse prominent brownish yellow (10YR 6/8), and few fine and common coarse prominent greenish gray (5G 6/1) mottles; massive parting to weak medium and thin plates resulting from deposition; common faint light reddish brown (5YR 6/4) silty clay coatings; slightly alkaline.

The thickness of the solum and the depth to free carbonates range from 10 to 22 inches. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has value of 5 or 6 and chroma of 3 or 4. It is silt loam or loam. Some pedons do not have an E horizon. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is silty clay loam or silt loam. The C horizon has hue of 7.5YR to 5Y, value of 5 to 7, and chroma of 3 or 4. It is very fine sand or stratified very fine sand and silty clay loam.

Gagetown Series

The Gagetown series consists of moderately well drained, moderately slowly permeable soils on lake plains. These soils formed in silty lacustrine material. Slopes range from 2 to 12 percent.

Typical pedon of Gagetown silt loam, 2 to 6 percent slopes, 1,360 feet south and 380 feet west of the northeast corner of sec. 25, T. 11 N., R. 6 E., Frankenmuth Township:

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; friable; slightly alkaline; abrupt smooth boundary.

Bw—11 to 14 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few discontinuous faint dark yellowish brown (10YR 4/4) coatings on horizontal faces of peds; about 10 percent black (10YR 2/1) krotovinas; moderately alkaline; clear wavy boundary.

C—14 to 60 inches; light yellowish brown (10YR 6/4), stratified silt loam and very fine sandy loam; few fine distinct brownish yellow (10YR 6/6) mottles; massive parting to moderate coarse plates resulting from deposition; friable; violent effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 11 to 16 inches. The Ap horizon has value and chroma of 2 or 3. The Bw horizon has value of 5 or 6. It is silt loam or very fine sandy loam. The C horizon has hue of 10YR or 2.5Y and value of 4 to 6. It is stratified silt loam, very fine sandy loam, silt, or very fine sand.

Granby Series

The Granby series consists of poorly drained soils on lake plains. These soils formed in sandy lacustrine material. They generally are rapidly permeable throughout. In the loamy substratum phase, however, permeability is rapid in the sandy part of the profile and moderately slow in the loamy part. Slopes range from 0 to 2 percent.

Typical pedon of Granby fine sand, 60 feet south and 780 feet east of the northwest corner of sec. 15, T. 10 N., R. 6 E., Birch Run Township:

Ap—0 to 12 inches; black (N 2/0) fine sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; slightly alkaline; abrupt smooth boundary.

Bg—12 to 20 inches; grayish brown (10YR 5/2) fine sand; common medium distinct olive gray (5Y 5/2) mottles; single grain; loose; slightly alkaline; clear irregular boundary.

Bw—20 to 48 inches; yellowish brown (10YR 5/4) fine sand; few fine distinct dark yellowish brown (10YR 4/6) and common medium prominent strong brown (7.5YR 5/6) mottles; single grain; loose; slightly alkaline; gradual wavy boundary.

Cg—48 to 60 inches; gray (10YR 5/1) fine sand; common medium prominent yellowish brown (10YR 5/6) mottles; single grain; loose; strong effervescence; slightly alkaline.

The thickness of the solum and the depth to free carbonates range from 25 to 50 inches. The Ap, Bg, and Bw horizons are sand or fine sand. The Ap horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The Bg horizon has value of 4 to 6 and chroma of 1 or 2. The Bw horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4. The Cg horizon has hue of 10YR, 5Y, or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is dominantly sand or fine sand. In the loamy substratum phase, however, silty clay loam or silt loam is below a depth of 40 inches.

Grattan Series

The Grattan series consists of excessively drained, rapidly permeable soils on beach ridges on lake plains and water-worked till plains. These soils formed in water- and wind-deposited material. Slopes range from 4 to 12 percent.

Typical pedon of Grattan sand, 4 to 12 percent slopes, 450 feet north and 50 feet west of the southeast corner of sec. 9, T. 11 N., R. 2 E., Fremont Township:

A—0 to 2 inches; very dark grayish brown (10YR 3/2) sand, dark grayish brown (10YR 4/2) dry; single grain; loose; slightly acid; abrupt wavy boundary.

E—2 to 7 inches; grayish brown (10YR 5/2) sand; single grain; loose; slightly acid; abrupt wavy boundary.

Bs1—7 to 20 inches; dark brown (7.5YR 4/4) sand; single grain; loose; medium acid; clear wavy boundary.

Bs2—20 to 27 inches; strong brown (7.5YR 4/6) sand; single grain; loose; strongly acid; clear wavy boundary.

BC—27 to 35 inches; yellowish brown (10YR 5/6) sand; single grain; loose; slightly acid; clear wavy boundary.

C—35 to 60 inches; brownish yellow (10YR 6/6) sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 20 to 50 inches. The content of gravel ranges from 0 to 5 percent throughout the profile.

The A or Ap horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 1 or 2. Some pedons have a Bhs horizon, which less than 2 inches thick. The Bs horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 4 to 8. The content of ortstein in this horizon ranges from 0 to 10 percent. Some pedons do not have a BC horizon. The C horizon has chroma of 4 to 6.

Lenawee Series

The Lenawee series consists of poorly drained, slowly permeable soils on lake plains. These soils formed in loamy lacustrine material. Slopes range from 0 to 2 percent.

The Lenawee soils in Saginaw County have a surface layer that is thicker than is definitive for the series. This difference, however, does not significantly affect the use and management of the soils.

Typical pedon of Lenawee silty clay loam, 250 feet north and 120 feet east of the southwest corner of sec. 33, T. 10 N., R. 6 E., Birch Run Township:

Ap—0 to 12 inches; very dark grayish brown (2.5Y 3/2) silty clay loam, grayish brown (10YR 5/2) dry; common medium prominent yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure parting to moderate medium granular; friable; neutral; abrupt smooth boundary.

Bg—12 to 26 inches; gray (5Y 5/1) clay loam; common medium prominent strong brown (7.5YR 5/8) and common medium prominent reddish yellow (7.5YR 6/8) mottles; moderate medium subangular blocky structure; firm; few medium irregular concretions of iron and manganese oxide; slightly alkaline; diffuse wavy boundary.

Cg1—26 to 42 inches; gray (5Y 5/1) clay loam; common medium prominent strong brown (7.5YR 5/8) and common medium prominent reddish yellow (7.5YR 6/8) mottles; massive; firm; few continuous faint dark gray (5Y 4/1) coatings in root channels and pores; common medium irregular concretions of iron and manganese oxide; slightly alkaline; diffuse wavy boundary.

Cg2—42 to 60 inches; gray (5Y 5/1) clay loam; common coarse prominent strong brown (7.5YR 5/8) and common medium prominent reddish yellow (7.5YR 6/8) mottles; massive; firm; few faint greenish gray (5G 6/1) coatings on horizontal bedding planes; slight effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 25 to 42 inches. The Ap horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. The Bg horizon has hue of 10YR or 5Y, value of 4 to 6, and chroma of 1 or 2. It is clay loam or silty clay loam. The Cg horizon has hue of 10YR, 5Y, 2.5Y, or 5GY and value of 4 to 6. It is dominantly clay loam or silty clay loam, but in some pedons it has strata of silty clay.

Londo Series

The Londo series consists of somewhat poorly drained, moderately slowly permeable soils on till plains. These soils formed in loamy glacial till. Slopes range from 0 to 3 percent.

The Londo soils in Saginaw County do not have the interfingering of albic material that is definitive for the series. This difference, however, does not significantly affect the use and management of the soils.

Typical pedon of Londo loam, 0 to 3 percent slopes, 150 feet south and 375 feet west of the northeast corner of sec. 21, T. 12 N., R. 6 E., Blumfield Township:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; firm; about 3 percent fine and medium gravel; neutral; abrupt smooth boundary.

Bt—9 to 13 inches; dark brown (7.5YR 4/4) clay loam; many medium and coarse prominent yellowish brown (10YR 5/6) and common coarse prominent grayish brown (10YR 5/2) mottles; weak fine and medium subangular blocky structure; firm; many grayish brown (10YR 4/2) silt coatings on faces of peds; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; about 3 percent fine and medium gravel; neutral; clear wavy boundary.

C1—13 to 32 inches; brown (10YR 5/3) loam; many coarse faint grayish brown (10YR 5/2), common medium distinct yellowish brown (10YR 5/6), and few fine prominent greenish gray (5GY 6/1) mottles; weak medium subangular blocky structure; firm; about 3 percent fine gravel; violent effervescence; moderately alkaline; gradual wavy boundary.

C2—32 to 40 inches; brown (7.5YR 5/4) loam; many medium prominent yellowish brown (10YR 5/8) and many coarse prominent greenish gray (5G 6/1) mottles; massive; firm; about 3 percent fine gravel; violent effervescence; moderately alkaline; gradual wavy boundary.

C3—40 to 60 inches; light brown (7.5YR 6/4) loam; many medium prominent yellowish brown (10YR 5/8) and many coarse prominent light brownish gray (10YR 6/2) mottles; massive; firm; about 5 percent

fine and medium gravel; violent effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 13 to 24 inches. The content of gravel is 3 to 5 percent throughout the profile.

The Ap horizon has value of 3 or 4 and chroma of 1 or 2. The Bt and C horizons are loam or clay loam. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4.

Misteguay Series

The Misteguay series consists of poorly drained, slowly permeable soils on flood plains. These soils formed in clayey or silty alluvial material. Slopes range from 0 to 2 percent.

Typical pedon of Misteguay silty clay, in an area of Zilwaukee-Misteguay complex, frequently flooded, 1,350 feet south and 100 feet west of the northeast corner of sec. 9, T. 11 N., R. 3 E., Swank Creek Township:

Ap—0 to 10 inches; very dark grayish brown (2.5Y 3/2) silty clay, light brownish gray (2.5Y 6/2) dry; weak coarse subangular blocky structure parting to weak coarse granular; firm; few white snail shells; slightly alkaline; abrupt smooth boundary.

A—10 to 14 inches; very dark grayish brown (2.5Y 3/2) silty clay, light brownish gray (2.5Y 6/2) dry; weak coarse subangular blocky structure; firm; few white snail shells; slight effervescence; slightly alkaline; abrupt wavy boundary.

Bg—14 to 18 inches; olive gray (5Y 5/2) silty clay; few fine and medium prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few white snail shells; strong effervescence; moderately alkaline; clear wavy boundary.

Bw—18 to 25 inches; yellowish brown (10YR 5/4) and brown (7.5YR 5/4) silty clay; continuous gray (5Y 5/1) coatings on faces of peds; common medium prominent gray (5Y 5/1) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium and coarse angular blocky structure; firm; few white snail shells; few white (10YR 8/1) irregular masses of carbonate; few black (10YR 3/1) accumulations of manganese on faces of peds; strong effervescence; slightly alkaline; gradual wavy boundary.

C—25 to 60 inches; brown (7.5YR 5/4) silty clay; common coarse prominent gray (5Y 5/1) mottles; massive parting to weak medium plates resulting from deposition; firm; gray (5Y 5/1) silt coatings on horizontal faces of strata; few white snail shells; few white (10YR 8/1) irregular soft masses of carbonate; violent effervescence; moderately alkaline.

The texture is silty clay or silty clay loam throughout the profile. The Ap and A horizons have hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 1 or 2. The Bg and Bw horizons have hue of 7.5YR to 5Y, value of 4 or 5, and chroma of 1 to 6. At least one subhorizon has chroma of 3 or more. The C horizon has hue of 7.5YR to 5Y, value of 4 or 5, and chroma of 4 to 6.

Parkhill Series

The Parkhill series consists of poorly drained, moderately slowly permeable soils on till plains. These soils formed in loamy glacial till. Slopes range from 0 to 2 percent.

The Parkhill soils in Saginaw County have a surface layer that is thicker than is definitive for the series. This difference, however, does not significantly affect the use and management of the soils.

Typical pedon of Parkhill loam, in an area of Parkhill-Wixom complex, 0 to 4 percent slopes, 440 feet north and 50 feet west of the southeast corner of sec. 32, T. 10 N., R. 3 E., St. Charles Township:

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) loam, dark yellowish brown (10YR 4/4) dry; weak fine and medium subangular blocky structure; firm; neutral; abrupt smooth boundary.

Bg1—11 to 20 inches; gray (10YR 5/1) clay loam; many fine and medium prominent strong brown (7.5YR 5/8) and common fine and medium prominent strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure; firm; neutral; clear smooth boundary.

Bg2—20 to 32 inches; gray (5Y 5/1) clay loam; many medium and coarse prominent yellowish brown (10YR 5/6) and common fine and medium prominent yellowish brown (10YR 5/8) mottles; weak fine and medium subangular blocky structure; firm; slightly alkaline; gradual wavy boundary.

Cg—32 to 60 inches; gray (5Y 5/1) clay loam; many fine and medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; massive; firm; slight effervescence; slightly alkaline.

The thickness of the solum and the depth to free carbonates range from 30 to 40 inches. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Bg and Cg horizons are loam or clay loam. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. The Cg horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 or 2.

Pella Series

The Pella series consists of poorly drained, moderately permeable soils on lake plains. These soils formed in silty lacustrine material. Slopes range from 0 to 2 percent.

Typical pedon of Pella silt loam, in an area of Pella-Frankenmuth complex, 0 to 4 percent slopes, 650 feet south and 50 feet west of the northeast corner of sec. 3, T. 13 N., R. 3 E., Tittabawassee Township:

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

Bg1—9 to 16 inches; grayish brown (10YR 5/2) silt loam; common medium prominent greenish gray (5G 6/1) and common coarse prominent yellowish brown (10YR 5/8) mottles; moderate fine and medium subangular blocky structure; firm; neutral; clear smooth boundary.

Bg2—16 to 24 inches; pinkish gray (7.5YR 6/2) silt loam; many coarse prominent yellowish brown (10YR 5/8) and common medium prominent greenish gray (5G 6/1) mottles; weak fine and medium subangular blocky structure; firm; slight effervescence; slightly alkaline; gradual smooth boundary.

2C—24 to 60 inches; pale brown (10YR 6/3), stratified silty clay loam and silt loam; many coarse prominent strong brown (7.5YR 5/6), many coarse distinct yellowish brown (10YR 5/6), and common medium prominent greenish gray (5G 6/1) mottles; massive; firm; slight effervescence; slightly alkaline.

The thickness of the solum and the depth to free carbonates range from 16 to 24 inches. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Bg horizon has hue of 10YR, 7.5YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is silt loam, silty clay loam, or silty clay. The 2C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 3 or 4. It is stratified silt loam, loam, silty clay loam, or clay loam.

Pipestone Series

The Pipestone series consists of somewhat poorly drained soils on outwash plains, lake plains, and water-worked till plains. These soils formed in sandy outwash and lacustrine material. They generally are rapidly permeable throughout. In the loamy substratum phase, however, permeability is rapid in the sandy part of the profile and slow or moderately slow in the loamy part. Slopes range from 0 to 3 percent.

Typical pedon of Pipestone sand, 0 to 3 percent slopes, 1,800 feet south and 100 feet east of the northwest corner of sec. 7, T. 12 N., R. 2 E., Richland Township:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

E—10 to 12 inches; about 60 percent grayish brown (10YR 5/2) and 40 percent pinkish gray (7.5YR 7/2) sand; single grain; loose; neutral; abrupt wavy boundary.

Bs1—12 to 21 inches; dark brown (7.5YR 4/4) sand; common medium prominent strong brown (7.5YR 5/8) mottles; single grain; loose; about 20 percent dark brown (7.5YR 3/2), weakly cemented ortstein; neutral; gradual wavy boundary.

Bs2—21 to 26 inches; yellowish brown (10YR 5/8) sand; few medium distinct dark yellowish brown (10YR 4/6) mottles; single grain; loose; neutral; gradual wavy boundary.

BC—26 to 45 inches; yellow (10YR 7/6) sand; many medium distinct brownish yellow (10YR 6/8) mottles; single grain; loose; neutral; abrupt smooth boundary.

C—45 to 60 inches; pale brown (10YR 6/3) sand; single grain; loose; slightly alkaline.

The solum ranges from 25 to 45 inches in thickness. The Ap or A horizon has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 1 to 3. The E, Bs, and BC horizons are sand or fine sand. The E horizon has value of 5 or 6 and chroma of 1 to 3. Some pedons do not have an E horizon. The Bs horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 8. The content of ortstein in this horizon ranges from 0 to 30 percent. The BC horizon has value of 6 or 7 and chroma of 4 to 6. Some pedons do not have a BC horizon. The C horizon has value of 5 or 6 and chroma or 3 or 4. It is dominantly sand or fine sand. In the loamy substratum phase, however, loam or silty clay loam is below a depth of 40 inches.

Poseyville Series

The Poseyville series consists of somewhat poorly drained soils on water-worked till plains. These soils formed in sandy and loamy water-worked material over loamy glacial till. Permeability is rapid in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 3 percent.

Typical pedon of Poseyville loamy fine sand, in an area of Tappan-Poseyville complex, 0 to 3 percent slopes, 1,600 feet north and 100 feet east of the

southwest corner of sec. 27, T. 12 N., R. 6 E., Blumfield Township:

Ap—0 to 10 inches; dark brown (10YR 4/3) loamy fine sand, light brownish gray (10YR 6/2) dry; weak fine and medium subangular blocky structure; friable; about 5 percent fine gravel; slightly alkaline; abrupt smooth boundary.

E—10 to 12 inches; pale brown (10YR 6/3) sand; single grain; loose; about 3 percent fine gravel; neutral; abrupt wavy boundary.

Bt—12 to 17 inches; dark brown (7.5YR 4/4) sandy loam; common fine distinct dark brown (7.5YR 4/2) mottles; weak fine subangular blocky structure; friable; few distinct dark brown (7.5YR 4/2) clay bridges between mineral grains; about 5 percent fine gravel; slightly alkaline; clear smooth boundary.

2Cg—17 to 60 inches; gray (10YR 5/1) loam; many medium distinct pinkish gray (7.5YR 6/2), many medium prominent yellowish brown (10YR 5/6), and many medium prominent greenish gray (5GY 6/1) mottles; massive; firm; about 8 percent fine gravel; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 15 to 24 inches. The content of gravel ranges from 3 to 8 percent throughout the profile.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. The E horizon has value of 5 or 6 and chroma of 2 or 3. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is coarse sandy loam or sandy loam. The 2Cg horizon has hue of 10YR or 5Y, value of 5 or 6, and chroma of 1 or 2. It is loam or clay loam.

Roundhead Series

The Roundhead series consists of very poorly drained, moderately slowly permeable soils in depressions on lake plains and flood plains. These soils formed in a thin layer of organic material, which is underlain by silty lacustrine material. Slopes range from 0 to 2 percent.

Typical pedon of Roundhead muck, 400 feet south and 200 feet west of the northeast corner of sec. 3, T. 12 N., R. 5 E., Buena Vista Township:

Oap—0 to 9 inches; black (N 2/0) muck; moderate medium granular structure; very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

Cg1—9 to 18 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 5/8) mottles; massive; firm; violent effervescence; moderately alkaline; clear wavy boundary.

2Cg2—18 to 31 inches; grayish brown (2.5Y 5/2) very fine sandy loam; common medium prominent yellowish brown (10YR 5/4) and distinct gray (10YR 6/1) mottles; massive; very friable; strong effervescence; moderately alkaline; clear wavy boundary.

3Cg3—31 to 60 inches; dark gray (5Y 4/1) silt loam; common medium and coarse prominent dark yellowish brown (10YR 4/4) and common medium distinct dark grayish brown (2.5Y 4/2) mottles; massive; friable; violent effervescence; moderately alkaline.

The Oap horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is 9 to 12 inches thick. The Cg, 2Cg, and 3Cg horizons have hue of 10YR, 2.5Y, or 5Y and value of 4 to 6. They are dominantly silt loam but have strata of very fine sandy loam or loam.

Sanilac Series

The Sanilac series consists of somewhat poorly drained, moderately slowly permeable soils on lake plains. These soils formed in silty lacustrine material. Slopes range from 1 to 3 percent.

The Sanilac soils in Saginaw County have a surface layer that is darker than is definitive for the series. Also, they do not have gray mottles in the subsoil. These differences, however, do not significantly affect the use and management of the soils.

Typical pedon of Sanilac very fine sandy loam, 1 to 3 percent slopes, 1,300 feet north and 60 feet west of the southeast corner of sec. 36, T. 11 N., R. 6 E., Frankenmuth Township:

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) very fine sandy loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

Bw—10 to 15 inches; brownish yellow (10YR 6/6) very fine sandy loam; common fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; few distinct dark yellowish brown (10YR 4/4) silt coatings on faces of peds; strong effervescence; moderately alkaline; clear wavy boundary.

C—15 to 60 inches; light yellowish brown (10YR 6/4), stratified very fine sand and silt; common fine distinct brownish yellow (10YR 6/8) and yellowish brown (10YR 5/8) mottles; moderate medium platy

structure; friable; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 15 to 31 inches. The Ap horizon has value of 3 or 4 and chroma of 2 or 3. The Bw horizon has hue of 2.5Y or 10YR and value of 5 or 6. The C horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 3 or 4. It is silt loam or stratified very fine sand and silt.

Shiawassee Series

The Shiawassee series consists of somewhat poorly drained soils on water-worked till plains. These soils formed in loamy outwash over loamy glacial till. Permeability is moderately rapid in the upper part of the profile and very slow in the lower part. Slopes range from 0 to 3 percent.

Typical pedon of Shiawassee gravelly sandy loam, 0 to 3 percent slopes, 50 feet north and 1,800 feet east of the southwest corner of sec. 32, T. 9 N., R. 4 E., Maple Grove Township:

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; friable; about 30 percent fine and medium gravel; neutral; abrupt smooth boundary.

Bt—11 to 27 inches; dark yellowish brown (10YR 4/6) very fine sandy loam; many coarse distinct brown (10YR 5/3) and common medium distinct strong brown (7.5YR 5/8) and light gray (10YR 7/2) mottles; moderate medium subangular blocky structure; friable; few distinct yellowish brown (10YR 5/4) clay films on the lower faces of peds; few medium irregular concretions of iron and manganese oxide; about 5 percent fine gravel; slightly alkaline; diffuse wavy boundary.

2BC—27 to 34 inches; brown (10YR 5/3) loam; common medium prominent brownish yellow (10YR 6/8) and few fine prominent greenish gray (5G 6/1) mottles; strong medium subangular blocky structure; firm; about 10 percent fine and medium gravel; strong effervescence; moderately alkaline; clear wavy boundary.

2Cd—34 to 60 inches; brown (10YR 5/3) loam; few fine prominent greenish gray (5G 6/1) mottles; strong medium platy soil fragments; very firm; common coarse irregular soft masses of calcium carbonate; about 5 percent gravel; violent effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 16 to 36 inches. The content of gravel ranges from 15 to 30 percent in the surface layer and from 5 to 15 percent in the rest of the profile.

The Ap horizon has chroma of 1 or 3. It is sandy loam or gravelly sandy loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is sandy loam, loam, or coarse sandy loam. The BC horizon has value of 4 or 5 and chroma of 3 or 4. It is loam or very fine sandy loam. The Cd horizon has hue of 10YR, 5Y, or 5G, value of 5 or 6, and chroma of 1 to 4. It is clay loam or loam.

Sloan Series

The Sloan series consists of very poorly drained soils on flood plains. These soils formed in loamy alluvial material. Permeability is moderately slow. Slopes range from 0 to 2 percent.

Typical pedon of Sloan silt loam, in an area of Sloan-Ceresco complex, rarely flooded, 320 feet south and 360 feet west of the northeast corner of sec. 2, T. 10 N., R. 4 E., Albee Township:

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; few fine distinct dark yellowish brown (10YR 4/4) and few fine prominent gray (5Y 6/1) mottles; moderate medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

A—12 to 24 inches; very dark gray (10YR 3/1) fine sandy loam; few fine prominent strong brown (7.5YR 4/6) and few fine prominent yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; friable; neutral; clear wavy boundary.

Bg1—24 to 42 inches; dark gray (10YR 4/1) silty clay loam; few fine prominent dark yellowish brown (10YR 4/6), common medium prominent dark brown (7.5YR 4/4), and few fine distinct dark brown (7.5YR 4/2) mottles; strong coarse subangular blocky structure; firm; common medium irregular concretions of iron and manganese oxide; neutral; clear wavy boundary.

Cg—42 to 60 inches; grayish brown (10YR 5/2), stratified silt loam and very fine sandy loam; common medium distinct dark brown (7.5YR 3/4) and few fine prominent strong brown (7.5YR 5/8) mottles; massive; friable; neutral.

The thickness of the solum and the depth to free carbonates range from 29 to 50 inches. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. Some pedons do not have an A horizon. The Bg horizon has value of 4 or 5 and chroma of 1 or 2. It is stratified silt loam, silty clay loam, or clay loam. The Cg horizon has value of 5 or 6 and chroma of 1 or 2.

Strawn Series

The Strawn series consists of well drained, moderately slowly permeable soils on till plains. These soils formed in loamy glacial till. Slopes range from 2 to 18 percent.

The Strawn soils in Saginaw County have a higher content of very fine sand than is definitive for the series. This difference, however, does not significantly affect the use and management of the soils.

Typical pedon of Strawn silt loam, 2 to 6 percent slopes, eroded, 1,500 feet south and 1,900 feet west of the northeast corner of sec. 26, T. 11 N., R. 6 E., Frankenmuth Township:

Ap—0 to 10 inches; dark brown (7.5YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; friable; moderately alkaline; abrupt smooth boundary.

Bt—10 to 20 inches; brown (7.5YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; many distinct dark brown (10YR 4/3) clay films on faces of peds; moderately alkaline; gradual wavy boundary.

C1—20 to 28 inches; brown (7.5YR 5/4) silt loam; moderate medium subangular blocky structure; firm; common fine prominent light greenish gray (5GY 7/1) coatings of carbonate on faces of peds; strong effervescence; moderately alkaline; diffuse wavy boundary.

C2—28 to 60 inches; light brown (7.5YR 6/4) silt loam; moderate medium platy structure; firm; few fine prominent light greenish gray (5GY 7/1) coatings on faces of peds; violent effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 16 to 24 inches. The content of gravel ranges from 0 to 10 percent in the profile.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is clay loam or silty clay loam. The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is loam, silt loam, or clay loam.

Sumava Series

The Sumava series consists of somewhat poorly drained soils on water-worked till plains. These soils formed in loamy glacial till. Permeability is moderately rapid in the upper part of the profile and moderate in the lower part. Slopes range from 0 to 3 percent.

Typical pedon of Sumava sandy loam, 0 to 3 percent slopes, 100 feet north and 1,020 feet west of the southeast corner of sec. 11, T. 12 N., R. 1 E., Jonesfield Township:

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak medium granular structure; very friable; neutral; abrupt smooth boundary.

Bt1—12 to 16 inches; dark brown (10YR 4/3) sandy loam; few medium prominent strong brown (7.5YR 5/8) and common medium faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; very friable; few faint dark brown (N 4/0) clay films on faces of peds; moderately alkaline; clear wavy boundary.

Bt2—16 to 25 inches; dark yellowish brown (10YR 4/6) sandy clay loam; many medium and coarse distinct yellowish brown (10YR 5/8), common medium faint brownish yellow (10YR 6/6), and common medium distinct dark grayish brown (10YR 4/2) mottles; weak medium subangular blocky structure; very friable; common faint yellowish brown (10YR 5/6) clay films on faces of peds and in pores; slight effervescence; moderately alkaline; clear wavy boundary.

2C—25 to 38 inches; dark yellowish brown (10YR 4/4) loam; common medium prominent yellowish brown (10YR 5/8), common medium distinct grayish brown (10YR 5/2), and common medium distinct brown (7.5YR 5/4) mottles; massive; friable; about 5 percent fine and medium gravel; slight effervescence; moderately alkaline; gradual wavy boundary.

2Cg—38 to 60 inches; gray (10YR 6/1) silty clay loam; common medium prominent brownish yellow (10YR 6/8) mottles; massive; friable; about 5 percent fine and medium gravel; many prominent light gray (10YR 7/1) filaments of carbonate in pores; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 36 inches. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. Some pedons have a Bw horizon. This horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is sandy loam or fine sandy loam. The Bt horizon has value of 4 or 5 and chroma of 4 to 6. It is sandy loam, fine sandy loam, or sandy clay loam. The 2C horizon has value of 4 to 6 and chroma of 3 or 4. The 2Cg horizon has chroma of 1 or 2. It is loam or silty clay loam.

Tappan Series

The Tappan series consists of poorly drained soils on till plains. These soils formed in loamy glacial till. Permeability is moderately slow in the upper part of the

profile and slow in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Tappan loam, 2,530 feet south and 1,290 feet west of the northeast corner of sec. 3, T. 12 N., R. 6 E., Blumfield Township:

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure parting to weak fine granular; friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

Bg—12 to 16 inches; gray (5Y 6/1) clay loam; common medium prominent strong brown (7.5YR 5/6), common fine prominent olive yellow (2.5Y 6/8), and common coarse distinct dark gray (5Y 4/1) mottles; moderate medium subangular blocky structure; friable; about 3 percent medium gravel; slight effervescence; moderately alkaline; gradual wavy boundary.

Cg—16 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common coarse prominent strong brown (7.5YR 5/6), common coarse prominent reddish brown (5YR 5/3), and common fine prominent greenish gray (5BG 6/1) mottles; massive; firm; about 4 percent fine gravel; violent effervescence; strongly alkaline.

The thickness of the solum ranges from 16 to 30 inches. The content of gravel is 0 to 4 percent throughout the profile.

The Ap horizon has hue of 10YR or 5Y, value of 2 or 3, and chroma of 1 or 2. The Bg horizon has hue of 5Y, 10YR, or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The Cg horizon has hue of 2.5Y, 7.5YR, 5Y, or 10YR, value of 4 to 6, and chroma of 1 or 2. It is loam, clay loam, or silty clay loam.

Wixom Series

The Wixom series consists of somewhat poorly drained soils on lake plains, water-worked till plains, and other till plains. These soils formed in sandy sediments and in the underlying loamy glacial till. Permeability is rapid in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 4 percent.

Typical pedon of Wixom sand, in an area of Parkhill-Wixom complex, 0 to 4 percent slopes, 440 feet north and 100 feet west of the southeast corner of sec. 32, T. 10 N., R. 3 E., St. Charles Township:

Ap—0 to 12 inches; dark brown (7.5YR 3/2) sand, dark grayish brown (10YR 5/2) dry; single grain; loose; neutral; abrupt smooth boundary.

Bs1—12 to 15 inches; dark brown (7.5YR 4/4) sand; single grain; loose; neutral; gradual wavy boundary.

Bs2—15 to 21 inches; light yellowish brown (10YR 6/4) sand; common medium faint dark yellowish brown (10YR 4/4) mottles; single grain; loose; neutral; gradual wavy boundary.

E—21 to 23 inches; pale brown (10YR 6/3) sand; single grain; loose; neutral; abrupt wavy boundary.

2Btg—23 to 26 inches; reddish brown (5YR 5/3) clay loam; many medium distinct brown (7.5YR 5/4) and many medium prominent light olive gray (5Y 6/2) mottles; weak medium subangular blocky structure; firm; about 3 percent fine and medium gravel; few distinct brown (7.5YR 5/4) clay films on faces of peds; neutral; gradual wavy boundary.

2C—26 to 60 inches; reddish brown (5YR 5/3) clay loam; many medium and coarse prominent gray (10YR 5/1) and common medium and coarse prominent yellowish brown (10YR 5/4) mottles; massive; firm; about 3 percent fine and medium gravel; violent effervescence; moderately alkaline.

Depth to the 2Bt horizon ranges from 22 to 40 inches. The content of gravel is 0 to 3 percent throughout the profile.

The Ap horizon has hue of 7.5YR or 10YR and value of 3 or 4. The Bs horizon has hue of 7.5YR, 10YR, or 5YR, value of 3 to 6, and chroma of 2 to 4. The E horizon has value of 5 or 6 and chroma of 2 or 3. It is sand or fine sand. Some pedons do not have an E horizon. The 2Bt horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 to 6, and chroma of 3 to 6. It is loam or clay loam. The 2C horizon has hue of 5YR or 10YR, value of 4 to 6, and chroma of 3 or 4. It is clay loam or silty clay loam.

Zilwaukee Series

The Zilwaukee series consists of poorly drained, slowly permeable soils on flood plains. These soils formed in clayey or silty alluvial material. Slopes range from 0 to 2 percent.

Typical pedon of Zilwaukee silty clay, in an area of Zilwaukee-Misteguay complex, rarely flooded, 2,050 feet north and 1,250 feet west of the southeast corner of sec. 30, T. 11 N., R. 4 E., Spaulding Township:

Ap—0 to 9 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; common fine and medium prominent gray (5Y 5/1) and common fine distinct dark yellowish brown (10YR 4/4) mottles; strong coarse subangular blocky structure; firm; slightly alkaline; abrupt smooth boundary.

A—9 to 16 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; common medium prominent gray (5Y 5/1) and common fine and medium distinct dark

yellowish brown (10YR 4/4) mottles; strong coarse subangular blocky structure; firm; slight effervescence; slightly alkaline; clear irregular boundary.

C1—16 to 23 inches; strong brown (7.5YR 4/6) silty clay; many fine and medium prominent gray (5Y 5/1) and few fine prominent pinkish gray (7.5YR 6/2) mottles; massive parting to weak medium and thin plates resulting from deposition; firm; many discontinuous prominent light gray (5Y 6/1) silt coatings on horizontal faces of strata; few white (10YR 8/1) irregular soft masses of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

C2—23 to 60 inches; strong brown (7.5YR 4/6) silty clay; many fine and medium prominent gray (5Y 5/1) and few fine prominent pinkish gray (7.5YR 6/2) mottles; massive parting to weak medium and thin plates resulting from deposition; firm; many prominent light gray (5Y 5/1) silt coatings on horizontal faces of strata; many white (10YR 8/1) irregular soft masses of carbonate; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 9 to 16 inches. The Ap or A horizon has value of 2 or 3 and chroma of 1 or 2. The C horizon has hue of 7.5YR, 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 to 6. It is silty clay loam or silty clay. Some pedons have a Cg horizon.

Formation of the Soils

This section relates the major factors of soil formation to the soils in Saginaw County. It also describes the processes of soil formation.

Factors of Soil Formation

Soil forms through the interaction of five major factors—the physical, chemical, and mineral composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the processes of soil formation have acted on the parent material *(3)*.

Climate and plant and animal life are the active forces in soil formation. They slowly change the parent material into a natural body of soil that has genetically related layers called horizons. The nature of the parent material affects the kind of soil profile that forms and in extreme cases determines it almost entirely. Time is needed for the transformation of the parent material into a soil.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made about the effect of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. Glaciers or meltwater from the glaciers deposited the parent material of the soils in Saginaw County. Water and wind subsequently reworked some of this material. Although the parent material is of common glacial origin, its properties vary greatly, sometimes within a small area, depending on how the material was deposited. The dominant kinds of parent material in Saginaw County are glacial till, lake sediments, wind-deposited sediments, alluvium, and organic material.

Glacial till is material that was deposited directly by glaciers with a minimum of water action. The till occurs as a mixture of particles of different sizes. Small pebbles in glacial till have sharp corners, indicating that they have not been worn by water. The glacial till in Saginaw County generally is calcareous loam. Tappan soils are an example of soils that formed in glacial till. Typically, they are loamy and have moderately developed structure.

Lake sediments consist of material that settled from still or slowly moving, deep lake water and from continually moving, shallow water near shorelines. The sediments are well sorted. The size of the particles depends on the speed of the water in which they were suspended. Pipestone soils are an example of sandy soils that formed in material deposited in sandbars on a shallow lake bottom. Lenawee soils are an example of fine textured soils that formed in material deposited on a deep lake bottom.

Wind-deposited sediments consist of material that was moved from the surface of the land and deposited in areas where the windspeed decreased. These sediments are fine sand or sand. They accumulated on the lee side of ridges and hills and formed dunes along shorelines and across broad sandy plains. Grattan soils are an example of soils that formed in wind-deposited sediments.

Alluvial material has been deposited recently by the floodwater of present streams. The texture of this material depends on the speed of the water that deposited it. Cohoctah soils are an example of soils that formed in alluvial material.

Organic material in the soil consists primarily of plant remains. After the glaciers receded from the survey area, water was left standing in depressions on flood plains and till plains. As the grasses and sedges that grew around the edge of these depressions died, their remains did not decompose because of the standing water. The remains accumulated around the edge of the depressions. Later, water-tolerant trees grew in the areas. As these trees died, their residue became part of the organic accumulation. Consequently, the depressions were eventually filled with organic material and developed into areas of muck. Roundhead soils are an example of soils that formed partially in organic material.

Plant and Animal Life

Green plants have been the principal organisms influencing the soils in Saginaw County. Bacteria, fungi, earthworms, and people also have been important. The chief contribution of plant and animal life is the addition of organic material and nitrogen to the soil. The kind of organic matter in the soil depends on the kinds of plants that grew on the soil. The residue of these plants accumulated on the surface of the soil. As it decayed, it became organic matter. Plant roots provided channels for the downward movement of water through the soil and added organic matter to the soil as they decayed. Bacteria in the soil helped to break down the organic matter into plant nutrients.

The native vegetation in Saginaw County was a mixture of coniferous and deciduous trees. Natural soil drainage and the kind of parent material affected the composition of the forests. In general, the well drained soils on uplands, such as Strawn soils, supported sugar maple and eastern white pine. The poorly drained soils, such as Belleville and Granby soils, supported eastern white-cedar and quaking aspen.

Climate

Climate determines the kind of plant and animal life on and in the soil and the amount of water available for the weathering of minerals and the translocation of soil material. Through its influence on soil temperature, climate determines the rate of chemical reaction in the soil.

The climate in Saginaw County is cool and humid. It is presumably similar to the climate under which the soils formed. The soils in this county differ from the soils that formed under a dry, warm climate and from those that formed under a moist, hot climate. Differences in climate account for only minor differences among the soils within the county.

Relief

Relief affects the natural drainage of soils, the rate of erosion, the kind of plant cover, and the soil temperature. Slopes in Saginaw County range from 0 to 18 percent.

Relief influences the formation of soils through its effect on runoff and drainage. Through its effect on aeration of the soil, drainage, in turn, determines the color of the soil. Runoff is most rapid on the steeper slopes. Water temporarily ponds in low areas. Water and air move freely through well drained soils and slowly through very poorly drained soils. Grattan and Granby soils formed in similar kinds of parent material, but they differ from one another because of the influence of relief on drainage. In the gently sloping or moderately sloping, excessively drained, well aerated Grattan soils, the iron and aluminum compounds are oxidized, giving the soils brighter colors. The nearly level, poorly drained, poorly aerated Granby soils are dull gray and mottled.

Time

Generally, a long time is required for the development of distinct soil horizons. Differences in the length of time that the parent material has been in place are commonly reflected in the degree of profile development. Some soils form rapidly, and others form slowly.

The soils in Saginaw County range in geologic age from young to mature. The glacial deposits in which many of the soils formed have been exposed to soil-forming factors long enough for distinct horizons to develop. Soils that formed in recent alluvial sediments have not been in place long enough for the development of distinct horizons. Cohoctah soils, which formed in alluvial material, are young soils. Capac soils, which are leached of lime to a greater depth, are an example of older soils.

Processes of Soil Formation

Several processes were involved in the development of horizons in the soils of Saginaw County. These are the accumulation of organic matter, the leaching of lime (calcium carbonate) and other bases, the reduction and transfer of iron, and the formation and translocation of clay minerals. In most of the soils, more than one of these processes has been active in the development of horizons.

As organic matter accumulates at the surface, an A horizon forms. If the soil is plowed, the A horizon is mixed into a plow layer, or Ap horizon. In the surface layer of the soils in Saginaw County, the content of organic matter ranges from high to low. It is high, for example, in Granby soils and low in Grattan soils.

The leaching of carbonates and other bases has occurred in most of the soils in the county. Some of the soils are weakly or moderately leached. Tappan soils are leached of carbonates to a depth of 8 to 12 inches, whereas Parkhill soils are leached to a depth of 20 to 40 inches. This difference in the depth of leaching is a result of differences in time, relief, and parent material.

Gleying, or the reduction and transfer of iron, is evident in somewhat poorly drained and poorly drained soils. A gray or dull color in the subsoil indicates the reduction and loss of iron. Tappan soils are an example of gleyed soils.

The translocation of clay is one of the more important processes of horizon differentiation. An eluviated, or

leached, E horizon has a lower content of clay than an illuviated B horizon and typically is lighter in color. The B horizon typically has an accumulation of clay and clay films in pores and on the faces of peds. The soils are probably leached of carbonates and soluble salts before the translocation of clay occurs. Strawn soils are an example of soils that have an accumulation of translocated clay in the form of clay films in the B horizon.

Iron, aluminum, and humus have moved from the A horizon to the B horizon in some of the soils in Saginaw County. Pipestone and Grattan soils are examples. The B horizon in these soils commonly is dark brown or dark reddish brown.

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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.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface

of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

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.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

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 human or animal activities 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 is not a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other

elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

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 uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be

limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and is low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. 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.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

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.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 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. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 2 percent
Very gently sloping	2 to 4 percent
Gently sloping	4 to 6 percent
Moderately sloping	6 to 12 percent
Strongly sloping	12 to 18 percent
Steep	18 to 25 percent

Classes for complex slopes are as follows:

Nearly level	0 to 2 percent
Gently undulating	2 to 4 percent
Undulating	4 to 6 percent
Gently rolling	6 to 12 percent
Rolling	12 to 18 percent
Hilly or steep	18 to 25 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-80 at Tri City Airport, 1955-80 at Saginaw, and 1952-80 at St. Charles, Michigan)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
TRI CITY AIRPORT:											
January----	27.2	13.9	20.5	51	-10	0	1.78	1.02	2.46	5	11.7
February---	29.6	15.2	22.4	50	-10	0	1.52	.75	2.18	5	9.0
March------	39.3	24.6	31.9	69	0	6	2.31	1.49	3.05	6	8.2
April------	55.0	36.2	45.6	82	19	66	3.00	1.98	3.94	7	2.3
May--------	67.4	45.8	56.6	88	29	247	2.45	1.50	3.31	6	.0
June-------	77.6	55.7	66.6	95	39	507	2.77	1.77	3.67	6	.0
July-------	81.8	59.9	70.8	95	46	655	2.60	1.50	3.59	6	.0
August-----	79.7	58.1	68.9	95	43	593	3.04	1.50	4.37	6	.0
September--	71.5	50.8	61.1	92	33	348	2.98	1.72	4.16	6	.0
October----	60.0	41.0	50.5	84	23	125	2.66	1.06	3.99	6	.2
November---	45.1	31.2	38.1	70	10	13	2.34	1.48	3.11	5	3.8
December---	32.4	20.2	26.3	59	-5	**	2.31	1.17	3.29	6	10.6
Yearly:											
Average---	55.6	37.7	46.6	---	---	---	---	---	---	---	---
Extreme---	---	---	---	98	-12	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,560	29.76	26.28	33.13	70	45.8
SAGINAW:											
January----	28.4	14.0	21.2	53	-10	**	1.47	.67	2.16	4	10.6
February---	31.2	14.8	23.0	52	-10	0	1.22	.51	1.82	4	6.6
March------	42.0	24.4	33.2	71	0	11	1.95	1.05	2.74	5	6.2
April------	57.5	36.0	46.7	83	19	81	2.76	1.90	3.56	7	1.3
May--------	70.0	46.2	58.1	89	28	286	2.70	1.58	3.70	7	.0
June-------	79.2	55.8	67.5	94	38	532	3.32	1.86	4.61	6	.0
July-------	83.4	60.0	71.7	96	45	680	2.72	1.43	3.85	6	.0
August-----	81.4	58.6	70.0	94	43	627	3.13	1.67	4.41	6	.0
September--	73.9	51.4	62.6	91	32	391	2.82	1.14	4.21	6	.0
October----	62.1	41.7	51.9	83	23	150	2.39	1.24	3.41	6	.2
November---	47.0	31.7	39.4	71	10	20	2.38	1.53	3.14	6	2.5
December---	34.0	20.5	27.2	60	-2	**	1.98	.86	2.94	5	8.7
Yearly:											
Average---	57.5	37.9	47.7	---	---	---	---	---	---	---	---
Extreme---	---	---	---	97	-11	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,778	28.84	25.13	32.61	68	36.1

See footnotes at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
ST. CHARLES:											
January----	29.4	14.4	21.9	52	-12	**	1.62	0.91	2.25	5	12.9
February---	32.7	15.4	24.0	53	-13	0	1.34	.71	1.90	4	9.0
March------	43.0	24.7	33.9	72	-2	10	2.13	1.18	2.97	5	8.9
April------	58.9	36.1	47.5	84	17	89	2.43	1.59	3.20	6	2.1
May--------	71.1	46.1	58.6	90	28	298	2.49	1.39	3.46	6	.0
June-------	80.9	55.5	68.2	96	38	552	3.09	1.80	4.25	6	.0
July-------	84.9	59.4	72.1	97	44	695	2.83	1.39	4.08	5	.0
August-----	82.7	57.7	70.2	96	41	633	3.29	1.71	4.66	6	.0
September--	75.0	50.8	62.9	94	31	397	2.76	1.30	4.02	6	.0
October----	62.8	40.8	51.8	85	21	146	2.24	1.05	3.27	5	.4
November---	47.5	31.6	39.5	72	10	20	2.17	1.29	2.96	6	4.2
December---	34.7	20.8	27.7	60	-4	**	1.91	1.07	2.65	5	10.9
Yearly:											
Average---	58.6	37.8	48.2	---	---	---	---	---	---	---	---
Extreme---	---	---	---	99	-14	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,840	28.30	24.69	31.81	65	48.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

** Less than 0.5.

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-80 at Tri City Airport, 1955-80 at Saginaw, and 1952-80 at St. Charles, Michigan)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
TRI CITY AIRPORT:			
Spring:			
1 year in 10 later than--	Apr. 16	May 1	May 16
2 years in 10 later than--	Apr. 12	Apr. 26	May 11
5 years in 10 later than--	Apr. 4	Apr. 16	May 3
Fall:			
1 year in 10 earlier than--	Oct. 20	Oct. 12	Sept. 28
2 years in 10 earlier than--	Oct. 26	Oct. 17	Oct. 3
5 years in 10 earlier than--	Nov. 6	Oct. 25	Oct. 13
SAGINAW:			
Spring:			
1 year in 10 later than--	Apr. 19	May 5	May 20
2 years in 10 later than--	Apr. 15	Apr. 29	May 15
5 years in 10 later than--	Apr. 8	Apr. 19	May 5
Fall:			
1 year in 10 earlier than--	Oct. 21	Oct. 9	Sept. 20
2 years in 10 earlier than--	Oct. 26	Oct. 14	Sept. 26
5 years in 10 earlier than--	Nov. 5	Oct. 23	Oct. 7

TABLE 2.--FREEZE DATES IN SPRING AND FALL--Continued

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
ST. CHARLES:			
Spring:			
1 year in 10 later than--	Apr. 17	May 4	May 21
2 years in 10 later than--	Apr. 14	Apr. 30	May 16
5 years in 10 later than--	Apr. 9	Apr. 22	May 6
Fall:			
1 year in 10 earlier than--	Oct. 13	Oct. 2	Sept. 20
2 years in 10 earlier than--	Oct. 19	Oct. 7	Sept. 25
5 years in 10 earlier than--	Oct. 31	Oct. 17	Oct. 5

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-80 at Tri City Airport, 1955-80 at Saginaw, and 1952-80 at St. Charles, Michigan)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
TRI CITY AIRPORT:			
9 years in 10	193	172	144
8 years in 10	201	179	150
5 years in 10	215	191	163
2 years in 10	230	203	176
1 year in 10	238	209	182
SAGINAW:			
9 years in 10	196	163	128
8 years in 10	201	171	137
5 years in 10	211	186	154
2 years in 10	220	201	171
1 year in 10	226	209	180
ST. CHARLES:			
9 years in 10	185	160	132
8 years in 10	191	166	139
5 years in 10	204	177	151
2 years in 10	217	189	164
1 year in 10	224	195	170

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
5A	Sumava sandy loam, 0 to 3 percent slopes	2,244	0.4
10C	Grattan sand, 4 to 12 percent slopes	3,103	0.6
12	Corunna sandy loam	8,852	1.7
13	Belleville fine sand	16,611	3.2
14	Pella silt loam	3,758	0.7
15B	Wixom sand, 0 to 4 percent slopes	52,135	10.0
17B	Frankenmuth very fine sandy loam, 0 to 4 percent slopes	5,234	1.0
18	Lenawee silty clay loam	4,654	0.9
19	Tappan loam	30,687	5.9
22B	Parkhill-Wixom complex, 0 to 4 percent slopes	15,520	3.0
23A	Capac loam, 0 to 3 percent slopes	24,683	4.7
24	Parkhill loam	56,113	10.7
26A	Pipestone sand, loamy substratum, 0 to 3 percent slopes	15,447	3.0
28A	Parkhill-Capac complex, 0 to 3 percent slopes	7,512	1.4
29	Sloan silt loam, frequently flooded	5,958	1.1
31A	Pipestone sand, 0 to 3 percent slopes	42,534	8.1
33	Granby fine sand	20,673	4.0
41A	Shiawassee gravelly sandy loam, 0 to 3 percent slopes	2,910	0.6
44	Sloan-Ceresco complex, frequently flooded	13,579	2.6
45A	Fabius sandy loam, 0 to 3 percent slopes	2,038	0.4
46B	Cadmus gravelly sandy loam, 1 to 4 percent slopes	558	0.1
55B	Gagetown silt loam, 2 to 6 percent slopes	1,444	0.3
55C2	Gagetown silt loam, 6 to 12 percent slopes, eroded	247	*
57B	Pella-Frankenmuth complex, 0 to 4 percent slopes	8,239	1.6
58B	Covert sand, 1 to 6 percent slopes	8,953	1.7
59	Zilwaukee-Misteguay complex, rarely flooded	18,900	3.6
60B	Arkona sand, 0 to 4 percent slopes	4,152	0.8
61A	Tappan-Poseyville complex, 0 to 3 percent slopes	3,666	0.7
62A	Tappan-Londo complex, 0 to 3 percent slopes	34,733	6.7
63A	Urban land-Tappan complex, 0 to 3 percent slopes	3,219	0.6
64A	Sanilac very fine sandy loam, 1 to 3 percent slopes	2,932	0.6
65A	Shiawassee sandy loam, 0 to 3 percent slopes	2,698	0.5
68A	Tappan-Londo-Poseyville complex, 0 to 3 percent slopes	11,894	2.3
69	Sloan silt loam, rarely flooded	6,723	1.3
70	Udipsamments, undulating	2,252	0.4
71	Udorthents, loamy, nearly level to steep	5,634	1.1
72	Aquents, ponded	338	0.1
73	Pits, sand	118	*
74	Urban land	3,080	0.6
75B2	Strawn silt loam, 2 to 6 percent slopes, eroded	2,120	0.4
75C2	Strawn silt loam, 6 to 12 percent slopes, eroded	1,132	0.2
75D3	Strawn silt loam, 12 to 18 percent slopes, severely eroded	257	*
76A	Londo loam, 0 to 3 percent slopes	11,390	2.2
77	Chesaning-Cohoctah complex, frequently flooded	4,814	0.9
78	Fluvaquents, frequently flooded	5,126	1.0
82	Granby sand, loamy substratum	6,277	1.2
84A	Parkhill-Poseyville complex, 0 to 3 percent slopes	1,197	0.2
88B	Boyer sandy loam, 2 to 8 percent slopes	1,236	0.2
89	Roundhead muck	476	0.1
91B	Branch sand, loamy substratum, 0 to 6 percent slopes	753	0.1
93A	Capac gravelly sandy loam, 0 to 3 percent slopes	3,340	0.6
94	Zilwaukee-Misteguay complex, frequently flooded	7,220	1.4
95	Sloan-Ceresco complex, rarely flooded	7,741	1.5
96	Chesaning-Cohoctah complex, rarely flooded	3,137	0.6
98A	Poseyville loamy fine sand, 0 to 3 percent slopes	945	0.2
99A	Urban land-Parkhill complex, 0 to 3 percent slopes	4,412	0.8
	Water areas less than 40 acres in size	6,175	1.2
	Water areas more than 40 acres in size	262	*
	Total	522,035	100.0

* Less than 0.05 percent. The combined extent of the soils assigned an asterisk in the "Percent" column is about 0.2 percent of the county.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
5A	Sumava sandy loam, 0 to 3 percent slopes (where drained)
12	Corunna sandy loam (where drained)
13	Belleville fine sand (where drained)
14	Pella silt loam (where drained)
15B	Wixom sand, 0 to 4 percent slopes (where drained)
17B	Frankenmuth very fine sandy loam, 0 to 4 percent slopes (where drained)
18	Lenawee silty clay loam (where drained)
19	Tappan loam (where drained)
22B	Parkhill-Wixom complex, 0 to 4 percent slopes (where drained)
23A	Capac loam, 0 to 3 percent slopes (where drained)
24	Parkhill loam (where drained)
28A	Parkhill-Capac complex, 0 to 3 percent slopes (where drained)
29	Sloan silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
41A	Shiawassee gravelly sandy loam, 0 to 3 percent slopes (where drained)
44	Sloan-Ceresco complex, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
45A	Fabius sandy loam, 0 to 3 percent slopes (where drained)
46B	Cadmus gravelly sandy loam, 1 to 4 percent slopes
55B	Gagetown silt loam, 2 to 6 percent slopes
57B	Pella-Frankenmuth complex, 0 to 4 percent slopes (where drained)
59	Zilwaukee-Misteguay complex, rarely flooded (where drained)
61A	Tappan-Poseyville complex, 0 to 3 percent slopes (where drained)
62A	Tappan-Londo complex, 0 to 3 percent slopes (where drained)
64A	Sanilac very fine sandy loam, 1 to 3 percent slopes (where drained)
65A	Shiawassee sandy loam, 0 to 3 percent slopes (where drained)
68A	Tappan-Londo-Poseyville complex, 0 to 3 percent slopes (where drained)
69	Sloan silt loam, rarely flooded (where drained)
75B2	Strawn silt loam, 2 to 6 percent slopes, eroded
76A	Londo loam, 0 to 3 percent slopes (where drained)
77	Chesaning-Cohoctah complex, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
84A	Parkhill-Poseyville complex, 0 to 3 percent slopes (where drained)
89	Roundhead muck (where drained)
93A	Capac gravelly sandy loam, 0 to 3 percent slopes (where drained)
94	Zilwaukee-Misteguay complex, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
95	Sloan-Ceresco complex, rarely flooded (where drained)
96	Chesaning-Cohoctah complex, rarely flooded (where drained)
98A	Poseyville loamy fine sand, 0 to 3 percent slopes (where drained)

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Dry beans	Soybeans	Sugar beets	Winter wheat	Oats	Alfalfa hay
		Bu	Bu	Bu	Tons	Bu	Bu	Tons
5A---------- Sumava	IIw	105	25	37	---	60	100	3.8
10C---------- Grattan	VIs	---	---	---	---	---	---	---
12---------- Corunna	IIw	140	---	40	22	65	105	5.0
13---------- Belleville	IIIw	110	25	32	16	45	85	4.5
14---------- Pella	IIw	140	32	40	21	62	105	5.0
15B---------- Wixom	IIIw	110	22	35	---	45	85	3.8
17B---------- Frankenmuth	IIw	130	30	40	20	70	105	5.0
18---------- Lenawee	IIw	130	32	42	---	60	100	5.5
19---------- Tappan	IIw	140	35	45	23	70	115	5.5
22B*---------- Parkhill-Wixom	IIw	127	30	41	23	60	101	4.5
23A---------- Capac	IIw	130	25	40	20	65	100	5.5
24---------- Parkhill	IIw	140	35	45	23	70	115	5.5
26A---------- Pipestone	IIIw	110	22	35	---	45	85	3.8
28A*---------- Parkhill-Capac	IIw	135	30	43	22	65	108	5.5
29---------- Sloan	IIIw	110	---	35	---	---	70	---
31A---------- Pipestone	IVw	85	---	25	---	35	60	2.3
33---------- Granby	IVw	100	20	30	---	40	60	2.3
41A---------- Shiawassee	IIw	120	---	36	---	65	100	5.0
44*---------- Sloan-Ceresco	IIIw	107	---	34	---	---	65	---

See footnote at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability	Corn	Dry beans	Soybeans	Sugar beets	Winter wheat	Oats	Alfalfa hay
		Bu	Bu	Bu	Tons	Bu	Bu	Tons
45A---------- Fabius	IIIw	110	28	32	19	50	85	4.5
46B---------- Cadmus	IIe	105	25	32	---	55	95	3.5
55B---------- Gagetown	IIe	120	25	35	17	50	85	4.2
55C2---------- Gagetown	IIIe	95	20	30	---	40	75	3.8
57B*---------- Pella-Frankenmuth	IIw	136	31	40	20	66	105	5.0
58B---------- Covert	IVs	50	---	---	---	25	45	3.0
59*---------- Zilwaukee-Misteguay	IIIw	135	25	40	20	60	85	---
60B---------- Arkona	IIIw	100	20	30	15	40	80	3.8
61A*---------- Tappan-Poseyville	IIw	124	32	40	23	60	105	5.0
62A*---------- Tappan-Londo	IIw	131	32	43	22	68	108	5.5
63A*. Urban land-Tappan								
64A---------- Sanilac	IIw	130	30	40	20	60	100	5.0
65A---------- Shiawassee	IIw	120	25	36	---	60	100	3.5
68A*---------- Tappan-Londo-Poseyville	IIw	126	32	40	23	60	104	5.0
69---------- Sloan	IIIw	135	28	42	23	45	80	---
70. Udipsamments								
71. Udorthents								
72. Aquents								

See footnote at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability	Corn	Dry beans	Soybeans	Sugar beets	Winter wheat	Oats	Alfalfa hay
		Bu	Bu	Bu	Tons	Bu	Bu	Tons
73*. Pits								
74*. Urban land								
75B2---------- Strawn	IIe	110	20	30	18	51	90	5.0
75C2---------- Strawn	IIIe	100	16	25	---	45	80	4.8
75D3---------- Strawn	VIe	90	12	20	---	35	70	4.0
76A---------- Londo	IIw	130	25	40	20	65	100	5.5
77*---------- Chesaning-Cohoctah	IIIw	---	---	---	---	---	---	---
78---------- Fluvaquents	Vw	---	---	---	---	---	---	---
82---------- Granby	IIIw	100	25	35	---	52	70	3.0
84A*---------- Parkhill-Poseyville	IIw	130	32	43	23	68	110	4.8
88B---------- Boyer	IIIs	80	15	25	---	30	60	2.5
89---------- Roundhead	IIw	135	28	42	---	45	80	---
91B---------- Branch	IIIs	80	20	28	---	35	60	3.5
93A---------- Capac	IIw	130	25	40	20	65	100	5.5
94*---------- Zilwaukee-Misteguay	IIIw	131	---	38	16	65	61	---
95*---------- Sloan-Ceresco	IIIw	133	27	43	22	48	75	---
96*---------- Chesaning-Cohoctah	IIIw	125	26	38	20	60	95	3.5
98A---------- Poseyville	IIw	115	25	40	---	60	100	3.8
99A*. Urban land-Parkhill								

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	---	---	---	---
II	247,799	4,122	243,677	---
III	163,286	1,379	159,918	1,989
IV	72,160	---	63,207	8,953
V	9,940	---	9,940	---
VI	3,698	257	338	3,103
VII	---	---	---	---
VIII	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
10C---------- Grattan	9S	Slight	Moderate	Moderate	Slight	Eastern white pine--	62	127	Eastern white pine, red pine.
						Quaking aspen-------	---	---	
						White oak----------	---	---	
						Black oak----------	---	---	
						Sugar maple---------	59	37	
12---------- Corunna	2W	Slight	Severe	Severe	Severe	Silver maple--------	82	36	---
						Red maple----------	56	36	
						White ash----------	---	---	
						American basswood---	---	---	
						American sycamore---	---	---	
						Pin oak------------	---	---	
						Swamp white oak-----	---	---	
13---------- Belleville	1W	Slight	Severe	Moderate	Severe	Silver maple--------	64	20	---
						Red maple----------	---	---	
						White ash----------	---	---	
						Pin oak------------	---	---	
						Swamp white oak-----	---	---	
14---------- Pella	3W	Slight	Severe	Moderate	Moderate	Northern whitecedar-	33	48	---
						American elm--------	---	---	
						White ash----------	---	---	
						Silver maple--------	---	---	
15B---------- Wixom	6W	Slight	Moderate	Moderate	Moderate	Quaking aspen-------	70	81	Eastern white pine, white spruce, northern red oak.
						American beech------	---	---	
						Northern red oak----	---	---	
						Red maple----------	66	41	
						American basswood---	---	---	
17B---------- Frankenmuth	4W	Slight	Moderate	Slight	Slight	Northern red oak----	66	60	White spruce, Norway spruce, eastern white pine, northern whitecedar.
						Green ash----------	66	60	
						Red maple----------	66	41	
						American basswood---	66	60	
						Bitternut hickory---	---	---	
						Shagbark hickory----	---	---	
						Sugar maple---------	61	38	
						Pin oak------------	---	---	
18---------- Lenawee	2W	Slight	Severe	Severe	Severe	Red maple----------	55	35	---
						White ash----------	---	---	
						American basswood---	---	---	
						Silver maple--------	---	---	
19---------- Tappan	3W	Slight	Severe	Severe	Severe	Red maple----------	66	41	---
						Silver maple--------	91	43	
						Swamp white oak-----	66	48	
						White ash----------	66	60	
						Bur oak------------	66	60	
						Black ash----------	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
22B**:									
Parkhill	3W	Slight	Severe	Severe	Severe	Red maple	66	41	---
						Silver maple	91	43	
						Pin oak	---	---	
						White ash	66	60	
						American basswood	66	60	
						Swamp white oak	---	---	
Wixom	6W	Slight	Moderate	Moderate	Moderate	Quaking aspen	70	81	Eastern white pine, white spruce, northern red oak.
						American beech	---	---	
						Northern red oak	---	---	
						Red maple	66	41	
						American basswood	---	---	
23A	4W	Slight	Moderate	Slight	Slight	Northern red oak	65	59	Northern red oak, eastern white pine, white spruce.
Capac						American basswood	---	---	
						Pin oak	---	---	
						White ash	---	---	
						Red maple	---	---	
						Bitternut hickory	---	---	
						Sugar maple	---	---	
						Black cherry	---	---	
						American beech	---	---	
24	3W	Slight	Severe	Severe	Severe	Red maple	66	41	Eastern white pine, white spruce.
Parkhill						Silver maple	91	43	
						Pin oak	---	---	
						White ash	66	60	
						American basswood	66	60	
						Swamp white oak	---	---	
26A	3W	Slight	Severe	Moderate	Moderate	Red maple	65	40	White spruce, eastern white pine.
Pipestone						White ash	---	---	
						Bitternut hickory	---	---	
						Eastern cottonwood	---	---	
						American basswood	---	---	
28A**:									
Parkhill	3W	Slight	Severe	Severe	Severe	Red maple	66	41	---
						Silver maple	91	43	
						Pin oak	---	---	
						White ash	66	60	
						American basswood	66	60	
						Swamp white oak	---	---	
Capac	4W	Slight	Moderate	Slight	Slight	Northern red oak	65	59	Northern red oak, eastern white pine, white spruce.
						American basswood	---	---	
						Pin oak	---	---	
						White ash	---	---	
						Red maple	---	---	
						Bitternut hickory	---	---	
						Sugar maple	---	---	
						Black cherry	---	---	
						American beech	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
29---------- Sloan	3W	Slight	Severe	Moderate	Moderate	Red maple----------	66	41	---
						Swamp white oak-----	---	---	
						White ash----------	66	60	
						Green ash----------	66	60	
						Eastern cottonwood--	89	100	
						Pin oak----------	---	---	
31A---------- Pipestone	3W	Slight	Severe	Moderate	Moderate	Red maple----------	65	40	Eastern white pine, white spruce.
						White ash----------	---	---	
						Eastern cottonwood--	---	---	
						Bitternut hickory---	---	---	
						Eastern white pine--	64	133	
						American basswood---	56	44	
33---------- Granby	2W	Slight	Severe	Severe	Severe	Silver maple--------	82	36	---
						Red maple----------	68	42	
						American basswood---	---	---	
						White ash----------	---	---	
						Quaking aspen-------	---	---	
						Eastern cottonwood--	---	---	
41A---------- Shiawassee	4W	Slight	Moderate	Slight	Slight	Northern red oak----	62	54	White spruce, northern whitecedar, eastern white pine.
						White ash----------	---	---	
						Bitternut hickory---	---	---	
						Green ash----------	---	---	
						Red maple----------	---	---	
						American basswood---	---	---	
44**:									
Sloan----------	3W	Slight	Severe	Moderate	Moderate	Red maple----------	66	41	---
						Swamp white oak-----	---	---	
						White ash----------	66	60	
						Green ash----------	66	60	
						Eastern cottonwood--	89	100	
						Pin oak----------	---	---	
Ceresco--------	4W	Slight	Moderate	Slight	Slight	Northern red oak----	66	60	Eastern white pine, white spruce, black walnut, yellow-poplar, northern red oak.
						White ash----------	---	---	
						Red maple----------	---	---	
						Silver maple--------	---	---	
						Eastern cottonwood--	---	---	
						American sycamore---	---	---	
						Black walnut--------	---	---	
45A---------- Fabius	4W	Slight	Severe	Slight	Slight	Quaking aspen-------	60	54	White spruce, eastern white pine, northern whitecedar.
						Pin oak----------	---	---	
						White ash----------	---	---	
						Northern red oak----	---	---	
						American basswood---	---	---	
46B---------- Cadmus	4A	Slight	Slight	Slight	Slight	Northern red oak----	65	59	Black walnut, yellow-poplar, white spruce, Carolina poplar, eastern white pine, red pine.
						Black walnut--------	---	---	
						Sugar maple---------	---	---	
						White oak----------	---	---	
						Shagbark hickory----	---	---	
						Yellow-poplar-------	---	---	
						Black cherry--------	---	---	
						White ash----------	---	---	
						Red maple----------	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
55B, 55C2---------- Gagetown	4A	Slight	Slight	Slight	Slight	Northern red oak----	66	60	Red pine, Norway spruce, white spruce, eastern white pine, northern red oak.
						American basswood---	66	60	
						White ash----------	66	60	
						Sugar maple---------	61	38	
57B**:									
Pella----------	3W	Slight	Severe	Moderate	Moderate	Northern whitecedar-	33	48	---
						American elm--------	---	---	
						White ash----------	---	---	
						Silver maple--------	---	---	
Frankenmuth----	4W	Slight	Moderate	Slight	Slight	Northern red oak----	66	60	White spruce, Norway spruce, eastern white pine, northern whitecedar.
						Green ash----------	66	60	
						Red maple----------	66	41	
						American basswood---	66	60	
						Bitternut hickory---	---	---	
						Shagbark hickory----	---	---	
						Sugar maple---------	61	38	
						Pin oak-------------	---	---	
58B---------- Covert	4S	Slight	Moderate	Moderate	Slight	Northern red oak----	67	61	Eastern white pine, red pine.
						Red maple----------	66	41	
						Black cherry--------	---	---	
						Eastern cottonwood--	---	---	
						American basswood---	---	---	
						White oak----------	---	---	
						Quaking aspen-------	---	---	
						American beech------	---	---	
						Eastern white pine--	---	---	
59**:									
Zilwaukee------	2W	Slight	Severe	Moderate	Moderate	Red maple----------	55	35	---
						Swamp white oak-----	---	---	
						Silver maple--------	---	---	
						Green ash----------	---	---	
						White ash----------	---	---	
						American basswood---	---	---	
Misteguay------	2W	Slight	Severe	Moderate	Moderate	Red maple----------	55	35	---
						Swamp white oak-----	---	---	
						Silver maple--------	---	---	
						Green ash----------	---	---	
						White ash----------	---	---	
						American basswood---	---	---	
60B---------- Arkona	2W	Slight	Moderate	Moderate	Slight	Red maple----------	56	36	White spruce, Norway spruce, eastern white pine, Carolina poplar.
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
						Eastern cottonwood--	91	105	
						Hackberry----------	---	---	
						Bitternut hickory---	---	---	
						Swamp white oak-----	---	---	
						Northern red oak----	---	---	
						Sugar maple---------	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume*	Trees to plant
61A**:									
Tappan	3W	Slight	Severe	Severe	Severe	Red maple	66	41	Northern whitecedar, eastern white pine, white spruce.
						Silver maple	91	43	
						Swamp white oak	66	48	
						White ash	66	60	
						Bur oak	66	60	
						Black ash	---	---	
Poseyville	3W	Slight	Moderate	Slight	Slight	Northern red oak	56	44	White spruce, eastern white pine, northern red oak.
						Sugar maple	53	33	
						American basswood	56	44	
						Eastern cottonwood	91	105	
						Bigtooth aspen	60	64	
62A**:									
Tappan	3W	Slight	Severe	Severe	Severe	Red maple	66	60	---
						Silver maple	91	60	
						Swamp white oak	66	48	
						White ash	66	60	
						Bur oak	66	60	
						Black ash	---	---	
Londo	3W	Slight	Severe	Slight	Slight	Green ash	66	60	White spruce, eastern white pine, northern red oak.
						Northern red oak	66	60	
						Black oak	---	---	
						Red maple	66	41	
						American basswood	66	60	
						Eastern cottonwood	101	130	
						White ash	65	59	
63A**:									
Urban land.									
Tappan	3W	Slight	Severe	Severe	Severe	Red maple	66	41	---
						Silver maple	91	43	
						Swamp white oak	66	48	
						White ash	66	60	
						Bur oak	66	60	
						Black ash	---	---	
64A	4W	Slight	Moderate	Slight	Slight	Northern red oak	66	60	White spruce, eastern white pine, northern whitecedar, Norway spruce.
Sanilac						Red maple	66	41	
						White ash	66	60	
						Sugar maple	61	38	
						Silver maple	91	43	
						American basswood	66	60	
						Pin oak	---	---	
65A	4W	Slight	Moderate	Slight	Slight	Northern red oak	62	54	White spruce, northern whitecedar, eastern white pine.
Shiawassee						White ash	---	---	
						Bitternut hickory	---	---	
						Green ash	---	---	
						Red maple	---	---	
						American basswood	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
68A**:									
Tappan	3W	Slight	Severe	Severe	Severe	Red maple	66	41	---
						Silver maple	91	43	
						Swamp white oak	66	48	
						White ash	66	60	
						Bur oak	66	60	
						Black ash	---	---	
Londo	3W	Slight	Severe	Slight	Slight	Green ash	66	60	White spruce, eastern white pine, northern red oak.
						Northern red oak	66	60	
						Black oak	---	---	
						Red maple	66	41	
						American basswood	66	60	
						Eastern cottonwood	101	130	
						White ash	65	59	
Poseyville	3W	Slight	Moderate	Slight	Slight	Northern red oak	56	44	White spruce, eastern white pine, northern red oak.
						Sugar maple	53	34	
						American basswood	56	44	
						Eastern cottonwood	91	105	
						Bigtooth aspen	60	64	
69 Sloan	3W	Slight	Severe	Moderate	Moderate	Red maple	66	41	---
						Swamp white oak	---	---	
						White ash	66	60	
						Green ash	66	60	
						Eastern cottonwood	89	100	
						Pin oak	---	---	
75B2, 75C2 Strawn	4A	Slight	Slight	Slight	Slight	White oak	80	80	White oak, black walnut, northern red oak, green ash, eastern white pine, red pine, sugar maple.
						Northern red oak	80	80	
						Black walnut	---	---	
75D3 Strawn	4R	Moderate	Moderate	Moderate	Slight	White oak	80	80	White oak, black walnut, northern red oak, green ash, eastern white pine, red pine, sugar maple.
						Northern red oak	80	80	
						Black walnut	---	---	
76A Londo	3W	Slight	Severe	Slight	Slight	Green ash	66	60	White spruce, eastern white pine, northern red oak.
						Northern red oak	66	60	
						Black oak	---	---	
						Red maple	66	41	
						American basswood	66	60	
						Eastern cottonwood	101	130	
						White ash	65	59	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
77**:									
Chesaning	9W	Slight	Moderate	Slight	Slight	Eastern cottonwood	100	129	Eastern white pine, white spruce, black walnut, Norway spruce, imperial Carolina poplar.
						White ash	---	---	
						Red maple	---	---	
						Silver maple	---	---	
						American elm	---	---	
Cohoctah	2W	Slight	Severe	Moderate	Moderate	Silver maple	80	34	---
						Red maple	56	36	
						White ash	---	---	
						Swamp white oak	---	---	
						Eastern cottonwood	---	---	
						American sycamore	---	---	
82 Granby	2W	Slight	Severe	Severe	Severe	Silver maple	82	36	---
						Red maple	68	42	
						American basswood	---	---	
						White ash	---	---	
						Quaking aspen	---	---	
						Eastern cottonwood	---	---	
84A**:									
Parkhill	3W	Slight	Severe	Severe	Severe	Red maple	66	41	---
						Silver maple	91	43	
						Pin oak	---	---	
						White ash	66	60	
						American basswood	66	60	
						Swamp white oak	---	---	
Poseyville	3W	Slight	Moderate	Slight	Slight	Northern red oak	56	44	White spruce, eastern white pine, northern red oak.
						Sugar maple	53	34	
						American basswood	56	44	
						Eastern cottonwood	91	105	
						Bigtooth aspen	60	64	
88B Boyer	4A	Slight	Slight	Slight	Slight	Northern red oak	66	60	Northern red oak, white oak, eastern white pine, red pine.
						White oak	---	---	
						American basswood	---	---	
						Sugar maple	---	---	
						Black oak	---	---	
91B Branch	4S	Slight	Moderate	Moderate	Slight	Northern red oak	65	59	Eastern white pine, red pine, black walnut, imperial Carolina poplar.
						White oak	---	---	
						Sugar maple	---	---	
						American beech	---	---	
						American basswood	---	---	
						Shagbark hickory	---	---	
						Black walnut	---	---	
93A Capac	4W	Slight	Moderate	Slight	Slight	Northern red oak	65	59	Northern red oak, eastern white pine, white spruce.
						American basswood	---	---	
						Pin oak	---	---	
						White ash	---	---	
						Red maple	---	---	
						Bitternut hickory	---	---	
						Sugar maple	---	---	
						Black cherry	---	---	
						American beech	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume*	Trees to plant
94**:									
Zilwaukee	2W	Slight	Severe	Moderate	Moderate	Red maple	55	35	---
						Swamp white oak	---	---	
						Silver maple	---	---	
						Green ash	---	---	
						White ash	---	---	
						American basswood	---	---	
Misteguay	2W	Slight	Severe	Moderate	Moderate	Red maple	55	35	---
						Swamp white oak	---	---	
						Silver maple	---	---	
						Green ash	---	---	
						White ash	---	---	
						American basswood	---	---	
95**:									
Sloan	3W	Slight	Severe	Moderate	Moderate	Red maple	66	41	---
						Swamp white oak	---	---	
						White ash	66	60	
						Green ash	66	60	
						Eastern cottonwood	89	100	
						Pin oak	---	---	
Ceresco	4W	Slight	Moderate	Slight	Slight	Northern red oak	66	60	Eastern white pine, white spruce, black walnut, yellow-poplar, northern red oak.
						White ash	---	---	
						Red maple	---	---	
						Silver maple	---	---	
						Eastern cottonwood	---	---	
						American sycamore	---	---	
						Black walnut	---	---	
96**:									
Chesaning	9W	Slight	Moderate	Slight	Slight	Eastern cottonwood	100	128	Eastern white pine, white spruce, black walnut, Norway spruce, imperial Carolina poplar.
						White ash	---	---	
						Red maple	---	---	
						Silver maple	---	---	
						American elm	---	---	
Cohoctah	2W	Slight	Severe	Moderate	Moderate	Silver maple	80	34	---
						Red maple	56	34	
						White ash	---	---	
						Swamp white oak	---	---	
						Eastern cottonwood	---	---	
						American sycamore	---	---	
98A Poseyville	3W	Slight	Moderate	Slight	Slight	Northern red oak	56	44	White spruce, eastern white pine, northern red oak.
						Sugar maple	53	34	
						American basswood	56	44	
						Eastern cottonwood	91	105	
						Bigtooth aspen	60	64	

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--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--			
	8-15	16-25	26-35	>35
5A Sumava	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
10C Grattan	Lilac, eastern redcedar, Siberian peashrub, Tatarian honeysuckle.	Siberian crabapple, Austrian pine, jack pine.	Red pine, eastern white pine.	---
12 Corunna	Silky dogwood, American cranberrybush, lilac, nannyberry viburnum, Amur privet.	Northern whitecedar, Manchurian crabapple, white spruce.	Green ash, eastern white pine, Norway spruce.	Imperial Carolina poplar.
13 Belleville	Nannyberry viburnum, lilac, American cranberrybush.	White spruce, northern whitecedar, green ash, Manchurian crabapple.	Eastern white pine, Norway spruce.	Imperial Carolina poplar.
14 Pella	Silky dogwood, redosier dogwood, common ninebark, nannyberry viburnum, American cranberrybush, northern whitecedar.	Balsam fir, white spruce.	Green ash, white ash, red maple, silver maple.	---
15B Wixom	Silky dogwood, lilac, nannyberry viburnum, American cranberrybush.	White spruce, northern whitecedar, Amur maple.	Eastern white pine, Norway spruce, green ash, red maple.	Imperial Carolina poplar.
17B Frankenmuth	American cranberrybush, lilac, Siberian peashrub, silver buffaloberry.	Nannyberry viburnum, white spruce, northern whitecedar, Austrian pine, Washington hawthorn.	Green ash, Norway spruce.	Imperial Carolina poplar.
18 Lenawee	Northern whitecedar, common ninebark, nannyberry viburnum, American cranberrybush.	Eastern white pine, blue spruce, Norway spruce, white spruce, Manchurian crabapple.	Green ash, red maple	---
19 Tappan	Siberian peashrub, lilac.	Northern whitecedar, eastern redcedar, blue spruce, nannyberry viburnum, Austrian pine, white spruce, Washington hawthorn.	Green ash, Norway spruce.	Imperial Carolina poplar.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
22B*:				
Parkhill	Common ninebark, lilac, nannyberry viburnum, American cranberrybush.	Northern whitecedar, white spruce, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce.	---
Wixom	Silky dogwood, lilac, nannyberry viburnum, American cranberrybush.	White spruce, northern whitecedar, Amur maple.	Eastern white pine, Norway spruce, green ash, red maple.	Imperial Carolina poplar.
23A Capac	Silky dogwood, American cranberrybush, Amur privet, lilac.	White spruce, northern whitecedar, Amur maple.	Eastern white pine, red maple, Norway spruce, green ash.	Imperial Carolina poplar.
24 Parkhill	Common ninebark, lilac, nannyberry viburnum, American cranberrybush.	Northern whitecedar, white spruce, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce.	---
26A Pipestone	American cranberrybush, lilac, silky dogwood, Roselow sargent crabapple, nannyberry viburnum.	White spruce, northern whitecedar, Siberian crabapple.	Green ash, eastern white pine, Norway spruce.	Imperial Carolina poplar.
28A*:				
Parkhill	Common ninebark, lilac, nannyberry viburnum, American cranberrybush.	Northern whitecedar, white spruce, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce.	---
Capac	Silky dogwood, American cranberrybush, Amur privet, lilac.	White spruce, northern whitecedar, Amur maple.	Eastern white pine, red maple, Norway spruce, green ash.	Imperial Carolina poplar.
29 Sloan	Green ash, silky dogwood, Amur privet, white spruce, American cranberrybush.	Northern whitecedar, Manchurian crabapple.	Golden willow	Imperial Carolina poplar.
31A Pipestone	Lilac, silky dogwood, American cranberrybush.	Northern whitecedar, Amur maple, white spruce.	Red maple, Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
33 Granby	Amur privet, silky dogwood, American cranberrybush, nannyberry viburnum.	Northern whitecedar, white spruce, Manchurian crabapple, green ash, lilac.	Eastern white pine, Norway spruce.	Imperial Carolina poplar.
41A Shiawassee	Lilac, Siberian peashrub, Tatarian honeysuckle.	Northern whitecedar, white spruce, nannyberry viburnum, Washington hawthorn, blue spruce.	Norway spruce, green ash, black willow.	Imperial Carolina poplar.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
44*:				
Sloan	Green ash, silky dogwood, Amur privet, white spruce, American cranberrybush.	Northern whitecedar, Manchurian crabapple.	Golden willow	Imperial Carolina poplar.
Ceresco	Common ninebark, silky dogwood, American cranberrybush.	White spruce, northern whitecedar, Manchurian crabapple, Amur maple.	Eastern white pine, Norway spruce, green ash.	Imperial Carolina poplar.
45A Fabius	Silky dogwood, nannyberry viburnum, Amur privet, American cranberrybush, Amur maple.	Northern whitecedar, white spruce, Manchurian crabapple.	Eastern white pine, Norway spruce, green ash.	Imperial Carolina poplar.
46B Cadmus	American cranberrybush, lilac, silky dogwood.	White spruce, blue spruce, northern whitecedar, Siberian crabapple.	Red pine, green ash, Austrian pine, Norway spruce.	Imperial Carolina poplar.
55B, 55C2 Gagetown	Common ninebark, lilac, Roselow sargent crabapple.	Blue spruce, white spruce, Manchurian crabapple.	Red pine, eastern white pine, Norway spruce.	Imperial Carolina poplar.
57B*:				
Pella	Silky dogwood, redosier dogwood, common ninebark, nannyberry viburnum, American cranberrybush, northern whitecedar.	Balsam fir, white spruce.	Green ash, white ash, red maple, silver maple.	---
Frankenmuth	American cranberrybush, lilac, Siberian peashrub, silver buffaloberry.	Nannyberry viburnum, white spruce, northern whitecedar, Austrian pine, Washington hawthorn.	Green ash, Norway spruce.	Imperial Carolina poplar.
58B Covert	Lilac, eastern redcedar, Tatarian honeysuckle, Siberian peashrub.	Austrian pine, jack pine, red pine.	Eastern white pine	---
59*:				
Zilwaukee	Siberian peashrub, Tatarian honeysuckle, lilac.	Nannyberry viburnum, northern whitecedar, white spruce, Washington hawthorn, blue spruce.	Eastern white pine, green ash, black willow.	Imperial Carolina poplar.
Misteguay	Siberian peashrub, Tatarian honeysuckle, lilac.	Nannyberry viburnum, northern whitecedar, white spruce, Washington hawthorn, white spruce.	Eastern white pine, green ash, black willow.	Imperial Carolina poplar.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
60B---------- Arkona	American cranberrybush, silky dogwood, lilac, Tatarian honeysuckle, nannyberry viburnum.	Northern whitecedar, blue spruce, Siberian crabapple.	Eastern white pine, Norway spruce, green ash.	Imperial Carolina poplar.
61A*:				
Tappan----------	Siberian peashrub, lilac.	Northern whitecedar, eastern redcedar, blue spruce, nannyberry viburnum, Austrian pine, white spruce, Washington hawthorn.	Green ash, Norway spruce.	Imperial Carolina poplar.
Poseyville-------	American cranberrybush, lilac, nannyberry viburnum, silky dogwood, Roselow sargent crabapple, common ninebark.	White spruce, northern whitecedar, Manchurian crabapple.	Green ash, eastern white pine, Norway spruce.	---
62A*:				
Tappan----------	Siberian peashrub, lilac.	Northern whitecedar, eastern redcedar, blue spruce, nannyberry viburnum, Austrian pine, white spruce, Washington hawthorn.	Green ash, Norway spruce.	Imperial Carolina poplar.
Londo----------	Lilac, American cranberrybush.	White spruce, northern whitecedar, Amur maple.	Norway spruce, green ash, red maple, eastern white pine.	Imperial Carolina poplar.
63A*: Urban land.				
Tappan----------	Siberian peashrub, lilac.	Northern whitecedar, eastern redcedar, blue spruce, nannyberry viburnum, Austrian pine, white spruce, Washington hawthorn.	Green ash, Norway spruce.	Imperial Carolina poplar.
64A---------- Sanilac	Siberian peashrub, lilac.	White spruce, northern whitecedar, eastern redcedar, white spruce, nannyberry viburnum, Washington hawthorn.	Eastern white pine, Norway spruce, green ash.	Imperial Carolina poplar.
65A---------- Shiawassee	Lilac, Siberian peashrub, Tatarian honeysuckle.	Northern whitecedar, white spruce, nannyberry viburnum, Washington hawthorn, blue spruce.	Norway spruce, green ash, black willow.	Imperial Carolina poplar.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
68A*:				
Tappan	Siberian peashrub, lilac.	Northern whitecedar, eastern redcedar, blue spruce, nannyberry viburnum, Austrian pine, white spruce, Washington hawthorn.	Green ash, Norway spruce.	Imperial Carolina poplar.
Londo	Lilac, American cranberrybush.	White spruce, northern whitecedar, Amur maple.	Norway spruce, green ash, red maple, eastern white pine.	Imperial Carolina poplar.
Poseyville	American cranberrybush, lilac, nannyberry viburnum, silky dogwood, Roselow sargent crabapple, common ninebark.	White spruce, northern whitecedar, Manchurian crabapple.	Green ash, eastern white pine, Norway spruce.	---
69--- Sloan	Green ash, silky dogwood, Amur privet, white spruce, American cranberrybush.	Northern whitecedar, Manchurian crabapple.	Golden willow---	Imperial Carolina poplar.
70. Udipsamments				
71. Udorthents				
72. Aquents				
73*. Pits				
74*. Urban land				
75B2, 75C2, 75D3--- Strawn	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
76A--- Londo	Lilac, American cranberrybush.	White spruce, northern whitecedar, Amur maple.	Norway spruce, green ash, red maple, eastern white pine.	Imperial Carolina poplar.
77*: Chesaning.				
Cohoctah	Common ninebark, lilac, American cranberrybush, nannyberry viburnum, silky dogwood.	Manchurian crabapple, white spruce, northern whitecedar.	Red maple, eastern white pine, Norway spruce.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
78. Fluvaquents				
82---------- Granby	American cranberrybush, lilac, nannyberry viburnum.	Northern whitecedar, Manchurian crabapple, white spruce, green ash.	Eastern white pine, Norway spruce.	Imperial Carolina poplar.
84A*:				
Parkhill---------	Common ninebark, lilac, nannyberry viburnum, American cranberrybush.	Northern whitecedar, white spruce, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce.	---
Poseyville-------	American cranberrybush, lilac, nannyberry viburnum, silky dogwood, Roselow sargent crabapple, common ninebark.	White spruce, northern whitecedar, Manchurian crabapple.	Green ash, eastern white pine, Norway spruce.	---
88B---------- Boyer	Amur maple, Siberian peashrub, lilac, Roselow sargent crabapple, Manchurian crabapple.	Red pine, Austrian pine, green ash, eastern redcedar.	Eastern white pine----	---
89---------- Roundhead	Silky dogwood, Amur honeysuckle, nannyberry viburnum, Amur privet.	Tall purple willow----	Baldcypress, black willow, golden willow.	Imperial Carolina poplar.
91B---------- Branch	Nannyberry viburnum, silky dogwood, lilac, Siberian peashrub.	Blue spruce, white spruce, northern whitecedar, Siberian crabapple.	Red pine, green ash, Norway spruce.	Imperial Carolina poplar.
93A---------- Capac	Silky dogwood, American cranberrybush, Amur privet, lilac.	White spruce, northern whitecedar, Amur maple.	Eastern white pine, red maple, Norway spruce, green ash.	Imperial Carolina poplar.
94*:				
Zilwaukee--------	Siberian peashrub, Tatarian honeysuckle, lilac.	Nannyberry viburnum, northern whitecedar, white spruce, Washington hawthorn, blue spruce.	Eastern white pine, green ash, black willow.	Imperial Carolina poplar.
Misteguay--------	Siberian peashrub, Tatarian honeysuckle, lilac.	Nannyberry viburnum, northern whitecedar, white spruce, Washington hawthorn, white spruce.	Eastern white pine, green ash, black willow.	Imperial Carolina poplar.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
95*:				
Sloan	Green ash, silky dogwood, Amur privet, white spruce, American cranberrybush.	Northern whitecedar, Manchurian crabapple.	Golden willow	Imperial Carolina poplar.
Ceresco	Common ninebark, silky dogwood, American cranberrybush.	White spruce, northern whitecedar, Manchurian crabapple, Amur maple.	Eastern white pine, Norway spruce, green ash.	Imperial Carolina poplar.
96*:				
Chesaning	Lilac, Siberian peashrub, silver buffaloberry.	Nannyberry viburnum, Washington hawthorn, white spruce, blue spruce, eastern redcedar, northern whitecedar.	Green ash	Imperial Carolina poplar.
Cohoctah	Common ninebark, lilac, American cranberrybush, nannyberry viburnum, silky dogwood.	Manchurian crabapple, white spruce, northern whitecedar.	Red maple, eastern white pine, Norway spruce.	---
98A Poseyville	American cranberrybush, lilac, nannyberry viburnum, silky dogwood, Roselow sargent crabapple, common ninebark.	White spruce, northern whitecedar, Manchurian crabapple.	Green ash, eastern white pine, Norway spruce.	---
99A*:				
Urban land.				
Parkhill	Common ninebark, lilac, nannyberry viburnum, American cranberrybush.	Northern whitecedar, white spruce, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce.	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
5A Sumava	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
10C Grattan	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
12 Corunna	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
13 Belleville	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.
14 Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
15B Wixom	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.
17B Frankenmuth	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
18 Lenawee	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
19 Tappan	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
22B*: Parkhill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Wixom	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.
23A Capac	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
24 Parkhill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
26A Pipestone	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.
28A*: Parkhill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Capac	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
29--Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
31A--Pipestone	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.
33--Granby	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.
41A--Shiawassee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: small stones, wetness, percs slowly.	Moderate: wetness.
44*:				
Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Ceresco	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.
45A--Fabius	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
46B--Cadmus	Moderate: small stones, wetness.	Moderate: wetness, small stones.	Severe: small stones.	Slight.
55B--Gagetown	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight.
55C2--Gagetown	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Slight.
57B*:				
Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Frankenmuth	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
58B--Covert	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
59*:				
Zilwaukee	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness, too clayey.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
59*:				
Misteguay	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness, too clayey.
60B Arkona	Severe: wetness, percs slowly, too sandy.	Severe: too sandy, percs slowly.	Severe: too sandy, wetness, percs slowly.	Severe: too sandy.
61A*:				
Tappan	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Poseyville	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
62A*:				
Tappan	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Londo	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
63A*:				
Urban land	Variable	Variable	Variable	Variable.
Tappan	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
64A Sanilac	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
65A Shiawassee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.
68A*:				
Tappan	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Londo	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
Poseyville	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
69 Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
70 Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
71 Udorthents	Variable	Variable	Variable	Variable.
72 Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
73*. Pits				
74* Urban land	Variable	Variable	Variable	Variable.
75B2 Strawn	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.
75C2 Strawn	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.
75D3 Strawn	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
76A Londo	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
77*: Chesaning	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.
Cohoctah	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
78 Fluvaquents	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.
82 Granby	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.
84A*: Parkhill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Poseyville	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
88B Boyer	Slight	Slight	Moderate: slope, small stones.	Slight.
89 Roundhead	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
91B Branch	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
93A Capac	Severe: wetness.	Moderate: wetness, small stones, percs slowly.	Severe: small stones, wetness.	Moderate: wetness.
94*: Zilwaukee	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness, flooding.	Severe: wetness, too clayey.
Misteguay	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness, flooding.	Severe: wetness, too clayey.
95*: Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ceresco	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
96*: Chesaning	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
Cohoctah	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
98A Poseyville	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
99A*: Urban land.				
Parkhill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
5A---------- Sumava	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
10C---------- Grattan	Very poor.	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
12---------- Corunna	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
13---------- Belleville	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
14---------- Pella	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
15B---------- Wixom	Fair	Fair	Good	Good	Fair	Poor	Poor	Fair	Good	Poor.
17B---------- Frankenmuth	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
18---------- Lenawee	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
19---------- Tappan	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
22B*:										
Parkhill----------	Poor	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
Wixom----------	Fair	Fair	Good	Good	Fair	Poor	Poor	Fair	Good	Poor.
23A---------- Capac	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
24---------- Parkhill	Poor	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
26A---------- Pipestone	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
28A*:										
Parkhill----------	Poor	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
Capac----------	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
29---------- Sloan	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Poor	Good.
31A---------- Pipestone	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
33---------- Granby	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
41A---------- Shiawassee	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
44*:										
Sloan----------	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Poor	Good.
Ceresco----------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
45A---------- Fabius	Fair	Fair	Good	Good	Good	Fair	Poor	Fair	Good	Poor.
46B---------- Cadmus	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
55B---------- Gagetown	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
55C2---------- Gagetown	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
57B*:										
Pella----------	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Frankenmuth-------	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
58B---------- Covert	Poor	Poor	Fair	Good	Good	Poor	Poor	Poor	Good	Poor.
59*:										
Zilwaukee---------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
Misteguay---------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
60B---------- Arkona	Fair	Fair	Good	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
61A*:										
Tappan----------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
Poseyville--------	Fair	Fair	Good	Good	Good	Fair	Good	Fair	Good	Fair.
62A*:										
Tappan----------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
Londo----------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
63A*: Urban land.										
Tappan----------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
64A---------- Sanilac	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
65A---------- Shiawassee	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
68A*:										
Tappan----------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
68A*:										
Londo	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Poseyville	Fair	Fair	Good	Good	Good	Fair	Good	Fair	Good	Fair.
69---------- Sloan	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Poor	Good.
70. Udipsamments										
71. Udorthents										
72. Aquents										
73*. Pits										
74*. Urban land										
75B2, 75C2---------- Strawn	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
75D3---------- Strawn	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
76A---------- Londo	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
77*:										
Chesaning	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Cohoctah	Poor	Poor	Poor	Good	Good	Good	Good	Poor	Good	Good.
78. Fluvaquents										
82---------- Granby	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
84A*:										
Parkhill	Poor	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
Poseyville	Fair	Fair	Good	Good	Good	Fair	Good	Fair	Good	Fair.
88B---------- Boyer	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
89---------- Roundhead	Fair	Fair	Poor	Fair	Fair	Good	Good	Fair	Fair	Good.
91B---------- Branch	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
93A---------- Capac	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
94*:										
Zilwaukee	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
Misteguay	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
95*:										
Sloan	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Poor	Good.
Ceresco	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
96*:										
Chesaning	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Cohoctah	Fair	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
98A---------- Poseyville	Fair	Fair	Good	Good	Good	Fair	Good	Fair	Good	Fair.
99A*:										
Urban land.										
Parkhill	Poor	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
5A Sumava	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness.
10C Grattan	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
12 Corunna	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
13 Belleville	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
14 Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
15B Wixom	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
17B Frankenmuth	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
18 Lenawee	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
19 Tappan	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
22B*: Parkhill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Wixom	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
23A Capac	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
24 Parkhill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
26A---------- Pipestone	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
28A*:						
Parkhill----------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Capac----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
29---------- Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
31A---------- Pipestone	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
33---------- Granby	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
41A---------- Shiawassee	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: small stones, wetness, droughty.
44*:						
Sloan----------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Ceresco----------	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
45A---------- Fabius	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, droughty.
46B---------- Cadmus	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: small stones.
55B---------- Gagetown	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: frost action.	Slight.
55C2---------- Gagetown	Severe: cutbanks cave, wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Severe: frost action.	Moderate: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
57B*:						
Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Frankenmuth	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
58B---------- Covert	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.
59*:						
Zilwaukee	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, too clayey.
Misteguay	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: wetness, too clayey.
60B---------- Arkona	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty, too sandy.
61A*:						
Tappan	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
Poseyville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, droughty.
62A*:						
Tappan	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
Londo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
63A*:						
Urban land	Variable	Variable	Variable	Variable	Variable	Variable.
Tappan	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
64A---------- Sanilac	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, droughty.
65A---------- Shiawassee	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, droughty.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
68A*:						
Tappan	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
Londo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Poseyville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, droughty.
69--- Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: wetness.
70--- Udipsamments	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
71--- Udorthents	Variable	Variable	Variable	Variable	Variable	Variable.
72--- Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
73*. Pits						
74*--- Urban land	Variable	Variable	Variable	Variable	Variable	Variable.
75B2--- Strawn	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.
75C2--- Strawn	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
75D3--- Strawn	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
76A--- Londo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
77*:						
Chesaning	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
Cohoctah	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding.
78--- Fluvaquents	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding.	Severe: ponding, flooding.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
82 Granby	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
84A*:						
Parkhill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Poseyville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, droughty.
88B Boyer	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
89 Roundhead	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding, excess humus.
91B Branch	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty, too sandy.
93A Capac	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: small stones, large stones, wetness.
94*:						
Zilwaukee	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, flooding, too clayey.
Misteguay	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding, too clayey.
95*:						
Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: wetness.
Ceresco	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: frost action.	Moderate: wetness.
96*:						
Chesaning	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: frost action.	Moderate: wetness.
Cohoctah	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, frost action.	Severe: wetness.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
98A---------- Poseyville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, droughty.
99A*: Urban land.						
Parkhill---------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
5A Sumava	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
10C Grattan	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
12 Corunna	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
13 Belleville	Severe: ponding, percs slowly, poor filter.	Severe: seepage, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
14 Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
15B Wixom	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
17B Frankenmuth	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: wetness.
18 Lenawee	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
19 Tappan	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
22B*: Parkhill	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Wixom	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
23A Capac	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
24 Parkhill	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
26A---------- Pipestone	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
28A*:					
Parkhill----------	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Capac----------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
29---------- Sloan	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
31A---------- Pipestone	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
33---------- Granby	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
41A---------- Shiawassee	Severe: wetness, percs slowly.	Severe: seepage.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
44*:					
Sloan----------	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Ceresco----------	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
45A---------- Fabius	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: wetness, seepage.	Poor: seepage, too sandy, small stones.
46B---------- Cadmus	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
55B---------- Gagetown	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy.
55C2---------- Gagetown	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
57B*:					
Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Frankenmuth	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: wetness.
58B Covert	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
59*:					
Zilwaukee	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Misteguay	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
60B Arkona	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: wetness, too clayey.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, wetness.
61A*:					
Tappan	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Poseyville	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
62A*:					
Tappan	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Londo	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
63A*:					
Urban land	Variable	Variable	Variable	Variable	Variable.
Tappan	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
64A Sanilac	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
65A Shiawassee	Severe: wetness, percs slowly.	Severe: seepage.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
68A*: Tappan	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Londo	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Poseyville	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
69 Sloan	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
70 Udipsamments	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
71 Udorthents	Variable	Variable	Variable	Variable	Variable.
72 Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
73*. Pits					
74* Urban land	Variable	Variable	Variable	Variable	Variable.
75B2 Strawn	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
75C2 Strawn	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
75D3 Strawn	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
76A Londo	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
77*: Chesaning	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
77*:					
Cohoctah	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness, thin layer.
78 Fluvaquents	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
82 Granby	Severe: ponding, percs slowly, poor filter.	Severe: seepage, ponding.	Severe: ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
84A*:					
Parkhill	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Poseyville	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
88B Boyer	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
89 Roundhead	Severe: ponding, percs slowly.	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
91B Branch	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy.
93A Capac	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
94*:					
Zilwaukee	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Misteguay	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
95*:					
Sloan	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ceresco	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
96*:					
Chesaning	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Cohoctah	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness, thin layer.
98A	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Poseyville					
99A*:					
Urban land.					
Parkhill	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
5A Sumava	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
10C Grattan	Good	Probable	Improbable: too sandy.	Poor: too sandy.
12 Corunna	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
13 Belleville	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
14 Pella	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
15B Wixom	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
17B Frankenmuth	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
18 Lenawee	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
19 Tappan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
22B*: Parkhill	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wixom	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
23A Capac	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
24 Parkhill	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
26A Pipestone	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
28A*: Parkhill	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
28A*:				
Capac	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
29	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Sloan				
31A	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Pipestone				
33	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Granby				
41A	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Shiawassee				
44*:				
Sloan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ceresco	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
45A	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Fabius				
46B	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Cadmus				
55B, 55C2	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
Gagetown				
57B*:				
Pella	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Frankenmuth	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
58B	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Covert				
59*:				
Zilwaukee	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Misteguay	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
60B Arkona	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
61A*: Tappan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Poseyville	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
62A*: Tappan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Londo	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
63A*: Urban land	Variable	Variable	Variable	Variable.
Tappan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
64A Sanilac	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
65A Shiawassee	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
68A*: Tappan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Londo	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Poseyville	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
69 Sloan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
70 Udipsamments	Good	Probable	Improbable: too sandy.	Poor: too sandy.
71 Udorthents	Variable	Variable	Variable	Variable.
72 Aquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
73*. Pits				
74*. Urban land	Variable	Variable	Variable	Variable.
75B2, 75C2. Strawn	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
75D3. Strawn	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
76A. Londo	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
77*:				
Chesaning	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, small stones, area reclaim.
Cohoctah	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
78. Fluvaquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
82. Granby	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
84A*:				
Parkhill	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Poseyville	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
88B. Boyer	Good	Probable	Probable	Poor: small stones, area reclaim.
89. Roundhead	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
91B. Branch	Fair: thin layer, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
93A. Capac	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
94*:				
Zilwaukee	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Misteguay	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
95*:				
Sloan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ceresco	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
96*:				
Chesaning	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, small stones, area reclaim.
Cohoctah	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
98A Poseyville	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
99A*:				
Urban land.				
Parkhill	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
5A---------- Sumava	Severe: seepage.	Severe: piping, wetness.	Favorable------	Wetness, soil blowing.	Erodes easily, wetness, soil blowing.	Wetness, erodes easily.
10C---------- Grattan	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
12---------- Corunna	Severe: seepage.	Severe: piping, ponding.	Ponding, frost action, cutbanks cave.	Ponding, droughty.	Erodes easily, ponding, soil blowing.	Wetness, erodes easily, droughty.
13---------- Belleville	Severe: seepage.	Severe: ponding.	Ponding, frost action.	Ponding, droughty, fast intake.	Ponding, soil blowing.	Wetness, droughty, rooting depth.
14---------- Pella	Moderate: seepage.	Severe: piping, ponding.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.
15B---------- Wixom	Severe: seepage.	Severe: wetness.	Favorable------	Wetness, droughty.	Erodes easily, wetness, soil blowing.	Wetness, erodes easily, droughty.
17B---------- Frankenmuth	Severe: seepage.	Severe: piping, wetness.	Frost action, cutbanks cave.	Wetness, soil blowing.	Erodes easily, wetness, soil blowing.	Wetness, erodes easily.
18---------- Lenawee	Slight---------	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
19---------- Tappan	Moderate: seepage.	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, erodes easily, rooting depth.
22B*:						
Parkhill---------	Slight---------	Severe: thin layer, ponding.	Ponding, frost action.	Ponding--------	Erodes easily, ponding.	Wetness, erodes easily.
Wixom----------	Severe: seepage.	Severe: wetness.	Favorable------	Wetness, droughty.	Erodes easily, wetness, soil blowing.	Wetness, erodes easily, droughty.
23A---------- Capac	Slight---------	Severe: piping, wetness.	Frost action---	Wetness--------	Wetness--------	Wetness.
24---------- Parkhill	Slight---------	Severe: thin layer, ponding.	Ponding, frost action.	Ponding--------	Erodes easily, ponding.	Wetness, erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
26A---------- Pipestone	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
28A*:						
Parkhill----------	Slight---------	Severe: thin layer, ponding.	Ponding, frost action.	Ponding--------	Erodes easily, ponding.	Wetness, erodes easily.
Capac----------	Slight---------	Severe: piping, wetness.	Frost action---	Wetness--------	Wetness--------	Wetness.
29---------- Sloan	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
31A---------- Pipestone	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
33---------- Granby	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Ponding, too sandy, soil blowing.	Wetness, droughty.
41A---------- Shiawassee	Severe: seepage.	Severe: piping.	Percs slowly, frost action.	Wetness, droughty, soil blowing.	Wetness, soil blowing, percs slowly.	Wetness, droughty, rooting depth.
44*:						
Sloan----------	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Ceresco----------	Severe: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness--------	Wetness--------	Wetness.
45A---------- Fabius	Severe: seepage.	Severe: seepage, wetness.	Frost action, cutbanks cave.	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
46B---------- Cadmus	Moderate: seepage.	Moderate: piping, wetness.	Favorable------	Wetness, soil blowing.	Wetness, soil blowing.	Rooting depth.
55B---------- Gagetown	Moderate: seepage, slope.	Severe: piping.	Frost action, slope, cutbanks cave.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
55C2---------- Gagetown	Severe: slope.	Severe: piping.	Frost action, slope, cutbanks cave.	Slope, wetness.	Slope, erodes easily, wetness.	Slope, erodes easily.
57B*:						
Pella----------	Moderate: seepage.	Severe: piping, ponding.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
57B*:						
Frankenmuth	Severe: seepage.	Severe: piping, wetness.	Frost action, cutbanks cave.	Wetness, soil blowing.	Erodes easily, wetness, soil blowing.	Wetness, erodes easily.
58B---------- Covert	Severe: seepage.	Severe: seepage, piping.	Slope, cutbanks cave.	Slope, wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
59*:						
Zilwaukee	Slight	Severe: wetness.	Percs slowly, frost action.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Misteguay	Slight	Severe: wetness.	Percs slowly, frost action.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
60B---------- Arkona	Severe: seepage.	Moderate: hard to pack, wetness.	Percs slowly---	Wetness, droughty.	Wetness, soil blowing, percs slowly.	Wetness, droughty, rooting depth.
61A*:						
Tappan	Moderate: seepage.	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, erodes easily, rooting depth.
Poseyville	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness, droughty.	Erodes easily, wetness, soil blowing.	Wetness, erodes easily, droughty.
62A*:						
Tappan	Moderate: seepage.	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, erodes easily, rooting depth.
Londo	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness	Wetness	Wetness, rooting depth.
63A*:						
Urban land	Variable	Variable	Variable	Variable	Variable	Variable.
Tappan	Moderate: seepage.	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, erodes easily, rooting depth.
64A---------- Sanilac	Moderate: seepage.	Severe: piping, wetness.	Frost action, cutbanks cave.	Wetness, droughty.	Erodes easily, wetness, soil blowing.	Wetness, erodes easily, droughty.
65A---------- Shiawassee	Severe: seepage.	Severe: piping.	Percs slowly, frost action.	Wetness, droughty, soil blowing.	Wetness, soil blowing, percs slowly.	Wetness, droughty, rooting depth.
68A*:						
Tappan	Moderate: seepage.	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, erodes easily, rooting depth.
Londo	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness	Wetness	Wetness, rooting depth.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
68A*: Poseyville	Moderate: seepage.	Severe: wetness.	Frost action	Wetness, droughty.	Erodes easily, wetness, soil blowing.	Wetness, erodes easily, droughty.
69--- Sloan	Moderate: seepage.	Severe: piping, wetness.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
70--- Udipsamments	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
71--- Udorthents	Variable	Variable	Variable	Variable	Variable	Variable.
72--- Aquents	Slight	Severe: ponding.	Ponding, frost action.	Ponding	Ponding	Wetness.
73*. Pits						
74*--- Urban land	Variable	Variable	Variable	Variable	Variable	Variable.
75B2--- Strawn	Moderate: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
75C2, 75D3--- Strawn	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
76A--- Londo	Moderate: seepage.	Severe: wetness.	Frost action	Wetness	Wetness	Wetness, rooting depth.
77*: Chesaning	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, erodes easily.	Erodes easily, wetness, too sandy.	Wetness, erodes easily.
Cohoctah	Severe: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, soil blowing, flooding.	Wetness, soil blowing.	Wetness.
78--- Fluvaquents	Slight	Severe: ponding.	Ponding, flooding.	Ponding, flooding.	Ponding	Wetness.
82--- Granby	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Ponding, too sandy, soil blowing.	Wetness, droughty.
84A*: Parkhill	Slight	Severe: thin layer, ponding.	Ponding, frost action.	Ponding	Erodes easily, ponding.	Wetness, erodes easily.
Poseyville	Moderate: seepage.	Severe: wetness.	Frost action	Wetness, droughty.	Erodes easily, wetness, soil blowing.	Wetness, erodes easily, droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
88B---------- Boyer	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
89---------- Roundhead	Slight---------	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, soil blowing, percs slowly.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.
91B---------- Branch	Severe: seepage.	Severe: seepage, piping.	Slope, cutbanks cave.	Slope, wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
93A---------- Capac	Slight---------	Severe: piping, wetness.	Frost action---	Wetness, soil blowing.	Wetness, soil blowing.	Wetness.
94*:						
Zilwaukee--------	Slight---------	Severe: wetness.	Percs slowly, flooding, frost action.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Misteguay--------	Slight---------	Severe: wetness.	Percs slowly, flooding, frost action.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
95*:						
Sloan----------	Moderate: seepage.	Severe: piping, wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
Ceresco----------	Severe: seepage.	Severe: piping, wetness.	Frost action---	Wetness--------	Wetness--------	Wetness.
96*:						
Chesaning--------	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, cutbanks cave.	Wetness, erodes easily.	Erodes easily, wetness, too sandy.	Wetness, erodes easily.
Cohoctah---------	Severe: seepage.	Severe: piping, wetness.	Frost action---	Wetness, soil blowing.	Wetness, soil blowing.	Wetness.
98A---------- Poseyville	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness, droughty.	Erodes easily, wetness, soil blowing.	Wetness, erodes easily, droughty.
99A*:						
Urban land.						
Parkhill---------	Slight---------	Severe: thin layer, ponding.	Ponding, frost action.	Ponding--------	Erodes easily, ponding.	Wetness, erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
5A---------- Sumava	0-12	Sandy loam-------	SM, SC-SM, ML, CL-ML	A-4, A-2-4	0	100	100	60-70	30-55	<25	NP-6
	12-16	Fine sandy loam, sandy loam.	SM, SC-SM, ML, CL-ML	A-4	0	100	100	55-85	30-55	<25	NP-7
	16-25	Sandy clay loam, sandy loam, fine sandy loam.	SM, SC-SM, ML, CL-ML	A-4	0	100	95-100	55-85	30-55	<25	NP-7
	25-38	Loam----------	CL-ML	A-4	0-3	95-100	90-100	75-95	50-75	<25	4-7
	38-60	Loam----------	ML, CL-ML	A-4	0-3	95-100	90-100	75-95	50-85	<25	NP-7
10C---------- Grattan	0-7	Sand----------	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-70	3-15	---	NP
	7-35	Sand, loamy sand	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-75	3-30	---	NP
	35-60	Sand----------	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	90-100	35-70	0-15	---	NP
12---------- Corunna	0-11	Sandy loam-------	SM, SC, SC-SM	A-2, A-4	0-5	95-100	85-100	50-70	25-40	<30	NP-10
	11-27	Sandy loam-------	SM, SC, SC-SM	A-4, A-2	0-5	95-100	85-100	50-70	30-40	<30	NP-10
	27-60	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	100	95-100	90-100	70-90	25-50	11-25
13---------- Belleville	0-12	Fine sand--------	SM, SP-SM	A-2-4, A-3, A-1-b	0	95-100	90-100	45-80	5-35	<20	NP-4
	12-23	Fine sand, loamy sand, loamy fine sand.	SM, SP-SM, SC-SM	A-2-4, A-1-b, A-3	0-3	95-100	90-100	45-85	5-35	<20	NP-6
	23-60	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0-3	95-100	90-100	75-100	55-95	30-45	10-25
14---------- Pella	0-9	Silt loam--------	CL	A-6, A-7	0	100	95-100	90-100	85-95	30-45	10-20
	9-24	Silty clay loam, silty clay, silt loam.	CL	A-6, A-7	0	100	95-100	90-100	85-95	30-50	15-30
	24-60	Stratified sandy loam to silty clay loam.	CL, CL-ML	A-4, A-6	0-5	90-100	80-100	70-100	50-85	20-35	7-20
15B---------- Wixom	0-12	Sand----------	SM, SP-SM	A-2-4, A-3	0	95-100	90-100	50-70	5-15	---	NP
	12-23	Sand, fine sand	SM, SP-SM, SC-SM	A-2-4, A-3	0	95-100	90-100	50-90	5-30	<25	NP-7
	23-60	Silty clay loam, sandy clay loam, loam.	CL	A-4, A-6, A-7-6	0	95-100	90-100	85-100	65-95	25-45	9-25

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
17B---------- Frankenmuth	0-9	Very fine sandy loam.	CL, ML, CL-ML	A-4	0	100	100	85-95	50-65	20-30	3-10
	9-13	Silt loam, loam	CL, ML, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-30	3-11
	13-18	Very fine sandy loam, silt loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	85-100	50-95	20-45	3-20
	18-60	Stratified very fine sand to silty clay loam.	CL, ML, SM, SC	A-4, A-6, A-7	0	100	100	90-100	40-95	20-45	3-20
18---------- Lenawee	0-12	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	75-95	35-45	15-25
	12-42	Silty clay loam, clay loam.	CH, CL	A-7	0	100	95-100	90-100	70-95	40-55	20-30
	42-60	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-95	25-50	10-25
19---------- Tappan	0-12	Loam----------	CL	A-4, A-6	0-5	95-100	90-100	75-95	55-75	25-35	7-15
	12-16	Clay loam--------	CL	A-6	0-5	95-100	90-100	85-95	65-80	25-40	10-20
	16-60	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0-5	95-100	90-100	85-95	55-90	25-40	7-20
22B*:											
Parkhill--------	0-11	Loam----------	CL-ML, CL	A-4, A-6	0-5	95-100	85-100	70-95	50-75	20-30	5-15
	11-32	Clay loam, loam	CL	A-6, A-7	0-5	95-100	85-100	70-95	60-90	25-45	10-25
	32-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	70-95	50-90	20-35	5-15
Wixom----------	0-12	Sand----------	SM, SP-SM	A-2-4, A-3	0	95-100	90-100	50-75	5-15	---	NP
	12-23	Sand, fine sand	SM, SP-SM, SC-SM	A-2-4, A-3	0	95-100	90-100	50-90	5-35	<25	NP-7
	23-60	Silty clay loam, sandy clay loam, loam.	CL	A-4, A-6, A-7-6	0	95-100	90-100	85-100	65-95	25-45	9-25
23A---------- Capac	0-12	Loam----------	CL, ML, CL-ML	A-4	0-5	95-100	85-100	70-95	50-85	<25	3-10
	12-38	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	85-100	75-95	50-85	25-45	5-20
	38-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	75-100	70-95	55-75	20-45	5-20
24---------- Parkhill	0-11	Loam----------	CL-ML, CL	A-4, A-6	0-5	95-100	85-100	70-95	50-75	20-30	5-15
	11-32	Clay loam, loam	CL	A-6, A-7	0-5	95-100	85-100	70-95	60-90	25-45	10-25
	32-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	70-95	50-80	20-35	5-15
26A---------- Pipestone	0-12	Sand----------	SP-SM, SM	A-1, A-2-4, A-3	0	95-100	85-100	40-80	5-15	---	NP
	12-52	Sand, fine sand	SP, SP-SM, SM	A-1, A-2-4, A-3	0	95-100	85-100	40-95	2-30	---	NP
	52-60	Loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	85-100	70-100	50-90	20-45	5-20
28A*:											
Parkhill--------	0-11	Loam----------	CL-ML, CL	A-4, A-6	0-5	95-100	85-100	70-95	50-75	20-30	5-15
	11-32	Clay loam, loam	CL	A-6, A-7	0-5	95-100	85-100	70-95	60-90	25-45	10-25
	32-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	70-95	50-90	20-35	5-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
28A*:											
Capac	0-12	Loam	CL, ML, CL-ML	A-4	0-5	95-100	85-100	70-95	50-85	<25	3-10
	12-38	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	85-100	75-95	50-85	25-45	5-20
	38-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	75-100	70-95	55-75	20-45	5-20
29 Sloan	0-24	Silt loam	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	24-42	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
	42-60	Stratified very fine sandy loam and silt loam.	ML, CL	A-4, A-6	0	100	90-100	85-95	50-90	25-40	3-15
31A Pipestone	0-10	Sand	SM, SP-SM	A-2-4, A-3, A-1-b	0	95-100	85-100	65-90	5-15	---	NP
	10-45	Sand, fine sand	SP-SM, SM	A-2-4, A-3, A-1-b	0	95-100	85-100	40-90	5-30	---	NP
	45-60	Sand, fine sand	SP-SM, SM	A-3, A-2-4, A-1-b	0	95-100	85-100	40-90	5-30	---	NP
33 Granby	0-12	Fine sand	SM	A-3, A-2	0	100	100	75-90	20-35	---	NP
	12-48	Sand, fine sand	SP-SM, SM	A-3, A-2, A-1	0	100	95-100	45-90	5-35	---	NP
	48-60	Sand, fine sand	SP-SM, SM	A-3, A-2, A-1	0	100	95-100	45-90	5-35	---	NP
41A Shiawassee	0-11	Gravelly sandy loam.	SC-SM, SC	A-2-4, A-2-6, A-1-b	0	65-90	55-75	35-55	15-35	20-30	4-11
	11-34	Sandy loam, very fine sandy loam, loam.	SC-SM, SC, CL-ML, CL	A-2-4, A-4, A-6, A-2-6	0-5	85-100	75-90	45-90	20-70	20-30	4-11
	34-60	Loam, clay loam	CL-ML, CL	A-4, A-6, A-7	0-5	85-100	75-90	65-90	50-75	20-45	5-25
44*:											
Sloan	0-24	Silt loam	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	24-42	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
	42-60	Stratified very fine sandy loam and silt loam.	ML, CL	A-4, A-6	0	100	90-100	85-95	50-90	25-40	3-15
Ceresco	0-11	Silt loam	CL-ML, CL	A-4	0	100	100	85-100	60-90	20-30	4-10
	11-19	Silt loam	SC-SM, CL, SC, CL-ML	A-2, A-4	0	100	100	85-100	60-80	20-30	4-10
	19-60	Fine sandy loam, silt loam, very fine sand.	SC, SC-SM, CL, CL-ML	A-4	0	100	100	60-100	40-90	20-30	4-10

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
45A---------- Fabius	0-16	Sandy loam-------	SM	A-2-4	0-5	95-100	90-95	60-70	20-35	20-30	NP-7
	16-22	Sandy loam, sandy clay loam, loam.	SC, CL	A-4, A-6	0-5	90-95	70-95	70-90	40-55	25-40	8-20
	22-60	Gravelly coarse sand, very gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0-5	50-80	25-75	10-35	0-10	---	NP
46B---------- Cadmus	0-7	Gravelly sandy loam.	SC-SM, SC	A-2-4, A-2-6, A-1-b	0-5	85-95	70-75	40-55	20-35	20-30	4-11
	7-19	Gravelly sandy clay loam, gravelly loam.	SC, CL	A-4, A-6, A-2, A-7	0-5	95-100	75-100	45-95	20-75	25-45	9-21
	19-25	Sandy loam, loamy sand, gravelly sandy loam.	SC, SC-SM, SP-SM	A-2, A-4	0-5	95-100	75-100	45-75	12-40	20-30	4-11
	25-60	Loam, clay loam, silty clay loam.	CL, SC	A-4, A-6	0-5	95-100	80-100	65-100	45-95	25-40	7-20
55B---------- Gagetown	0-11	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	90-100	70-90	<25	NP-10
	11-60	Stratified fine sand to silt loam.	ML, SM, SC, CL	A-4, A-6	0	100	100	70-100	40-90	15-30	NP-15
55C2---------- Gagetown	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	3-15
	8-60	Stratified fine sand to silt loam.	ML, SM, SC, CL	A-4, A-6	0	100	100	70-100	40-90	15-30	NP-15
57B*:											
Pella----------	0-9	Silt loam--------	CL	A-6, A-7	0	100	95-100	90-100	85-95	30-45	10-20
	9-24	Silty clay loam, silty clay, silt loam.	CL	A-6, A-7	0	100	95-100	90-100	85-95	30-50	15-30
	24-60	Stratified loam to silty clay loam.	SC, CL, CL-ML	A-2, A-4, A-6	0-5	90-100	80-100	70-100	50-85	20-35	7-20
Frankenmuth-----	0-9	Very fine sandy loam.	CL, ML, CL-ML	A-4	0	100	100	85-95	50-65	20-30	3-10
	9-13	Silt loam, loam	CL, ML, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-30	3-11
	13-18	Very fine sandy loam, silt loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	85-100	50-95	20-45	3-20
	18-60	Stratified very fine sand to silty clay loam.	CL, ML, SM, SC	A-4, A-6, A-7	0	100	100	90-100	40-95	20-45	3-20
58B---------- Covert	0-8	Sand----------	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-75	5-15	---	NP
	8-35	Sand----------	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-70	5-15	---	NP
	35-60	Sand----------	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-70	5-15	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
59*:											
Zilwaukee	0-9	Silty clay	CH, CL	A-7	0	100	100	95-100	90-95	45-65	25-40
	9-16	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-40
	16-60	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-40
Misteguay	0-14	Silty clay	CH, CL	A-7	0	100	100	95-100	90-95	45-65	25-40
	14-25	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-40
	25-60	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-40
60B--Arkona	0-10	Sand	SM, SP-SM	A-2-4, A-1-b, A-3	0	95-100	90-100	50-70	5-15	---	NP
	10-27	Sand, loamy sand	SM, SP-SM	A-2-4, A-3, A-1-b	0	95-100	90-100	50-75	5-30	---	NP
	27-60	Silty clay, silty clay loam.	CH	A-7	0	95-100	90-100	85-100	75-95	50-70	25-40
61A*:											
Tappan	0-12	Loam	CL	A-4, A-6	0-5	95-100	90-100	75-95	55-75	25-35	7-15
	12-16	Clay loam	CL	A-6	0-5	95-100	90-100	85-95	65-80	25-40	10-20
	16-60	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0-5	95-100	90-100	85-95	55-90	25-40	7-20
Poseyville	0-12	Loamy fine sand	SM	A-2-4, A-1	0-2	95-100	90-100	45-75	15-30	---	NP
	12-17	Sandy loam, coarse sandy loam.	SM, SC-SM	A-2-4, A-4	0-2	95-100	90-100	55-70	25-40	<25	NP-5
	17-60	Loam, clay loam	CL	A-4, A-6	0-2	95-100	90-100	80-100	60-80	25-36	8-18
62A*:											
Tappan	0-12	Loam	CL	A-4, A-6	0-5	95-100	90-100	75-95	55-75	25-35	7-15
	12-16	Clay loam	CL	A-6	0-5	95-100	90-100	85-95	65-80	25-40	10-20
	16-60	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0-5	95-100	90-100	85-95	55-90	25-40	7-20
Londo	0-9	Loam	CL-ML, CL	A-4	0	95-100	90-100	75-95	50-75	20-30	4-10
	9-13	Clay loam, loam	CL	A-6	0	95-100	90-100	85-95	60-80	30-40	10-20
	13-60	Loam, clay loam	CL	A-6	0-2	95-100	90-100	85-95	60-80	30-40	10-20
63A*:											
Urban land	0-60	Variable	---	---	---	---	---	---	---	---	---
Tappan	0-12	Loam	CL	A-4, A-6	0-5	95-100	90-100	75-95	55-75	25-35	7-15
	12-16	Clay loam	CL	A-6	0-5	95-100	90-100	85-95	65-80	25-40	10-20
	16-60	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0-5	95-100	90-100	85-95	55-90	25-40	7-20
64A--Sanilac	0-10	Very fine sandy loam.	SM, ML	A-4	0	100	100	85-95	40-65	<20	NP-4
	10-15	Very fine sandy loam.	ML, SM	A-4	0	100	100	85-95	40-65	<25	NP-4
	15-60	Stratified very fine sand to silt loam.	SM, SC, ML, CL	A-4	0	100	80-100	75-95	35-60	15-30	NP-10

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
65A---------- Shiawassee	0-11	Sandy loam-------	SC-SM, SC	A-2-4, A-2-6, A-1-b	0	90-100	75-100	45-70	20-40	20-30	4-11
	11-34	Sandy loam, very fine sandy loam, loam.	SC-SM, SC, CL-ML, CL	A-2-4, A-4, A-6, A-2-6	0-5	85-100	75-90	45-90	20-70	20-30	4-11
	34-60	Loam, clay loam	CL-ML, CL	A-4, A-6, A-7	0-5	85-100	75-90	65-90	50-75	20-45	5-25
68A*:											
Tappan----------	0-12	Loam----------	CL	A-4, A-6	0-5	95-100	90-100	75-95	55-75	25-35	7-15
	12-16	Clay loam--------	CL	A-6	0-5	95-100	90-100	85-95	65-80	25-40	10-20
	16-60	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0-5	95-100	90-100	85-95	55-90	25-40	7-20
Londo----------	0-9	Loam----------	CL-ML, CL	A-4	0	95-100	90-100	75-95	50-75	20-30	4-10
	9-13	Clay loam, loam	CL	A-6	0	95-100	90-100	85-95	60-80	30-40	10-20
	13-60	Loam, clay loam	CL	A-6	0-2	95-100	90-100	85-95	60-80	30-40	10-20
Poseyville------	0-12	Loamy fine sand	SM	A-2-4, A-1	0-2	95-100	90-100	45-75	15-30	---	NP
	12-17	Sandy loam, coarse sandy loam.	SM, SC-SM	A-2-4, A-4	0-2	95-100	90-100	55-70	25-40	<25	NP-5
	17-60	Loam, clay loam	CL	A-4, A-6	0-2	95-100	90-100	80-100	60-80	25-36	8-18
69---------- Sloan	0-24	Silt loam--------	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	24-42	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
	42-60	Stratified very fine sandy loam and silt loam.	ML, CL	A-4, A-6	0	100	90-100	85-95	50-90	25-40	3-15
70---------- Udipsamments	0-60	Sand----------	SP, SP-SM, SM	A-1, A-2, A-3	0	85-100	80-100	40-75	0-15	---	NP
71---------- Udorthents	0-60	Loam----------	---	---	---	---	---	---	---	---	NP-15
72---------- Aquents	0-60	Variable---------	---	---	---	---	---	---	---	---	---
73*. Pits											
74*---------- Urban land	0-60	Variable---------	---	---	---	---	---	---	---	---	---
75B2, 75C2------- Strawn	0-10	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	95-100	95-100	90-100	90-100	20-40	3-20
	10-20	Silty clay loam, clay loam.	CL	A-6, A-7	0-5	90-100	90-100	85-95	80-90	25-45	10-25
	20-60	Loam, silt loam, clay loam.	CL	A-4, A-6	0-5	90-100	85-100	75-95	60-95	20-35	7-20

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
75D3---------- Strawn	0-10	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	95-100	95-100	90-100	90-100	20-40	3-20
	10-16	Silty clay loam, clay loam.	CL	A-6, A-7	0-5	90-100	90-100	85-95	80-90	25-45	10-25
	16-60	Loam, silt loam, clay loam.	CL	A-4, A-6	0-5	90-100	85-100	75-95	60-95	20-35	7-20
76A---------- Londo	0-9	Loam----------	CL-ML, CL	A-4	0	95-100	90-100	75-95	50-75	20-30	4-10
	9-13	Clay loam, loam	CL	A-6	0	95-100	90-100	85-95	60-80	30-40	10-20
	13-60	Loam, clay loam	CL	A-6	0-2	90-100	85-100	80-90	55-75	30-40	10-20
77*:											
Chesaning-------	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	5-15
	6-28	Sandy loam, very fine sandy loam, loamy very fine sand.	CL-ML, CL, SC-SM, SC	A-4, A-6, A-2-4, A-2-6	0	100	100	50-100	15-90	20-30	4-11
	28-60	Sand, loamy sand, gravelly sand.	SP, SP-SM, SM	A-1, A-3, A-2-4	0	80-100	60-100	30-75	0-15	<20	NP-4
Cohoctah--------	0-10	Very fine sandy loam.	ML, CL-ML	A-4	0	100	90-100	75-95	50-65	<20	NP-6
	10-27	Sandy loam, very fine sandy loam, fine sandy loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	100	90-100	55-90	30-70	<20	NP-6
	27-60	Sand, coarse sand.	SP, SP-SM, SM	A-3, A-2-4, A-1-b	0	100	90-100	45-70	3-15	---	NP
78---------- Fluvaquents	0-60	Variable---------	---	---	---	---	---	---	---	---	---
82---------- Granby	0-11	Sand----------	SP-SM, SM	A-3, A-2	0	100	100	50-80	5-15	---	NP
	11-49	Sand, fine sand	SP, SP-SM, SM	A-3, A-2	0	100	95-100	50-80	3-35	---	NP
	49-60	Silt loam, silty clay loam.	CL, ML	A-4, A-6	0-5	90-100	90-100	80-100	65-90	25-40	3-15
84A*:											
Parkhill--------	0-11	Loam----------	CL-ML, CL	A-4, A-6	0-5	95-100	85-100	70-95	50-75	20-30	5-15
	11-32	Clay loam, loam	CL	A-6, A-7	0-5	95-100	85-100	70-95	60-90	25-45	10-25
	32-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	70-95	50-90	20-35	5-15
Poseyville------	0-12	Loamy fine sand	SM	A-2-4, A-1	0-2	95-100	90-100	45-75	15-30	---	NP
	12-17	Sandy loam, coarse sandy loam.	SM, SC-SM	A-2-4, A-4	0-2	95-100	90-100	55-70	25-40	<25	NP-5
	17-60	Loam, clay loam	CL	A-4, A-6	0-2	95-100	90-100	80-100	60-80	25-36	8-18

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
88B---------- Boyer	0-9	Sandy loam-------	SM, SC-SM	A-2, A-4, A-1	0-5	90-100	75-95	45-85	20-50	<25	NP-7
	9-23	Gravelly sandy loam, sandy loam.	SM, SC-SM, ML, CL-ML	A-2, A-4, A-1-b	0-5	85-100	60-95	30-85	10-55	<20	NP-4
	23-34	Sandy loam, gravelly sandy loam, gravelly sandy clay loam.	SC, SC-SM, CL, CL-ML	A-2, A-4, A-1-b	0-5	80-100	60-95	35-90	15-75	20-30	5-10
	34-60	Gravelly sand, coarse sand, gravel.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0-10	40-95	30-85	20-60	0-10	---	NP
89---------- Roundhead	0-9	Muck----------	PT	A-8	0	---	---	---	---	---	---
	9-60	Stratified silt loam to fine sandy loam.	CL	A-6, A-7	0	100	100	90-100	70-90	25-45	10-25
91B---------- Branch	0-8	Sand----------	SM, SP-SM	A-2-4, A-3	0	95-100	90-100	50-70	5-15	---	NP
	8-27	Sand, loamy sand	SM, SP-SM	A-2-4, A-3	0	95-100	90-100	50-75	5-30	---	NP
	27-34	Gravelly sandy loam.	SM, SC, SC-SM	A-2-4, A-2-6	0	95-100	60-75	35-55	15-35	<30	NP-15
	34-49	Stratified very gravelly sand and sand.	SP, SP-SM, GP, GP-GM	A-3, A-1-b, A-2-4	0-5	50-80	40-80	30-55	3-12	---	NP
	49-60	Clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	80-100	65-90	35-45	15-25
93A---------- Capac	0-12	Gravelly sandy loam.	SM, SC-SM, SC	A-2, A-1-b	0-10	80-90	60-75	35-55	15-35	<25	3-10
	12-38	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	85-100	75-95	50-85	25-45	5-20
	38-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	75-100	70-95	55-75	20-45	5-20
94*:											
Zilwaukee-------	0-9	Silty clay-------	CH, CL	A-7	0	100	100	95-100	90-95	45-65	25-40
	9-16	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-40
	16-60	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-40
Misteguay-------	0-14	Silty clay-------	CH, CL	A-7	0	100	100	95-100	90-95	45-65	25-40
	14-25	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-40
	25-60	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-40
95*:											
Sloan----------	0-24	Silt loam--------	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	24-42	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
	42-60	Stratified very fine sandy loam and silt loam..	ML, CL	A-4, A-6	0	100	90-100	85-95	50-90	25-40	3-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
95*:											
Ceresco	0-11	Silt loam	CL-ML, CL	A-4	0	100	100	85-100	60-90	20-30	4-10
	11-19	Silt loam	SC-SM, CL, SC, CL-ML	A-4	0	100	100	85-100	60-90	20-30	4-10
	19-60	Sandy loam, fine sandy loam, silt loam, very fine sand.	SC, SC-SM, CL, CL-ML	A-4	0	100	100	60-100	40-90	20-30	4-10
96*:											
Chesaning	0-6	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	5-15
	6-28	Sandy loam, very fine sandy loam, loamy very fine sand.	CL-ML, CL, SC-SM, SC	A-4, A-6, A-2-4, A-2-6	0	100	100	50-100	15-90	20-30	4-11
	28-60	Sand, loamy sand, gravelly sand.	SP, SP-SM, SM	A-1, A-3, A-2-4	0	80-100	60-100	30-75	0-15	<20	NP-4
Cohoctah	0-10	Very fine sandy loam.	ML, CL-ML	A-4	0	100	90-100	75-95	50-65	<20	NP-6
	10-27	Sandy loam, very fine sandy loam, fine sandy loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	100	90-100	55-90	30-70	<20	NP-6
	27-60	Sand, coarse sand	SP, SP-SM, SM	A-3, A-2-4, A-1-b	0	100	90-100	45-70	3-15	---	NP
98A---------- Poseyville	0-12	Loamy fine sand	SM	A-2-4, A-1	0-2	95-100	90-100	45-75	15-30	---	NP
	12-17	Sandy loam, coarse sandy loam.	SM, SC-SM	A-2-4, A-4	0-2	95-100	90-100	55-70	25-40	<25	NP-5
	17-60	Loam, clay loam	CL	A-4, A-6	0-2	95-100	90-100	80-100	60-80	25-36	8-18
99A*:											
Urban land.											
Parkhill	0-11	Loam	CL-ML, CL	A-4, A-6	0-5	95-100	85-100	70-95	50-75	20-30	5-15
	11-32	Clay loam, loam	CL	A-6, A-7	0-5	95-100	85-100	70-95	60-90	25-45	10-25
	32-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	70-95	50-90	20-35	5-15

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
5A	0-12	8-12	1.30-1.50	2.0-6.0	0.13-0.15	6.1-7.3	Low	0.20	5	3	2-4
Sumava	12-16	8-15	1.50-1.60	2.0-6.0	0.15-0.17	6.6-7.3	Low	0.20			
	16-25	8-15	1.50-1.60	2.0-6.0	0.14-0.16	7.4-7.8	Low	0.20			
	25-38	10-15	1.50-1.70	0.6-2.0	0.08-0.13	7.4-8.4	Low	0.37			
	38-60	8-30	1.50-1.70	0.6-2.0	0.08-0.13	7.4-8.4	Low	0.37			
10C	0-7	0-10	1.35-1.55	6.0-20	0.06-0.08	4.5-6.5	Low	0.15	5	1	1-3
Grattan	7-35	0-10	1.40-1.60	6.0-20	0.05-0.10	4.5-6.5	Low	0.15			
	35-60	0-10	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low	0.15			
12	0-11	5-15	1.10-1.60	2.0-6.0	0.12-0.15	5.6-7.8	Low	0.20	5	3	4-8
Corunna	11-27	10-18	1.30-1.60	0.6-6.0	0.08-0.14	5.6-7.8	Low	0.20			
	27-60	18-35	1.45-1.70	0.2-0.6	0.16-0.20	7.4-8.4	Moderate	0.43			
13	0-12	0-10	0.90-1.60	6.0-20	0.08-0.10	6.1-7.8	Low	0.15	5	1	3-10
Belleville	12-23	2-12	1.45-1.70	6.0-20	0.06-0.10	6.1-8.4	Low	0.17			
	23-60	25-35	1.45-1.80	0.2-0.6	0.14-0.20	7.4-8.4	Moderate	0.32			
14	0-9	18-27	1.15-1.35	0.6-2.0	0.22-0.24	6.1-7.8	Moderate	0.28	5	6	5-6
Pella	9-24	27-35	1.20-1.45	0.6-2.0	0.21-0.24	6.6-7.8	Moderate	0.28			
	24-60	15-30	1.40-1.70	0.6-2.0	0.10-0.22	7.4-8.4	Low	0.28			
15B	0-12	0-10	1.20-1.60	6.0-20	0.07-0.09	5.1-6.5	Low	0.15	5	1	3-4
Wixom	12-23	2-10	1.40-1.70	6.0-20	0.06-0.11	5.1-7.3	Low	0.15			
	23-60	18-35	1.50-1.70	0.2-0.6	0.14-0.20	7.4-8.4	Low	0.43			
17B	0-9	8-18	1.40-1.60	0.6-2.0	0.20-0.22	6.6-7.3	Low	0.37	5	3	2-3
Frankenmuth	9-13	8-20	1.45-1.60	0.6-2.0	0.17-0.22	6.6-7.3	Low	0.37			
	13-18	8-35	1.45-1.60	0.2-0.6	0.17-0.22	6.6-7.3	Moderate	0.37			
	18-60	5-35	1.50-1.70	0.2-20	0.07-0.18	7.4-7.8	Moderate	0.37			
18	0-12	27-35	1.40-1.55	0.6-2.0	0.17-0.26	5.6-7.8	Moderate	0.28	3	7	3-12
Lenawee	12-42	35-45	1.40-1.65	0.06-0.2	0.14-0.20	6.1-7.8	Moderate	0.37			
	42-60	18-40	1.50-1.65	0.06-0.2	0.16-0.22	7.4-8.4	Moderate	0.37			
19	0-12	15-25	1.20-1.60	0.6-2.0	0.18-0.22	7.4-8.4	Moderate	0.28	5	5	2-4
Tappan	12-16	18-30	1.60-1.80	0.2-2.0	0.14-0.19	7.9-8.4	Moderate	0.32			
	16-60	15-30	1.60-1.80	0.06-0.2	0.15-0.19	7.9-8.4	Moderate	0.37			
22B*:											
Parkhill	0-11	10-20	1.10-1.60	0.6-2.0	0.20-0.22	6.1-7.3	Low	0.24	5	5	3-5
	11-32	18-35	1.45-1.70	0.2-0.6	0.15-0.19	6.1-7.8	Low	0.32			
	32-60	12-25	1.50-1.70	0.2-0.6	0.17-0.19	7.4-8.4	Low	0.37			
Wixom	0-12	0-10	1.20-1.60	6.0-20	0.07-0.09	5.1-6.5	Low	0.15	5	1	3-4
	12-23	2-10	1.40-1.70	6.0-20	0.06-0.11	5.1-7.3	Low	0.15			
	23-60	18-35	1.50-1.70	0.2-0.6	0.14-0.20	7.4-8.4	Low	0.43			
23A	0-12	10-18	1.40-1.70	0.6-2.0	0.18-0.22	5.6-7.3	Low	0.32	5	5	2-6
Capac	12-38	18-35	1.45-1.70	0.2-0.6	0.14-0.18	5.6-7.3	Low	0.32			
	38-60	10-35	1.50-1.70	0.2-0.6	0.14-0.17	7.4-8.4	Low	0.32			
24	0-11	10-20	1.10-1.60	0.6-2.0	0.20-0.22	6.1-7.3	Low	0.24	5	5	3-5
Parkhill	11-32	18-35	1.45-1.70	0.2-0.6	0.15-0.19	6.1-7.8	Low	0.32			
	32-60	12-25	1.50-1.70	0.2-0.6	0.17-0.19	7.4-8.4	Low	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
26A	0-12	2-10	1.30-1.50	6.0-20	0.06-0.10	4.5-7.3	Low	0.15	5	1	3-4
Pipestone	12-52	2-10	1.20-1.60	6.0-20	0.04-0.08	4.5-7.3	Low	0.17			
	52-60	12-35	1.40-1.70	0.06-0.6	0.16-0.18	7.4-8.4	Low	0.32			
28A*:											
Parkhill	0-11	10-20	1.10-1.60	0.6-2.0	0.20-0.22	6.1-7.3	Low	0.24	5	5	3-5
	11-32	18-35	1.45-1.70	0.2-0.6	0.15-0.19	6.1-7.8	Low	0.32			
	32-60	12-25	1.50-1.70	0.2-0.6	0.17-0.19	7.4-8.4	Low	0.37			
Capac	0-12	10-18	1.40-1.70	0.6-2.0	0.18-0.22	5.6-7.3	Low	0.32	5	5	2-6
	12-38	18-35	1.45-1.70	0.2-0.6	0.14-0.18	5.6-7.3	Low	0.32			
	38-60	10-35	1.50-1.70	0.2-0.6	0.14-0.17	7.4-8.4	Low	0.32			
29	0-24	15-27	1.20-1.40	0.6-2.0	0.19-0.24	6.1-7.8	Low	0.28	5	6	3-6
Sloan	24-42	22-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate	0.37			
	42-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low	0.37			
31A	0-10	2-10	1.30-1.50	6.0-20	0.07-0.10	3.6-7.3	Low	0.15	5	1	3-4
Pipestone	10-45	2-10	1.40-1.70	6.0-20	0.06-0.09	3.6-7.3	Low	0.15			
	45-60	2-10	1.40-1.65	6.0-20	0.05-0.07	3.6-7.3	Low	0.15			
33	0-12	2-10	1.20-1.60	6.0-20	0.07-0.10	5.6-7.3	Low	0.15	5	1	4-10
Granby	12-48	0-10	1.45-1.60	6.0-20	0.05-0.12	5.6-7.8	Low	0.17			
	48-60	0-10	1.45-1.60	6.0-20	0.05-0.09	6.6-8.4	Low	0.17			
41A	0-11	8-18	1.20-1.50	2.0-6.0	0.09-0.13	6.6-7.3	Low	0.20	4	3	2-4
Shiawassee	11-34	8-18	1.35-1.60	2.0-6.0	0.08-0.12	6.6-8.4	Low	0.32			
	34-60	10-35	1.80-2.10	<0.06	0.01-0.02	7.9-8.4	Low	0.32			
44*:											
Sloan	0-24	15-27	1.20-1.40	0.6-2.0	0.19-0.24	6.1-7.8	Low	0.28	5	6	3-6
	24-42	22-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate	0.37			
	42-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low	0.37			
Ceresco	0-11	10-15	1.35-1.60	2.0-6.0	0.20-0.24	6.1-7.8	Low	0.24	5	5	3-5
	11-19	10-20	1.40-1.70	0.6-6.0	0.09-0.17	6.1-7.8	Low	0.24			
	19-60	10-18	1.40-1.70	0.6-6.0	0.11-0.20	6.6-8.4	Low	0.24			
45A	0-16	5-15	1.30-1.50	2.0-6.0	0.13-0.15	5.6-7.3	Low	0.20	3	3	3-4
Fabius	16-22	18-30	1.35-1.55	2.0-6.0	0.15-0.18	5.6-7.3	Low	0.32			
	22-60	0-10	1.25-1.50	>20	0.02-0.04	7.9-8.4	Low	0.10			
46B	0-7	10-20	1.30-1.60	2.0-6.0	0.10-0.13	5.6-7.3	Low	0.17	5	3	2-4
Cadmus	7-19	18-35	1.35-1.70	0.6-2.0	0.11-0.19	5.6-7.3	Low	0.32			
	19-25	12-20	1.35-1.70	0.6-2.0	0.07-0.12	6.1-7.8	Low	0.24			
	25-60	15-32	1.35-1.85	0.2-0.6	0.10-0.19	7.9-8.4	Low	0.32			
55B	0-11	12-18	1.30-1.60	0.6-2.0	0.22-0.24	6.6-7.8	Low	0.32	5	3	1-3
Gagetown	11-60	0-18	1.30-1.80	0.2-2.0	0.06-0.22	7.4-8.4	Low	0.43			
55C2	0-8	12-18	1.30-1.60	0.6-2.0	0.20-0.22	6.6-7.8	Low	0.32	5	5	1-3
Gagetown	8-60	0-18	1.30-1.80	0.2-2.0	0.06-0.22	7.4-8.4	Low	0.43			
57B*:											
Pella	0-9	18-27	1.15-1.35	0.6-2.0	0.22-0.24	6.1-7.8	Moderate	0.28	5	6	5-6
	9-24	27-35	1.20-1.45	0.6-2.0	0.21-0.24	6.6-7.8	Moderate	0.28			
	24-60	15-30	1.40-1.70	0.6-2.0	0.10-0.22	7.4-8.4	Low	0.28			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
57B*:											
Frankenmuth	0-9	8-18	1.40-1.60	0.6-2.0	0.20-0.22	6.6-7.3	Low	0.37	5	3	2-3
	9-13	8-20	1.45-1.60	0.6-2.0	0.17-0.22	6.6-7.3	Low	0.37			
	13-18	8-35	1.45-1.60	0.2-0.6	0.17-0.22	6.6-7.3	Moderate	0.37			
	18-60	5-35	1.50-1.70	0.2-20	0.07-0.18	7.4-7.8	Moderate	0.37			
58B	0-8	2-10	1.30-1.55	6.0-20	0.06-0.09	4.5-7.3	Low	0.15	5	1	1-2
Covert	8-35	2-10	1.30-1.60	6.0-20	0.05-0.08	4.5-7.3	Low	0.15			
	35-60	0-10	1.45-1.65	6.0-20	0.04-0.07	5.1-7.3	Low	0.15			
59*:											
Zilwaukee	0-9	40-60	1.35-1.60	0.2-0.6	0.12-0.14	7.4-8.4	High	0.28	5	4	4-6
	9-16	35-60	1.40-1.60	0.06-0.2	0.11-0.20	7.4-8.4	High	0.28			
	16-60	35-60	1.40-1.60	0.06-0.2	0.10-0.20	7.4-8.4	High	0.28			
Misteguay	0-14	40-60	1.35-1.60	0.2-0.6	0.12-0.14	7.4-8.4	Moderate	0.32	5	4	2-5
	14-25	35-60	1.40-1.60	0.06-0.2	0.11-0.20	7.4-8.4	Moderate	0.32			
	25-60	35-60	1.40-1.60	0.06-0.2	0.10-0.20	7.4-8.4	Moderate	0.32			
60B	0-10	1-10	1.25-1.40	6.0-20	0.07-0.09	5.1-7.3	Low	0.15	4	1	1-3
Arkona	10-27	3-15	1.35-1.45	6.0-20	0.06-0.11	5.1-7.3	Low	0.17			
	27-60	35-50	1.50-1.75	<0.06	0.08-0.12	5.6-8.4	High	0.28			
61A*:											
Tappan	0-12	15-25	1.20-1.60	0.6-2.0	0.18-0.22	7.4-8.4	Moderate	0.28	5	5	2-4
	12-16	18-30	1.60-1.80	0.2-2.0	0.14-0.19	7.9-8.4	Moderate	0.32			
	16-60	15-30	1.60-1.80	0.06-0.2	0.15-0.19	7.9-8.4	Moderate	0.37			
Poseyville	0-12	2-12	1.30-1.50	6.0-20	0.09-0.12	6.1-7.3	Low	0.17	5	2	2-3
	12-17	12-18	1.55-1.70	0.6-2.0	0.06-0.14	6.6-7.8	Low	0.24			
	17-60	18-35	1.45-1.70	0.2-2.0	0.12-0.19	7.9-8.4	Moderate	0.37			
62A*:											
Tappan	0-12	15-25	1.20-1.60	0.6-2.0	0.18-0.22	7.4-8.4	Moderate	0.28	5	5	2-4
	12-16	18-30	1.60-1.80	0.2-2.0	0.14-0.19	7.9-8.4	Moderate	0.32			
	16-60	15-30	1.60-1.80	0.06-0.2	0.15-0.19	7.9-8.4	Moderate	0.37			
Londo	0-9	10-18	1.40-1.70	0.6-2.0	0.18-0.22	6.1-7.8	Low	0.32	5	5	1-3
	9-13	20-35	1.40-1.75	0.2-2.0	0.14-0.19	6.6-7.8	Moderate	0.32			
	13-60	20-32	1.45-1.75	0.2-2.0	0.12-0.19	7.9-8.4	Moderate	0.32			
63A*:											
Urban land	0-60	---	---	---	---	---	---	----	---	---	---
Tappan	0-12	15-25	1.20-1.60	0.6-2.0	0.18-0.22	7.4-8.4	Moderate	0.28	5	5	2-4
	12-16	18-30	1.60-1.80	0.2-2.0	0.14-0.19	7.9-8.4	Moderate	0.32			
	16-60	15-30	1.60-1.80	0.06-0.2	0.15-0.19	7.9-8.4	Moderate	0.37			
64A	0-10	3-15	1.40-1.70	2.0-6.0	0.15-0.22	6.6-8.4	Low	0.37	5	3	2-3
Sanilac	10-15	0-18	1.45-1.80	0.2-2.0	0.06-0.22	7.9-8.4	Low	0.37			
	15-60	0-18	1.50-1.90	0.2-2.0	0.06-0.22	7.9-8.4	Low	0.37			
65A	0-11	8-18	1.20-1.50	2.0-6.0	0.11-0.15	6.6-7.3	Low	0.24	4	3	2-4
Shiawassee	11-34	8-18	1.35-1.60	2.0-6.0	0.08-0.12	6.6-8.4	Low	0.32			
	34-60	10-35	1.80-2.10	<0.06	0.01-0.02	7.9-8.4	Low	0.32			
68A*:											
Tappan	0-12	15-25	1.20-1.60	0.6-2.0	0.18-0.22	7.4-8.4	Moderate	0.28	5	5	2-4
	12-16	18-30	1.60-1.80	0.2-2.0	0.14-0.19	7.9-8.4	Moderate	0.32			
	16-60	15-30	1.60-1.80	0.06-0.2	0.15-0.19	7.9-8.4	Moderate	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
68A*:											
Londo	0-9	10-18	1.40-1.70	0.6-2.0	0.18-0.22	6.1-7.8	Low	0.32	5	5	1-3
	9-13	20-35	1.40-1.75	0.2-2.0	0.14-0.19	6.6-7.8	Moderate	0.32			
	13-60	20-32	1.45-1.75	0.2-2.0	0.12-0.19	7.9-8.4	Moderate	0.32			
Poseyville	0-12	2-12	1.30-1.50	6.0-20	0.09-0.12	6.1-7.3	Low	0.17	5	2	2-3
	12-17	12-18	1.55-1.70	0.6-2.0	0.06-0.14	6.6-7.8	Low	0.24			
	17-60	18-35	1.45-1.70	0.2-2.0	0.12-0.19	7.9-8.4	Moderate	0.37			
69	0-24	15-27	1.20-1.40	0.6-2.0	0.19-0.24	6.1-7.8	Low	0.28	5	6	3-6
Sloan	24-42	22-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate	0.37			
	42-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low	0.37			
70	0-60	0-10	1.35-1.65	>6.0	0.05-0.09	5.1-6.5	Low	0.15	5	1	<1
Udipsamments											
71	0-60	2-18	1.50-1.70	0.6-2.0	0.11-0.18	---	Low	0.24	5	3	---
Udorthents											
72	0-60	---	---	---	---	---	---	---	---	---	---
Aquents											
73*.											
Pits											
74*	0-60	---	---	---	---	---	---	---	---	---	---
Urban land											
75B2, 75C2	0-10	18-27	1.15-1.45	0.6-2.0	0.20-0.24	6.1-7.3	Low	0.37	5	6	1-2
Strawn	10-20	27-35	1.35-1.55	0.6-2.0	0.15-0.20	5.6-7.8	Moderate	0.37			
	20-60	22-30	1.50-1.70	0.2-0.6	0.08-0.12	7.4-8.4	Low	0.32			
75D3	0-10	18-27	1.15-1.45	0.6-2.0	0.20-0.24	6.1-7.3	Low	0.37	5	6	.5-1
Strawn	10-16	27-35	1.35-1.55	0.6-2.0	0.15-0.20	5.6-7.8	Moderate	0.37			
	16-60	22-30	1.50-1.70	0.2-0.6	0.08-0.12	7.4-8.4	Low	0.32			
76A	0-9	10-18	1.40-1.70	0.6-2.0	0.18-0.22	6.1-7.8	Low	0.32	5	5	1-3
Londo	9-13	20-35	1.40-1.75	0.2-2.0	0.14-0.19	6.6-7.8	Moderate	0.32			
	13-60	20-32	1.45-1.75	0.2-2.0	0.12-0.19	7.9-8.4	Moderate	0.32			
77*:											
Chesaning	0-6	12-27	1.20-1.60	2.0-6.0	0.22-0.24	6.6-7.8	Low	0.37	4	5	1-3
	6-28	10-20	1.35-1.60	2.0-6.0	0.12-0.20	7.4-7.8	Low	0.37			
	28-60	0-10	1.50-1.65	6.0-20	0.03-0.07	7.4-7.8	Low	0.15			
Cohoctah	0-10	5-15	1.20-1.50	2.0-6.0	0.20-0.22	6.1-7.3	Low	0.28	3	3	3-6
	10-27	5-18	1.55-1.65	2.0-6.0	0.12-0.18	6.1-7.3	Low	0.28			
	27-60	1-6	1.60-1.70	6.0-20	0.05-0.07	6.6-7.8	Low	0.15			
78	0-60	---	---	---	---	---	---	---	---	---	---
Fluvaquents											
82	0-11	2-10	1.20-1.60	6.0-20	0.07-0.10	5.6-7.3	Low	0.15	5	1	4-10
Granby	11-49	0-10	1.45-1.60	6.0-20	0.05-0.12	5.6-7.8	Low	0.17			
	49-60	12-35	1.40-1.70	0.06-0.6	0.16-0.18	7.4-8.4	Low	0.32			
84A*:											
Parkhill	0-11	10-20	1.10-1.60	0.6-2.0	0.20-0.22	6.1-7.3	Low	0.24	5	5	3-5
	11-32	18-35	1.45-1.70	0.2-0.6	0.15-0.19	6.1-7.8	Low	0.32			
	32-60	12-25	1.50-1.70	0.2-0.6	0.17-0.19	7.4-8.4	Low	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
84A*:											
Poseyville	0-12	2-12	1.30-1.50	6.0-20	0.09-0.12	6.1-7.3	Low	0.17	5	2	2-3
	12-17	12-18	1.55-1.70	0.6-2.0	0.06-0.14	6.6-7.8	Low	0.24			
	17-60	18-35	1.45-1.70	0.2-2.0	0.12-0.19	7.9-8.4	Moderate	0.37			
88B	0-9	5-15	1.30-1.60	2.0-6.0	0.11-0.15	5.6-7.3	Low	0.24	4	3	1-3
Boyer	9-23	2-15	1.30-1.60	2.0-6.0	0.08-0.16	5.6-7.3	Low	0.17			
	23-34	10-18	1.35-1.60	2.0-6.0	0.11-0.13	5.6-7.8	Low	0.24			
	34-60	0-10	1.40-1.55	>20	0.02-0.04	7.4-8.4	Low	0.10			
89	0-9	---	0.35-0.45	0.6-6.0	0.25-0.30	5.1-7.8		----	5	2	15-60
Roundhead	9-60	24-35	1.50-1.70	0.06-0.6	0.18-0.22	7.4-8.4	Moderate	0.43			
91B	0-8	2-10	1.40-1.60	6.0-20	0.07-0.09	4.5-7.3	Low	0.15	5	1	.5-3
Branch	8-27	2-12	1.40-1.60	6.0-20	0.06-0.11	4.5-7.3	Low	0.15			
	27-34	10-25	1.25-1.60	2.0-6.0	0.08-0.18	4.5-7.3	Low	0.24			
	34-49	1-8	1.50-1.70	>20	0.02-0.05	7.4-8.4	Low	0.15			
	49-60	27-35	1.50-1.70	0.2-0.6	0.14-0.16	7.4-8.4	Moderate	0.37			
93A	0-12	10-18	1.40-1.70	2.0-6.0	0.07-0.12	5.6-7.3	Low	0.17	5	3	2-6
Capac	12-38	18-35	1.45-1.70	0.2-0.6	0.14-0.18	5.6-7.3	Low	0.32			
	38-60	10-35	1.50-1.70	0.2-0.6	0.14-0.17	7.4-8.4	Low	0.32			
94*:											
Zilwaukee	0-9	40-60	1.35-1.60	0.2-0.6	0.12-0.14	7.4-8.4	High	0.28	5	4	4-6
	9-16	35-60	1.40-1.60	0.06-0.2	0.11-0.20	7.4-8.4	High	0.28			
	16-60	35-60	1.40-1.60	0.06-0.2	0.10-0.20	7.4-8.4	High	0.28			
Misteguay	0-14	40-60	1.35-1.60	0.2-0.6	0.12-0.14	7.4-8.4	Moderate	0.32	5	4	2-5
	14-25	35-60	1.40-1.60	0.06-0.2	0.11-0.20	7.4-8.4	Moderate	0.32			
	25-60	35-60	1.40-1.60	0.06-0.2	0.10-0.20	7.4-8.4	Moderate	0.32			
95*:											
Sloan	0-24	15-27	1.20-1.40	0.6-2.0	0.19-0.24	6.1-7.8	Low	0.28	5	6	3-6
	24-42	22-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate	0.37			
	42-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low	0.37			
Ceresco	0-11	10-15	1.35-1.60	2.0-6.0	0.20-0.24	6.1-7.8	Low	0.24	5	5	3-5
	11-19	12-20	1.40-1.70	0.6-6.0	0.09-0.17	6.1-7.8	Low	0.24			
	19-60	10-18	1.40-1.70	0.6-6.0	0.11-0.20	6.6-8.4	Low	0.24			
96*:											
Chesaning	0-6	12-27	1.20-1.60	2.0-6.0	0.22-0.24	6.6-7.8	Low	0.37	4	5	1-3
	6-28	10-20	1.35-1.60	2.0-6.0	0.12-0.20	7.4-7.8	Low	0.37			
	28-60	0-10	1.50-1.65	6.0-20	0.03-0.07	7.4-7.8	Low	0.15			
Cohoctah	0-10	5-15	1.20-1.50	2.0-6.0	0.20-0.22	6.1-7.3	Low	0.28	3	3	3-6
	10-27	5-18	1.55-1.65	2.0-6.0	0.12-0.18	6.1-7.3	Low	0.28			
	27-60	1-6	1.60-1.70	6.0-20	0.05-0.07	6.6-7.8	Low	0.15			
98A	0-12	2-12	1.30-1.50	6.0-20	0.09-0.12	6.1-7.3	Low	0.17	5	2	2-3
Poseyville	12-17	12-18	1.55-1.70	0.6-2.0	0.06-0.14	6.6-7.8	Low	0.24			
	17-60	18-35	1.45-1.70	0.2-2.0	0.12-0.19	7.9-8.4	Moderate	0.37			
99A*:											
Urban land.											
Parkhill	0-11	10-20	1.10-1.60	0.6-2.0	0.20-0.22	6.1-7.3	Low	0.24	5	5	3-5
	11-32	18-35	1.45-1.70	0.2-0.6	0.15-0.19	6.1-7.8	Low	0.32			
	32-60	12-25	1.50-1.70	0.2-0.6	0.17-0.19	7.4-8.4	Low	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
5A---------- Sumava	B	None----------	---	---	1.0-3.0	Apparent	Nov-May	Moderate	Moderate	Low.
10C---------- Grattan	A	None----------	---	---	>6.0	---	---	Low-------	Low-------	High.
12---------- Corunna	B/D	None----------	---	---	+1-1.0	Apparent	Nov-May	High------	High------	Low.
13---------- Belleville	B/D	None----------	---	---	+1-1.0	Apparent	Nov-May	High------	High------	Low.
14---------- Pella	B/D	None----------	---	---	+.5-2.0	Apparent	Nov-May	High------	High------	Low.
15B---------- Wixom	B	None----------	---	---	0.5-1.5	Perched	Nov-May	Moderate	Moderate	High.
17B---------- Frankenmuth	C	None----------	---	---	1.0-2.0	Apparent	Nov-May	High------	High------	Low.
18---------- Lenawee	B/D	None----------	---	---	+1-1.0	Apparent	Nov-May	High------	High------	Low.
19---------- Tappan	B/D	None----------	---	---	+1-1.0	Apparent	Nov-May	High------	High------	Low.
22B*:										
Parkhill----------	B/D	None----------	---	---	+1-1.0	Apparent	Nov-May	High------	High------	Low.
Wixom----------	B	None----------	---	---	0.5-1.5	Perched	Nov-May	Moderate	Moderate	High.
23A---------- Capac	C	None----------	---	---	1.0-2.0	Apparent	Nov-May	High------	High------	Low.
24---------- Parkhill	B/D	None----------	---	---	+1-1.0	Apparent	Nov-May	High------	High------	Low.
26A---------- Pipestone	B	None----------	---	---	0.5-1.5	Apparent	Nov-May	Moderate	Low-------	Moderate.
28A*:										
Parkhill----------	B/D	None----------	---	---	+1-1.0	Apparent	Nov-May	High------	High------	Low
Capac----------	C	None----------	---	---	1.0-2.0	Apparent	Nov-May	High------	High------	Low.
29---------- Sloan	B/D	Frequent-----	Brief------	Nov-Jun	0-1.0	Apparent	Oct-Jun	High------	High------	Low.
31A---------- Pipestone	B	None----------	---	---	0.5-1.5	Apparent	Nov-May	Moderate	Low-------	Moderate.
33---------- Granby	A/D	None----------	---	---	+1-1.0	Apparent	Nov-May	Moderate	High------	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
41A---------- Shiawassee	C	None--------	---	---	1.0-2.0	Perched	Nov-May	High-----	High-----	Low.
44*:										
Sloan----------	B/D	Frequent----	Brief-----	Nov-Jun	0-1.0	Apparent	Oct-Jun	High-----	High-----	Low.
Ceresco----------	B	Frequent----	Brief-----	Mar-May	1.0-2.0	Apparent	Oct-Jun	High-----	Low------	Low.
45A---------- Fabius	B	None--------	---	---	1.0-2.0	Apparent	Nov-May	High-----	Moderate	Moderate.
46B---------- Cadmus	B	None--------	---	---	2.0-3.0	Perched	Nov-May	Moderate	Moderate	Low.
55B, 55C2--------- Gagetown	B	None--------	---	---	2.0-3.0	Apparent	Nov-Apr	High-----	Moderate	Low.
57B*:										
Pella----------	B/D	None--------	---	---	+.5-2.0	Apparent	Nov-May	High-----	High-----	Low.
Frankenmuth------	C	None--------	---	---	1.0-2.0	Apparent	Nov-May	High-----	High-----	Low.
58B---------- Covert	A	None--------	---	---	2.0-3.5	Apparent	Nov-May	Low------	Low------	Moderate.
59*:										
Zilwaukee--------	D	Rare--------	---	---	0-1.0	Apparent	Oct-Jun	High-----	High-----	Low.
Misteguay--------	D	Rare--------	---	---	0-1.0	Apparent	Oct-Jun	High-----	High-----	Low.
60B---------- Arkona	B	None--------	---	---	1.0-2.0	Perched	Nov-May	Moderate	High-----	Moderate.
61A*:										
Tappan----------	B/D	None--------	---	---	+1-1.0	Apparent	Nov-May	High-----	High-----	Low.
Poseyville-------	C	None--------	---	---	1.0-2.0	Apparent	Nov-May	High-----	High-----	Low.
62A*:										
Tappan----------	B/D	None--------	---	---	+1-1.0	Apparent	Nov-May	High-----	High-----	Low.
Londo----------	C	None--------	---	---	1.0-2.0	Apparent	Nov-May	High-----	High-----	Low.
63A*:										
Urban land-------	---	None--------	---	---	---	---	---	---	---	---
Tappan----------	B/D	None--------	---	---	+1-1.0	Apparent	Nov-May	High-----	High-----	Low.
64A---------- Sanilac	B	None--------	---	---	1.0-2.0	Apparent	Nov-Jun	High-----	Moderate	Low.
65A---------- Shiawassee	C	None--------	---	---	1.0-2.0	Perched	Nov-May	High-----	High-----	Low.
68A*:										
Tappan----------	B/D	None--------	---	---	+1-1.0	Apparent	Nov-May	High-----	High-----	Low.
Londo----------	C	None--------	---	---	1.0-2.0	Apparent	Nov-May	High-----	High-----	Low.
Poseyville-------	C	None--------	---	---	1.0-2.0	Apparent	Nov-May	High-----	High-----	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
69---------- Sloan	B/D	Rare---------	---	---	0-1.0	Apparent	Oct-Jun	High-----	High-----	Low.
70---------- Udipsamments	A	None---------	---	---	>6.0	---	---	Low------	Low------	Moderate.
71---------- Udorthents	---	None---------	---	---	>6.0	---	---	---	---	---
72---------- Aquents	D	None---------	---	---	+1-1.0	Apparent	Jan-Dec	High-----	---	---
73*. Pits										
74*---------- Urban land	---	None---------	---	---	---	---	---	---	---	---
75B2, 75C2, 75D3-- Strawn	B	None---------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
76A---------- Londo	C	None---------	---	---	1.0-2.0	Apparent	Nov-May	High-----	High-----	Low.
77*:										
Chesaning---------	B	Frequent----	Brief-----	Mar-May	1.0-2.0	Apparent	Oct-May	High-----	Low------	Low.
Cohoctah----------	D	Frequent----	Very brief to long.	Nov-May	0-1.0	Apparent	Oct-May	High-----	High-----	Moderate.
78---------- Fluvaquents	---	Frequent----	Long------	Jan-Dec	+1-1.0	Apparent	Oct-Jun	---	---	---
82---------- Granby	A/D	None---------	---	---	+1-1.0	Apparent	Nov-May	Moderate	High-----	Low.
84A*:										
Parkhill----------	B/D	None---------	---	---	+1-1.0	Apparent	Nov-May	High-----	High-----	Low.
Poseyville--------	C	None---------	---	---	1.0-2.0	Apparent	Nov-May	High-----	High-----	Low.
88B---------- Boyer	B	None---------	---	---	>6.0	---	---	Moderate	Low------	Moderate.
89---------- Roundhead	B/D	None---------	---	---	+1-1.5	Apparent	Oct-Jun	High-----	High-----	Low.
91B---------- Branch	B	None---------	---	---	2.5-3.5	Apparent	Nov-May	Moderate	Low------	Moderate.
93A---------- Capac	C	None---------	---	---	1.0-2.0	Apparent	Nov-May	High-----	High-----	Low.
94*:										
Zilwaukee---------	D	Frequent----	Brief to very long.	Oct-Jun	0-1.0	Apparent	Oct-Jun	High-----	High-----	Low.
Misteguay---------	D	Frequent----	Brief to very long.	Oct-Jun	0-1.0	Apparent	Oct-Jun	High-----	High-----	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
95*:										
Sloan	B/D	Rare	---	---	0-1.0	Apparent	Oct-Jun	High	High	Low.
Ceresco	B	Rare	---	---	1.0-2.0	Apparent	Oct-Jun	High	Low	Low.
96*:										
Chesaning	B	Rare	---	---	1.0-2.0	Apparent	Oct-May	High	Low	Low.
Cohoctah	D	Rare	---	---	0-1.0	Apparent	Oct-May	High	High	Moderate.
98A Poseyville	C	None	---	---	1.0-2.0	Apparent	Nov-May	High	High	Low.
99A*:										
Urban land.										
Parkhill	B/D	None	---	---	+1-1.0	Apparent	Nov-May	High	High	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Aquents	Aquents
Arkona	Sandy over clayey, mixed, mesic Alfic Haplaquods
Belleville	Sandy over loamy, mixed, mesic Typic Haplaquolls
Boyer	Coarse-loamy, mixed, mesic Typic Hapludalfs
Branch	Loamy, mixed, mesic Aquic Arenic Hapludalfs
*Cadmus	Fine-loamy, mixed, mesic Mollic Hapludalfs
Capac	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Ceresco	Coarse-loamy, mixed, mesic Fluvaquentic Hapludolls
Chesaning	Coarse-loamy, mixed (calcareous), mesic Aeric Fluvaquents
*Cohoctah	Coarse-loamy, mixed, mesic Fluvaquentic Haplaquolls
Corunna	Coarse-loamy, mixed, mesic Typic Haplaquolls
Covert	Sandy, mixed, mesic Entic Haplorthods
Fabius	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Aquic Argiudolls
Fluvaquents	Fluvaquents
Frankenmuth	Fine-silty, mixed, mesic Aquic Argiudolls
Gagetown	Coarse-silty, mixed, mesic Typic Hapludolls
Granby	Sandy, mixed, mesic Typic Haplaquolls
Grattan	Sandy, mixed, mesic Entic Haplorthods
*Lenawee	Fine, mixed, nonacid, mesic Mollic Haplaquepts
*Londo	Fine-loamy, mixed, mesic Aeric Glossaqualfs
Misteguay	Fine, mixed (calcareous), mesic Aeric Haplaquepts
*Parkhill	Fine-loamy, mixed, nonacid, mesic Mollic Haplaquepts
Pella	Fine-silty, mixed, mesic Typic Haplaquolls
Pipestone	Sandy, mixed, mesic Entic Haplaquods
Poseyville	Coarse-loamy, mixed, mesic Psammaquentic Hapludalfs
Roundhead	Fine-silty, mixed (calcareous), mesic Histic Humaquepts
*Sanilac	Coarse-silty, mixed (calcareous), mesic Aeric Haplaquepts
Shiawassee	Coarse-loamy, mixed, mesic Aquic Argiudolls
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
*Strawn	Fine-loamy, mixed, mesic Typic Hapludalfs
Sumava	Coarse-loamy, mixed, mesic Aquic Argiudolls
Tappan	Fine-loamy, mixed (calcareous), mesic Typic Haplaquolls
Udipsamments	Udipsamments
Udorthents	Udorthents
Wixom	Sandy over loamy, mixed, mesic Alfic Haplaquods
Zilwaukee	Fine, mixed (calcareous), mesic Typic Haplaquolls

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